N A O
National Audit Office
MALTA

Performance Audit: Evaluation of Feed-In Tariff Schemes for Photovoltaics

March 2018

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List of Abbreviations

ARMS	Automated Revenue Management Systems Ltd
CAPEX	Capital Expenditure
CBA	Cost Benefit Analysis
EC	European Commission
ECJ	European Court of Justice
EEA	European Economic Area
EP	European Parliament
ERDF	European Regional Development Fund
EU	European Union
EWA	Energy and Water Agency
FiT	Feed-In Tariff
GWh	Gigawatt hour
IRR	Internal Rate of Return
KPI	Key Performance Indicator
kWh	Kilowatt hour
LCOE	Levelised Cost of Electricity
LN	Legal Notice
MS	Member State
MWh	Megawatt hour
MWp	Megawatt peak
NAO	National Audit Office
NREAP	National Renewable Energy Action Plan
OPEX	Operational Expenditure
PV	Photovoltaic
RES	Renewable Energy Source
REWS	Regulator for Energy and Water Services
WACC	Weighted Average Cost of Capital

Executive Summary

1. The National Audit Office (NAO) conducted the performance audit: 'Evaluation of Feed-In Tariff Schemes for Photovoltaics' in accordance with the Standard for Performance Auditing, ISSAI 3000. The primary aim of this audit was to evaluate the cost-effectiveness of Feed-In Tariff (FiT) Schemes for Photovoltaic (PV) installations and to assess the extent to which these initiatives managed to reach an optimal balance between affordability, decarbonisation, security of supply as well as contribute towards the attainment of the 10 per cent renewable energy generation target out of the total consumption by 2020. Within this context, this audit also considered other options at Government's disposal for the achievement of such a target, namely cooperation mechanisms as envisaged by the Renewable Energy Directive 2009/28/EC. To this effect, this audit sought to determine the degree to which the:

   i. measures listed in the National Renewable Energy Action Plan (NREAP) 2015-2020 were implemented;
   ii. uptake of the PV FiT Schemes issued to-date was positive;
   iii. methodologies used by National Entities to calculate the optimal FiT were in line with best-practices;
   iv. schemes' subscribers economic interests were appropriately considered;
   v. additional FiT costs incurred by Government for every Scheme represents value for money; and
   vi. cooperation mechanisms may have offered a more cost-effective option to attain the 2020 target, as opposed to the current indigenous PV Renewable Energy Source (RES) choice.

2. Despite the marginal variances between the pre-determined target and the actually connected PV installations, it can be considered that Malta is on track to attain its 2020 obligatory National and European Union (EU) targets. This statement, however, does not imply that attaining this target is a foregone conclusion or that it is a low risk situation. A case in point relates to the implementation of measures relating to solar farms. Although most of the administrative groundwork is concluded, a degree of uncertainty prevails as the evaluation related to the competitive bidding process is yet to commence. Additionally, some planning issues are still to be fully resolved.

3. Measures listed in the NREAP 2015-2020 are not comprehensively supported by details of their implementation, particularly in terms of budgetary requirements, the identification of quantitative Key Performance Indicators (KPIs) and relative milestones. Shortcomings concerning these factors influence management planning, monitoring and control over the exploitation of PVs within the residential as well as non-residential sectors, including solar farms.

4. The steady increase in the generation of PV RES is mainly attributable to FiT Schemes as these initiatives generally proved beneficial in kick starting and sustaining the use of PVs. As at end 2017, Government incurred an expenditure of €84 million through FiTs together with another €60 million for grants on investment mainly through EU funds. This expenditure fulfilled three NAO established effectiveness criteria. Firstly, FiT Schemes' uptake has improved over time, which suggests subscribers' buy-in of these initiatives. Secondly, a payback period ranging from an average of five to nine years is less than half of the 20-year life expectancy of PV installations. Such a payback period implies a good investment opportunity for Schemes' subscribers. Thirdly, the estimated discounted additional value of each unit of renewable energy generated through PVs, expressed in € per kilowatt hour (kWh), has decreased significantly over time.

5. Apart from the benefits discussed in the preceding paragraph, indigenous initiatives yield additional benefits to the environment and the National economy. For example, in the former case, PV RES leads to a reduction in the emissions associated with the generation of energy through conventional means. Economical benefits reaped through the indigenous generation of PV RES include the propagation and nurturing of an industry including an increase in green jobs.

6. Malta, nonetheless, still has other avenues available for the exploitation of renewable energy through cooperation mechanisms. The NREAP 2015-2020 considers cooperation mechanism as outlined in the Renewable Energy Directive in the context of back-up if Malta fails to attain its EU obligatory target or if this option provides higher net benefits. This performance audit showed that the opportunity exists for National Authorities to consider more actively the extent to which cooperation mechanisms, particularly statistical transfers, can contribute cost-effectively in Malta's quest to reach its renewable energy target.

7. The Renewable Energy Directive outlines the option for statistical transfers, which allows EU Member States with more abundant and cheaper renewable energy sources, to cooperate with other countries for reaching their national RES target at lower costs. Although information on the prevalent costs of statistical transfers remains mostly illusive, research undertaken for the purpose of this audit showed that the market price of statistical transfers has declined. There is evidence that certain countries traded statistical transfers at a lesser cost than the discounted additional costs incurred by Government to finance the indigenous generation of renewable energy through PV FiT Schemes. These circumstances, however, must be viewed within the broader context of the local environment and the National economy.

8. Conversely, based on currently available information and prevailing circumstances, this review provided indicators that joint projects with other countries will not necessarily yield a more favourable outcome than the indigenous generation of PV RES or the procurement of statistical transfers. In view of information lacunae these indicators, however, cannot be considered as conclusive. Similarly to the case of statistical transfers, the constantly changing scenarios and technological changes, makes it imperative for National Authorities to study comprehensively the potential of joint projects.

Concluding Comment

9. Malta has registered significant progress in generating renewable energy from PVs, and the attainment of the EU 2020 obligatory target looks more than just a possibility. The current indigenous approach adopted has yielded various benefits. Nonetheless, the opportunity exists for National Authorities to continue in their quest to obtain deeper insights into the potential of cooperation mechanisms and their applicability within Malta's context.

Recommendations

In view of the findings and conclusions emanating from this performance audit, the NAO is proposing the following recommendations.

i. The NREAP 2015-2020 is to be supported with measure specific plans outlining the respective goals and targets. Such an approach will facilitate management control over the relative processes particularly by facilitating implementation and monitoring of the measures in question.

ii. The National Competent Authorities are to consider the setting up of an information-sharing platform that is supported by a comprehensive database management system, primarily intended to facilitate the real-time sharing of PV RES related data including installations and the respective renewable energy generated. Such a setup will minimise duplication of work as well as enable timelier and more informed interventions.

iii. While acknowledging that the EU direction relating to the post 2020 Member State specific RES targets is yet to be formally adopted, the Energy and Water Agency (EWA) is encouraged to sustain its work in connection with the updating of the NREAP to cover the period up to 2030. Expediting work on the updating of the National plan will provide a more realistic lead-time for National Authorities to determine whether changes are required to the prevailing RES mix to reach new and possibly more stringent EU targets. Such workings will entail cost-benefit analysis and considerations within the broader context of the local environment and the National economy.

iv. In line with the comments presented in the preceding paragraph, it is critical that statistics depicting clearly the contribution and impact of the PV industry on the Maltese economy are regularly compiled. While, qualitatively there are widespread indicators that it is positive, to date such a contribution has not been accurately quantified.

v. National Authorities are encouraged to undertake deeper studies on the potential benefits of cooperation mechanisms as outlined in the Renewable Energy Directive, namely with respect to statistical transfers and joint projects. This performance audit acknowledges the complexities involved, including the rapidly changing circumstances – namely through

technological advances and the volatile energy market. Nonetheless such an assessment will prove a useful policy input, specifically with respect to the NREAP covering the period 2021-2030.

vi. Further to the foregoing, National Authorities are to consider the benefits, particularly in terms of cost effectiveness, of engaging into negotiations with third parties on the procurement of statistical transfers. There is publicly available evidence that the recently signed bilateral agreements between Member States take into consideration the decreasing trend of the cost of statistical transfers.

vii. Administrative efforts concerning the implementation of indigenous solar farms are to be expedited. The contribution of these initiatives is crucial to Malta's progress to attaining its obligatory renewable energy share in the gross final energy consumption by 2020. A conserted effort is required to ensure that contracting and planning issues are settled at the earliest.

viii. Consideration is to be given to minimize the potential conflict of interest faced through REWS's dual role, namely that of regulator and implementer of FiT Schemes. The separation of roles will be in line with best practices and emphasize the principle of good governance.

Chapter 1

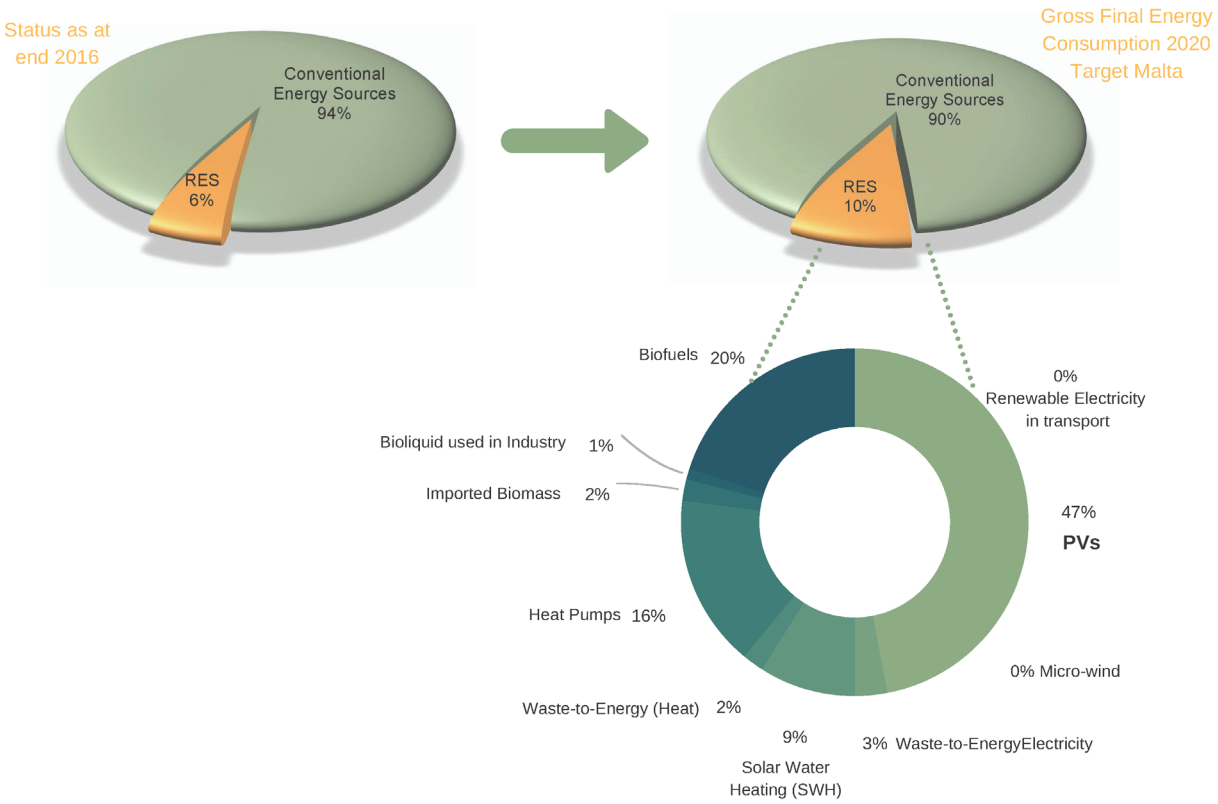
Terms of Reference

1.1. Introduction

1.1.1. The use of renewable energy is consistent with and embraces principles of sustainability. To this end, renewable energy reduces emissions associated with the generation of conventional energy, which consequently leads to health related benefits through better air quality. Renewable energy also implies improvements in the security of energy supplies as well as contributing in other ways to the economy, such as through the generation of green jobs. Within this context, as a European Union (EU) Member State (MS), Malta is obliged to comply with the provisions of Renewable Energy Directive 2009/28/EC. A major obligation emanating from this Directive relates to the respective national overall target for MSs regarding the share of energy from renewable sources in the gross final consumption of energy in 2020. Such targets range from 49 per cent for Sweden to 10 per cent for Malta.

1.1.2. The National Renewable Energy Action Plan (NREAP) 2015-2020 presents the energy mix that is expected to attain the 2020 target of 10 per cent use of energy generated through Renewable Energy Sources (RES). Due to the robustness and availability of photovoltaics (PVs) as an indigenous RES, in line with Government's policy, they are expected to contribute almost half (47 per cent) of the National RES target, which is equivalent to around 277 Gigawatt hour (GWh) and shall occupy around 2.7 square kilometres of space. The foregoing implies a policy shift from the previous 2010 NREAP, which predominantly sought to attain the 10 per cent target through the production of offshore wind energy. Figure 1 refers.

Figure 1: Contribution by technology as a percentage share of the overall 10 per cent RES 2020 target



Source: NAO and the NREAP 2015-2020

1.1.3. Most of the renewable energy generated through PVs is fed into the national electricity grid in return for a Feed-in Tariff (FiT). Between 2010 and 2017, FiT related expenditure intended to support the development of solar PVs as a RES amounted to around €84 million for 94 Megawatt peak (MWp) and an additional €96 million is expected to be incurred by 2020. This figure is partly offset by the savings of €38 million related to the non-generation of the same amount of energy through conventional means. The latter Figure is based on the proxy for the market price, which is established annually by law. Between 2010 and 2017, the proxy for the market price ranged from €0.11 to €0.07,25 per kilowatt hour (kWh).[1]

1.1.4. Government sought to stimulate the uptake of PVs through various schemes, which involved the payment of grants and a FiT. The payment of grants was intended to ease the burden of the capital investment that households and commercial premises were to incur to set-up PV installations. The financing of these schemes was mainly through co-funding projects involving National and EU funds. Total expenditure related to grants passed on to beneficiaries during the period 2010 to 2017 amounted to around €60 million.[2]

[1] S.L. 545.27 Feed-in Tariffs Scheme (Electricity Generated from Solar Photovoltaic Installations) Regulations, Fourth Schedule.

[2] Due to incomplete information, the grants allocated to four specific FiT Schemes was extrapolated on the basis of other schemes in vigore during the same period in terms of the average grant per kWp.

1.1.5. Since the introduction of the first FiT Scheme for PVs in 2010, with €0.28 and €0.25 per kWh for installations located in Gozo and Malta respectively (applicable for the first eight years of operation and with a grant on investment not exceeding 50 per cent), various other schemes were launched. Over the years, FiTs have been generally decreasing to the latest FiT of €0.14,5 per kWh for a period of 20 years (without any grant or other support on the initial capital investment). Such decrease in FiT coincided with the cheaper capital costs as well as the downward trend in the proxy for the market price, formerly referred to as the marginal cost of energy generation. Figures 2 and 3 refer.

Figure 2: Cost of capital expenditure per kWp of PV capacity

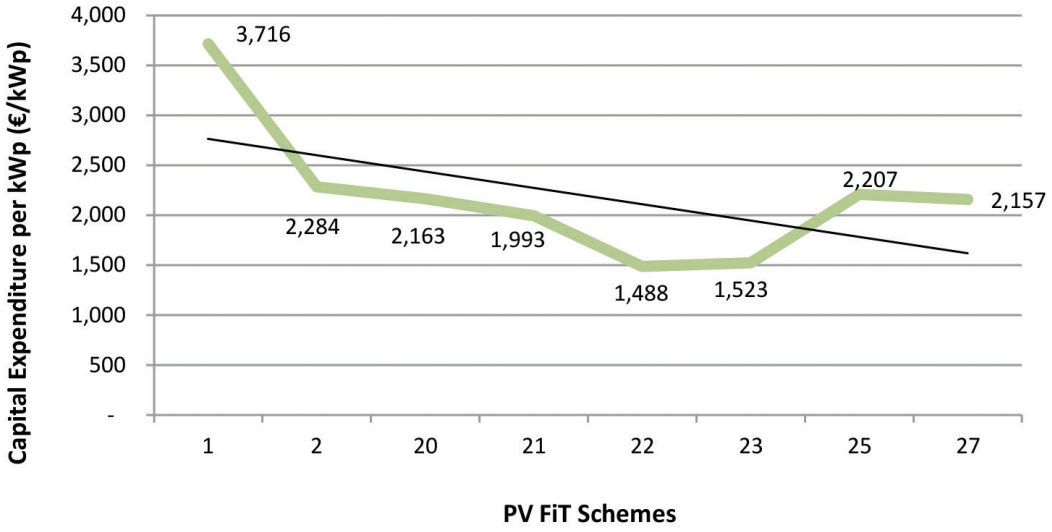
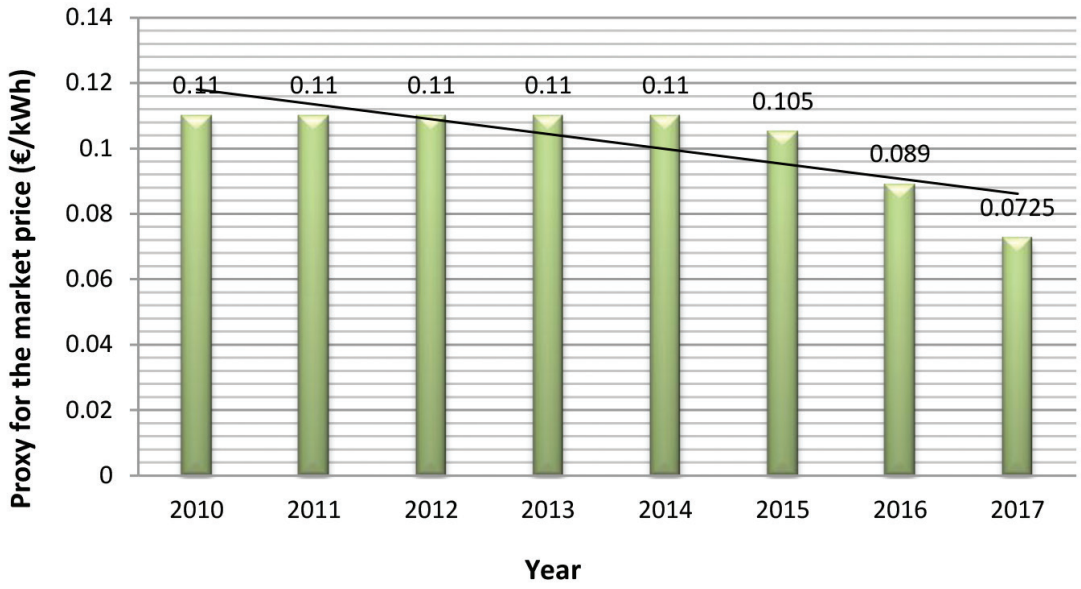


Figure 3: Yearly proxy for the market price (2010 to 2017)



1.1.6. Nevertheless, the additional costs incurred by Government to buy the clean renewable energy generated through PV installations, must be considered in view of the opportunity cost associated with the non-attainment of the 2020 target, that is, the 10 per cent share in the use of energy generated through RES[3] and, the non-utilisation of EU funds allocated for such purpose. These include potential fines and penalties, as well as, other indirect impacts such as the approval of future EU budgets. Furthermore, as outlined earlier, other intrinsic benefits of indigenous solar PV energy generation include the creation of green jobs, improved security of supply, lower electricity bills, a decrease in the importation of fuels and a lower National carbon footprint.[4]

1.1.7. Against this backdrop, the National Audit Office (NAO) conducted the performance audit: '*Evaluation of Feed-In Tariff Schemes for Photovoltaics*' in accordance with the Standard for Performance Auditing, ISSAI 3000. The primary aim of this audit was to evaluate the cost-effective contribution of FiT Schemes for PV installations towards the attainment of the 10 per cent RES target by 2020. To this effect, this audit also considered other options at the Government's disposal for the achievement of such a target. These options include cooperation mechanisms namely joint projects and statistical transfers, thereby benchmarking with other options in view of a more comprehensive value for money evaluation. Such topics have already been discussed, to varying degrees, in three previous NAO reports on renewable energy, which were published between 2009 and 2011.

1.2. Audit Focus

1.2.1. This performance audit sought to determine the extent to which the Government Entities responsible for the planning and administration of PV FiT Schemes in Malta, namely the Energy and Water Agency (EWA) and the Regulator for Energy and Water Services (REWS), adequately support the growth of RES in view of attaining the 2020 target. The audit aimed to propose recommendations intended to highlight those areas that need to be strengthened to ensure that incentives by Government to generate clean renewable energy through FiT Schemes for PV installations, manage to reach an optimal balance between affordability, decarbonisation and security of supply.[5] Towards this end, this audit's objectives sought to determine the degree to which the:

a. measures listed in the NREAP 2015-2020 were implemented;
b. uptake of PV FiT Schemes issued to-date was positive or otherwise;
c. methodologies used to calculate the optimal FiT were in line with best-practices;
d. economic interests of the general public were safeguarded;
e. additional FiT costs incurred by Government for every Scheme represent value for money; and
f. cooperation mechanisms may have offered a more cost-effective option to attain the 2020 target, as opposed to the current indigenous PV RES choice.

[3] As per Annex I of Directive 2009/28/EC on the promotion of the use of energy from renewable sources.
[4] Currently, there is limited information on the quantification of green jobs emanating directly from PVs.
[5] https://www.nao.org.uk/wp-content/uploads/2016/10/Controlling-the-consumer-funded-costs-of-energy-policies-The-Levy-Control-Framework-1.pdf

1.3. Methodology

1.3.1. The realisation of this performance audit's objectives entailed the conduct of interviews with key personnel at EWA and REWS. The former is tasked with formulating and implementing Government's national policies in the energy and water sectors, aimed at ensuring security, sustainability and affordability of energy and water supply in Malta.[6] The latter Entity is responsible for the regulation of energy and water services in Malta.[7]

1.3.2. Other stakeholders such as ARMS Ltd and Enemalta Plc were also involved primarily in an effort to quantify the actual renewable energy generated by every PV FiT Scheme, in view of cost-effectiveness related evaluations. A variety of other exercises, based on the analysis of the data available at the aforementioned auditees, sought to analyse the demand for the various PV FiT schemes and the methodology adopted to identify the optimal FiT.

1.3.3. Moreover, this audit evaluated potential scenarios related to cooperation mechanisms as an alternative to the present indigenous PV RES policy option. This was mainly attained through market research with regard to similar arrangements.

1.3.4. This audit was, to varying degrees, influenced by a number of limitations relating to the quality and timeliness of data. For instance, data relating to the actual generation of renewable energy from PVs is not structured in a manner which permits specific analysis on individual PV FiT Schemes. Consequently, most of the calculations and evaluations in this Report were based on the 'expected' generation values as determined by the responsible Government Entities. This Report has considered data made available to the NAO as at end of December 2017. Unless otherwise indicated, this audit discusses findings and conclusions based on data pertaining to the period 2010 to 2017.

1.4. Report Structure

1.4.1. Following this introductory Chapter, the Report proceeds to discuss the following:

- Chapter 2 provides an overview of the extent to which measures listed in the NREAP 2015-2020 have been implemented and contributed towards the attainment of interim targets in relation to the mandatory 2020 renewable energy generation obligations.

- Chapter 3 reviews the 29 PV FiT Schemes issued to-date, to assess their cost-effective contribution towards reaching the planned RES target. The various FiT schemes were examined for their effective uptake, as well as the methodology adopted to calculate the optimal FiT. This Chapter also assesses the payback period for Schemes' subscribers, as well as the costs incurred by Government in view of more strategic value for money considerations.

[6] https://energywateragency.gov.mt/en/Pages/About-Us.aspx

[7] Regulator for Energy and Water Services Act (Act XXV) of 2015

- Chapter 4 evaluates cooperation mechanisms, in this case joint projects and statistical transfers. These mechanisms were reviewed to determine whether such alternatives could constitute a more cost-effective option for reaching the set target. The commissioning of detailed studies and bilateral discussions regarding the purchasing of statistical transfers is deemed of critical importance, particularly in view of the fact that this option is also considered as Government's fallback position in case the current plan does not materialise.

1.4.2. The conclusions and recommendations emanating from this performance audit are included in this Report's Executive Summary on pages 5 to 8.

Chapter 2

Renewable Energy Action Plan and Interim Targets

2.1. Introduction

2.1.1 In accordance with National legislation and European Union (EU) Directives, Malta is obliged to consume 10 per cent of its energy requirements through Renewable Energy Sources (RES) by 2020. The National Renewable Energy Action Plan (NREAP) 2015-2020 stipulates that 4.7 per cent of this mandatory target is to be generated through solar photovoltaics (PVs). As at end 2016, the latest official published figures, Malta's progress in this regard is reflected by the 2.1 per cent of energy consumption through PVs. The foregoing implies that in the forthcoming four years consumption of energy through PVs is to increase from around 83 Megawatt peak (MWp) in 2016 to 185MWp in 2020. To this effect, the NREAP 2015-2020 lists a number of measures, which aim to facilitate the further uptake of PV installations.

2.1.2 At the outset, this Chapter evaluates the NREAP 2015-2020 and seeks to determine the extent to which this document provides sufficient assurance that Malta will attain the 2020 RES target. The discussion then proceeds to highlight the progress attained in the implementation of measures listed in the NREAP. The Chapter concludes by discussing the degree to which Malta remains on track in reaching PV related interim and the 2020 targets.

2.2. The NREAP does not fully support the attainment of the 2020 target with measure specific goals and targets

2.2.1 The NREAP 2015-2020 is ultimately intended to provide a clear roadmap of how Malta intends to honour its RES obligations by 2020. However, a review of the NREAP, officially published in the second quarter of 2017, revealed that the list of measures listed therein as well as the expected outcomes are not always supported with specific project milestones and Key Performance Indicators (KPIs).

2.2.2 As the NREAP does not indicate measure specific target dates, then it can be assumed that completion date is envisaged for end 2020. However, the absence of measure specific completion dates hinders management from tracking implementation progress. This state of affairs was evident in the NREAP when outlining measures relating to the strategic aspects, the further exploitation of solar energy through PV uptake and the use of cooperation mechanisms. A case in point relates to one of the strategic measures whereby Government is to 'ensure the timely implementation of the measures in the NREAP and take corrective actions where necessary to meet targets'. In this case, the expected outcomes are 'Good governance, achievement of

targets and avoidance of penalties'. The absence of specific target dates for the completion of measures listed in the NREAP does not motivate National Competent Authorities to kick start measures in time to ensure their full implementation, together with any corrective action that may be necessary, to attain 2020 obligatory targets.

2.2.3 Another concern emanating from the NREAP relates to instances where measures are not supported by an appropriately detailed implementation methodology. An example in this regard relates to the PV related measures with respect to the exploitation of the remaining rooftop space, promotion and incentives. The NREAP notes that while the rooftop space exists, in practice only a small portion can be utilised by PVs. To this end, the remaining rooftop solar potential by 2020 has been estimated at around 45 to 55 MWp, including the domestic sector (23 to 28MWp), industrial roof space (15 to 20MWp) and public buildings (7MWp). To this end, the NREAP outlines the need to ensure that the remaining rooftop potential is exploited. However, the document in question does not clearly indicate how such a goal is to be attained.

2.2.4 Similar issues on the timeliness and implementation methodology relate to measures concerning cooperation mechanisms. To this effect, the NREAP 2015-2020 lists measures regarding prospective cooperation mechanisms with the intention to be utilised as a fallback position in the eventuality that Malta does not attain the obligatory 10 per cent through indigenous RES. These measures mainly relate to statistical transfers and joint projects. Whilst reference is made to these factors, the NREAP discusses these measures in a generic manner and does not refer to measure specific completion date or Key Performance Indicators (KPIs). Such circumstances render it problematic for management to keep track of and measure the expected outcomes.

2.3 EWA contends that the implementation status of most measures remains ongoing

2.3.1 As outlined earlier, the absence of pre-determined schedules for completing specific measures hinder their monitoring, particularly through objective evaluations concerning progress attained. These circumstances pose limitations to determine, with a high degree of confidence, the relationship between the implementation status of measures and their respective impact on Malta's obligatory 2020 targets. Moreover, the NREAP does not provide detailed accounts on the various tasks and budgets necessary to implement specific tasks. Consequently, findings and conclusions featuring in this Report relating to the status of implementation of measures is based solely on a qualitative analysis, namely interviews with key officials within the Competent Authorities.

2.3.2 Nonetheless, the issues raised within this Section remain robustly indicative on implementation progress. Tables 1 to 3 portrayed in this Section show the implementation progress of measures considered to address the strategic level, the further exploitation of solar energy through PV uptake as well as the use of cooperation mechanisms.

Table 1: Implementation status of 'strategic' measures listed in the NREAP 2015-2020

Measure	Status	Implementation progress description
1. Develop the legal and policy framework to support RES sector	Ongoing	• Aligned support for PV < 1MWp with State Aid Guidelines (2014). • Introduced competitive procedure for PV=>1MWp. • Reviewing support for Solar Water Heaters (SWH) and Water Heat Pumps.
2. Establish a record keeping and analysis system covering schemes and RES related hardware	Pending	• Support and generation from PV systems is reviewed twice a year to ensure it remains in line with State Aid rules and avoids over compensation. • RES data is collected from various stakeholders including REWS, Wasteserv and Enemalta, validated and reported to NSO.
3. Ensure an adequate share of EU funding for RES and EE projects	Completed	• Malta has negotiated the allocation of funds for support towards PV under Operational Programme I Cohesion Policy 2014-2020. These funds are being used to support PV through grants for the residential sector as well as NGOs.
4. Investigate all proposals for RES projects	Ongoing	• Project proposals regularly submitted by investors are assessed within the framework of existing energy policies.
5. Ensure the timely implementation of NREAP measures and take corrective actions where necessary	Pending	• Data collection and monitoring ensures that the RES trajectory set in the NREAP is adhered with. • Additional measures such as extra PV capacity allocation or higher support for SWH are possible corrective options.
6. Ensure the necessary planning policies are in place to ensure seamless integration of RES within the built and other environment	Completed	• With the publication of the Development Control Design Policy, Guidance and Standards 2015 and the Solar Farm Policy in 2017, a planning policy framework is in place to guide development of PVs and SWH. Lower electricity tariffs also favour the installation of heat pumps, which contribute towards the RES target when used for heating.

7. Keep all measures under constant review, including cost-benefit, including externalities, new technologies and contingency options	Ongoing	• Support and generation from PV systems is reviewed twice a year to ensure it remains in line with State Aid rules and avoids over compensation.
8. Keep methodologies of permitting, authorization and applications of funding for RES systems streamlined	Ongoing	• Regularly engage with REWS, Enemalta and the PA to improve permitting and licensing procedures.
9. Promote self-consumption of energy produced through RES in private establishments	Completed	• Self consumption is allowed, providing the facility to offset energy consumed with that generated onsite in real time. • Legal provisions have been included to provide for the possibility of multiple installations at the same site.
10. Increased research on the adaption of technologies and ideas to the local market	Ongoing	• Regular meetings are held with the academia to encourage research in renewable energy solutions in Malta. • Participation in EU funded research projects.
11. Organise gathering of information/ knowledge on status of RES technologies, whether established, emerging or inception stage	Ongoing	• Scientific papers, including from local authors which could then feed into future possible policy development/s.
12. Utilise smart meters to optimize management of distributed RES	Ongoing	• Smart meters are used to provide the option of 'self- consumption' and, are valuable to provide a readout of daily generation of PV to consumers.

Source: EWA

Table 2: Implementation status of 'PV-related measures' as listed in the NREAP 2015-2020

Measure	Status	Implementation progress description
13. Ensure that the remaining domestic rooftop potential is exploited. Continue grant schemes for PV installation in the domestic sector	Ongoing	• Present PV grant scheme for residential systems were extended up to December 2018. • Currently evaluating options such as FiT only or Grant and FiT to continue to support the sector.
14. Ensure that the remaining industrial rooftop potential is exploited	Ongoing	• Regular meetings with stakeholders in possession of appropriate space to develop PV systems. • Development is supported through a FiT.
15. Ensure the development of PV systems on the rooftops of public buildings using appropriate financial and governance mechanisms	Ongoing	• Regular meetings with stakeholders in possession of appropriate space to develop PV systems. • MEDE agreed to proceed with a concession model. • MIP are proceeding with a pilot project as well as encouraging factory tenants to develop the roof space. • Development is supported through a FiT.
16. Continue in principle existing schemes to provide the minimum incentive necessary to achieve the target penetration of PV systems, but modify the terms from time to time to reflect changes in circumstances such as in capital cost	Ongoing	• Support level is reviewed at least twice a year.
17. Ensure that FITs are revised regularly in response to changing conditions and that at any time they are sufficient but not excessive to meet objectives	Ongoing	• Support level is reviewed at least twice a year.
18. Promote and support research in technologies and RES issues relevant to Malta, covering more efficient and cost effective systems, and in development (technical and governance) to meet Malta's specific needs	Ongoing	• Regular meetings are held with the academia and industry representatives to encourage research in renewable energy solutions in Malta.
19. Use the full potential of Smart meters to fine-tune FIT, maximizing the benefit of PV systems	Ongoing	• Different options for consumption of PV generation are available. The self-consumption option provides the facility to offset energy consumed with that generated onsite in real time.

Source: EWA

Table 3: Implementation status of 'cooperation mechanisms' related measures listed in the NREAP 2015-2020

Measure	Status	Implementation progress description
20. Identify business opportunities in EU member states and third countries for investment in joint large scale RES projects	Pending	• EWA received only one proposal for joint RES project but was not deemed worth pursuing as joint projects are not deemed a priority.
21. Participate actively in the development of the market at international level, particularly at the EU fora	Ongoing	• EWA is actively participating in the recast of the Energy Market Design at EU level.
22. Commission the necessary studies to evaluate the opportunities and potential of all options offered by cooperation mechanisms should they be required to meet 2020 target and trajectory or prove to provide significant net benefits to the economy	Pending	• Projections indicate that Malta would not require the use of flexible mechanisms in order to meet its target, which, as a matter of policy is to be met through indigenous resources.

Source: EWA

2.3.3 As shown in Tables 1 to 3, most of the measures remain ongoing. Within this context, the term ongoing relates to instances where implementation has commenced but not completed and cases where the nature of the measure requires the continuous input and follow-up from the Competent Authorities. Examples pertaining to the latter categorisation relate to measures 4 and 13, listed in Tables 1 and 2 respectively.

2.3.4 Tables 1 to 3 highlight three main concerns. The first relates to the minimal progress attained in implementing measure 2, which stipulates that the National Competent Authorities are to establish a record keeping and analysis system covering schemes as well as RES equipment. The importance of reliable and timely data cannot be overemphasised and is considered as a prerequisite to effective management control and decision-making. Nonetheless, to date National Authorities are still amalgamating data generated from various National Authorities manually. This poses significant risks to data integrity as well as to its expedient availability.

2.3.5 The second issue relates to the commissioning of studies relating to the feasibility of adopting cooperation mechanisms within the National context. Measure 22 remains unimplemented on EWA's contention that such a study is no longer necessary given that projections show that Malta is on track to reach the 2020 target without the need to resort to the procurement of statistical transfers or the implementation of joint projects. The only effort in this regard relates to the ECOFYS study undertaken in 2014, whose focus related to the possibility of purchasing statistical transfers or implementing a joint project between Malta and Italy, which shall be further discussed in Chapter 4 of this Report.[8] Nonetheless, this Office reiterates that

such studies have the potential to make a significant contribution, particularly if unforeseen circumstances derail Malta's progress towards the achievement of mandatory targets. A case in point relates to the delays experienced in the competitive bidding process relating to solar farms.

2.3.6 Malta is aiming to attain around a quarter of its solar PV RES through solar-farm installations. In absolute terms, solar farms are expected to contribute 30 to 50 MWp. Delays materialised as the adoption of the policy was dependant on the outcome of a three year-long public consultation process. Moreover, planning issues – particularly related to the approval of sites identified for solar farms – also prolonged the process. Following the publication of the tender document, third party bids are currently being evaluated. EWA contends that it is unlikely that such delays will impact negatively Malta's attainment of the 2020 target. However, PV interim targets for 2016 and 2017, which were dependent on the commissioning of PV installations through the competitive bidding process, were marginally missed.

2.4 EWA estimates show that PV interim targets for 2016 and 2017 were marginally missed

2.4.1 Following the change in the National policy concerning the RES mix, which was to contribute to the attainment of the 2020 obligatory RES target, the expected share of renewable energy generated through solar PVs increased from 1 to 4.7 per cent. The NREAP 2015-2020 makes such a reference but does not directly stipulate PV specific interim targets. These have been established and adopted internally by EWA. Table 4 refers.

Table 4: Yearly PV target and the capacity of connected PVs

Year	PV interim target		Connected PV capacity	
	%	MWp	%	MWp
2016	2.2	91	2.1	82.6
2017	2.8	121	2.5	109
2018	3.6	154	n/a	n/a
2019	4.3	169	n/a	n/a
2020	4.7	185	n/a	n/a

Source: EWA

2.4.2 Table 4 compares the estimated connected PV capacity with the EWA established and adopted pre-set PV targets. This comparison shows that there is a marginal negative variance between the set target and the estimated installed capacity in 2016 and 2017. This situation mainly materialised through the delays in the implementation of the measure concerning solar farms. Nonetheless, National Entities remain optimistic that the marginal shortfall in the installed PV capacity will be reversed once solar farms related measures are fully implemented.

[8] Cooperation under the RES Directive – Case Study: Joint projects/statistical transfers between Malta and Italy (ECOFYS), 2014

2.5 Conclusions

2.5.1 Despite the marginal variances between the pre-determined target and the actually connected PV installations, it can be considered that Malta is on track to attain its 2020 obligatory National and EU targets. This statement, however, does not imply that attaining this target is a foregone conclusion or that it is a low risk situation. Risks are further increased since data concerning the generation of renewable energy from PVs is fragmented among various National Entities and is amalgamated and analysed manually.

2.5.2 Implementation of the measures listed in the NREAP 2015-2020, which are intended to facilitate the path for attaining the 2020 target is, to varying degrees, hindered. In this respect, the NREAP poses some limitations as it does not comprehensively support the listed measures with details of their implementation, particularly in terms of the budgetary requirements, the identification of quantitative KPIs and the relative milestones. Shortcomings concerning these factors influence management planning, control and monitoring over the exploitation of PVs within the residential as well as non-residential sectors, including solar farms.

2.5.3 To date, most of the administrative groundwork concerning solar farms either has been concluded or is at a very advanced stage – albeit following some delays. Nonetheless, a degree of uncertainty remains as competitive bids are still being evaluated. Further risks, which might prolong the implementation of this measure exist in the form of a potential appeal process in conjunction with the tender adjudication and award processes as well as issues with the relative planning permits. The latter mainly concern disused quarries that are in the vicinity of Natura 2000 sites. It is only after these stages that solar farm installations may proceed and energy from this renewable source would be available.

2.5.4 While this Chapter concluded that it can be considered that Malta is generally on track to attaining its PV RES target, the next Chapter discusses the cost-effectiveness associated with the generation of solar energy through the utilization of PVs. To this effect, the discussion therein focuses on the uptake of the various FiT Schemes for PVs as well as the extent to which the costs incurred constituted value for money.

Chapter 3

Assessment of Feed-In Tariff Schemes for Photocoltaics

3.1. Introduction

3.1.1 Feed-in Tariff (FiT) together with grant Schemes covering up to 50 per cent of the capital outlay made with respect to PV installations were the main instruments adopted by Government to encourage further the exploitation of solar energy. This Chapter reviewed the 29 FiT Schemes for Photovoltaics (PVs) developed and administered between 2010 and 2017 by two major Governmental Entities, namely the Energy and Water Agency (EWA) and, the Regulator for Energy and Water Services (REWS). The responsibility for designing FiT Schemes vests with EWA, which is also responsible for policy making to ascertain that Malta remains on track to attain the 10 per cent Renewable Energy Source (RES) target by 2020. On the other hand, REWS is the Governmental Entity responsible for the administration of these FiT Schemes, that is, from the application stage to the processing as well as the allocation of the respective tariff and grant if deemed eligible.

3.1.2 In order to address the major scope of this performance audit, that is, an evaluation of the cost-effective contribution of these FiT Schemes towards the attainment of the 10 per cent RES target by 2020, this Chapter discusses the extent to which the:

a. uptake of the 29 FiT Schemes for PVs issued between 2010 and 2017 adhered to pre-determined targets;
b. methodologies used to identify the optimal FiT were in line with best practices;
c. economic interests of the Schemes' participants were safeguarded through a reasonable payback period; and
d. expenses incurred by Government to sustain the development of this RES represented value for money.

3.2. The uptake of the various FiT Schemes was generally positive

3.2.1 The FiT Schemes for PVs issued since 2010, were mainly intended to exploit all the space made available for the development of this RES, through voluntary participation. Consequently, a major objective of these schemes entailed encouraging participation by ensuring a reasonable payback period. To this end, Government issued five FiT Schemes for the residential sector only, four Schemes for the non-residential sector and the remaining 20 FiT Schemes for both sectors. A grant on the capital investment was available in nine out of the 29 Schemes. The most common variable between the various FiT Schemes issued was the tariff due for the renewable energy fed into the National electricity grid. This varied from the highest rate of

€0.28 per kilowatt hour (kWh) for the first FiT scheme in Gozo, to the latest FiT of €0.14,5 per kWh. As presented in Table 5, other variables included the:

a. number of years for which the FiT would be applicable and beyond which the proxy for the market price would apply;
b. size of the PV installations in terms of the capacity to generate renewable energy and the relative installation footprint;
c. location where such PVs would be installed, namely on roofs or on the ground; and
d. availability of a grant on the investment made by the Schemes' participants which would not exceed 50 per cent of the capital outlay.

Table 5: PV FiT Schemes issued between 2010 and 2017

FiT Scheme (No.)	Sector	Period of FiT approval	Feed-in Tariff	Other support	Other conditions
1	Residential	10 September 2010 to 31 December 2012	Malta: €0.25/ kWh for 8 years Gozo: €0.28/ kWh for 8 years	FIT applicable irrespective of whether the applicant benefits from a grant or not	Grant on investment not exceeding 50%
2	Residential	1 January 2013 to 30 April 2015	€0.22/kWh for 6 years	FIT applicable only where the applicant benefits from a grant	Grant on investment not exceeding 50%
3	Non–Residential	10 September 2010 to 31 December 2012	€0.20/kWh for 7 years	FIT applicable irrespective of whether the applicant benefits from a grant or not	Grant on investment not exceeding 50%
4	Non–Residential	1 January 2013 to 30 June 2013	€0.17/kWh for 7 years	FIT applicable only where the applicant benefits from a grant	Grant on investment not exceeding 50%
5	Non–Residential	1 July 2013 to 30 April 2015	€0.15/kWh for 7 years	Grant on investment approved before 1 July 2013	Grant on investment not exceeding 50%
6	Non–Residential	1 July 2013 to 30 April 2015	€0.11/kWh for 7 years	Grant on investment approved after 30 June 2013	Grant on investment not exceeding 50%
7	Residential and Non- Residential	1 January 2013 to 30 June 2013	€0.18/kWh for 20 years	No grant or other support on the capital investment	Roof mounted and < 1MWp
8	Residential and Non- Residential	1 January 2013 to 30 June 2013	€0.17/kWh for 20 years	No grant or other support on the capital investment	Roof mounted and >=1MWp
9	Residential and Non-Residential	1 January 2013 to 30 June 2013	€0.17/kWh for 20 years	No grant or other support on the capital investment	Ground mounted and < 1MWp
10	Residential and Non-Residential	1 January 2013 to 30 June 2013	€0.16/kWh for 20 years	No grant or other support on the capital investment	Ground mounted and >= 1MWp
11	Residential and Non-Residential	1 July 2013 to September 2013	€0.17/kWh for 20 years	No grant or other support on the capital investment	Roof mounted and < 1MWp
12	Residential and Non-Residential	1 July 2013 to 30 September 2013	€0.16/kWh for 20 years	No grant or other support on the capital investment	Roof mounted and >=1MWp

13	Residential and Non-Residential	1 July 2013 to 30 September 2013	€0.16/kWh for 20 years	No grant or other support on the capital investment	Ground mounted and < 1MWp
14	Residential and Non-Residential	1 July 2013 to 30 September 2013	€0.15,5/kWh for 20 years	No grant or other support on the capital investment	Ground mounted and >= 1MWp
15	Residential and Non-Residential	1 May 2014 to 31 October 2014	€0.16,5/kWh for 20 years	No grant or other support on the capital investment	Roof mounted only and < 40 kWp
16	Residential and Non-Residential	1 May 2014 to 31 October 2014	€0.16/kWh for 20 years	No grant or other support on the capital investment	Roof mounted only and >=40kWp
17	Residential and Non-Residential	1 November 2014 to 30 April 2015	€0.15,5/kWh for 20 years	No grant or other support on the capital investment	Roof mounted only and < 40 kWp
18	Residential and Non-Residential	1 November 2014 to 30 November 2014	€0.15/kWh for 20 years	No grant or other support on the capital investment	Roof mounted only and >=40kWp
19	Residential and Non-Residential	1 December 2014 to 30 April 2015	€0.15/kWh for 20 years	No grant or other support on the capital investment	Roof mounted only and >=40kWp and <1MWp
20	Residential	13 July 2015 to 30 June 2016	€0.16,5/kWh for 6 years	FIT applicable only where the applicant benefits from a grant	Grant on investment not exceeding 50%
21	Residential and Non-Residential	3 August 2015 to 30 June 2017	€0.15,5/kWh for 20 years	No grant or other support on the capital investment	Installed in any location and >=1kWp and < 40 kWp
22	Residential and Non-Residential	3 August 2015 to 29 January 2016	€0.15/kWh for 20 years	No grant or other support on the capital investment	Installed in any location and >=40kWp and <1MWp
23	Residential and Non-Residential	2 December 2015 to 30 December 2016	€0.15/kWh for 20 years	No grant or other support on the capital investment	Any installation (excluding structure integrated solar PV installations) and >=40kWp and <1MWp
24	Residential and Non-Residential	2 November 2015 to 30 June 2016	€0.15/kWh for 20 years	No grant or other support on the capital investment	Structure integrated solar PV installations and >=40kWp and <1MWp
25	Residential	13 July 2015 to 30 December 2016	€0.16,5/kWh for 6 years	FIT applicable only where the applicant benefits from a grant	Grant on investment not exceeding 50%
26	Residential and Non-Residential	1 February 2017 to 30 June 2017	€0.15/kWh for 20 years	No grant or other support on the capital investment	Installed in any location and >=40kWp and <1MWp
27	Residential	3 July 2017 to 29 December 2017	€0.16,5/kWh for 6 years	FIT applicable only where the applicant benefits from a grant	Grant on investment not exceeding 50%
28	Residential and Non-Residential	3 July 2017 to 29 December 2017	€0.15,5/kWh for 20 years	No grant or other support on the capital investment	Installed in any location and >=1kWp and < 40 kWp
29	Residential and Non-Residential	3 July 2017 to 29 June 2018	€0.14,5/kWh for 20 years	No grant or other support on the capital investment	Installed in any location and >=40kWp and <1MWp

Source: REWS

3.2.2 REWS contended that five of the 29 FiT Schemes issued to-date, namely, Schemes 8, 9, 12, 13 and 14, did not result in any of the respective PV installations being connected to the National electricity grid. The root-cause of this issue resulting in zero uptake of these FiT Schemes related to the absence of a National large-scale installation policy – that is focusing on installations greater than 1 Megawatt peak (MWp) and/or which require an area of around 1,000 square metres. The absence of such a policy, consequently, influenced negatively potential investors' confidence. The prolonging of policy adoption also implied that large-scale PV installations, as envisaged by these Schemes, delayed the potential benefits that could be derived through such large installations.

3.2.3 Nonetheless, the uptake relating to the remaining 24 out of the 29 Schemes, as outlined in Table 5, was positive. This statement considers two assessments undertaken, namely:

a. A comparison of the estimated yearly PV RES generated with the maximum FiT eligible units outlined in legislation. The 24 FiT Schemes were subjected to this assessment.

b. Confirmation that the generation targets set for specific FiT Schemes were attained. This exercise focused on nine of the 29 Schemes issued between 2010 and 2017.

3.2.4 As implied by the evaluations presented above, National Authorities did not standardize their approach when setting targets related to specific schemes. Consequently, analysis to determine the uptake of the various FiT Schemes rendered assessments in this regard problematic. Nonetheless, the two approaches depicted above are considered appropriately robust to provide reliable conclusions.

The cumulative capping for PV generation as established in legislation is subject to different interpretations

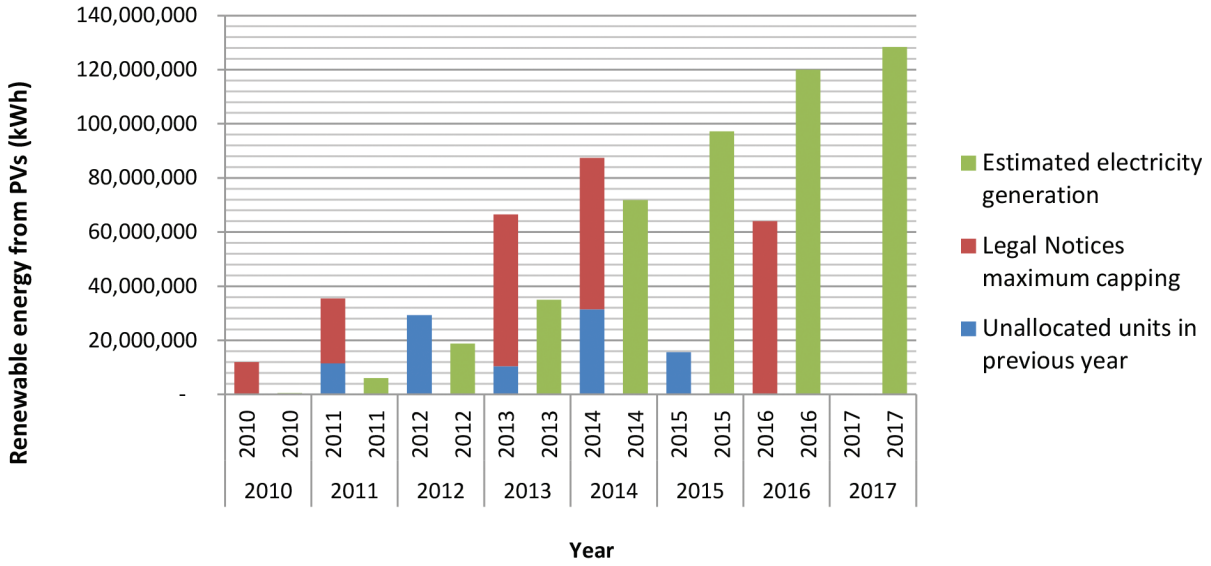
3.2.5 The first evaluation undertaken related to a comparison of the estimated PV RES generated with the maximum FiT eligible units outlined in legislation. This approach was adopted as National Authorities did not always allocate KPIs or targets to specific FiT Schemes.[9] REWS pointed out that the cumulative overall cap was never meant to be the target generation capacity but rather as a safeguard for budgetary purposes. Moreover, the Regulator opined that the legally established FiT eligible PV RES generation is to be interpreted as an annual rather than a cumulative capping. On the other hand, NAO notes that the legislative provisions are open to varying interpretations including that the capping established therein can be interpreted as cumulative. This assertion considers the chronological developments of the relative Legal Notices.[10] Despite the different interpretations, for the purpose of this audit the legally set financial cumulative capping was assumed as an indicative target for the expected PV generation.

[9] National Authorities did not always maintain PV RES generation statistics in accordance to specific FiT Schemes.

[10] CAP. 423 L.N 422 of 2010, L.N. 70 of 2011, L.N. 71 of 2013, L.N. 253 of 2013 and L.N. 155 of 2014; CAP. 545 L.N. 264 of 2015, L.N. 415 of 2015 and L.N. 237 of 2016.

3.2.6 This evaluation showed that the assumed maximum capping with regard to the amount of electricity generated by PV installations that can be exported to the National electricity grid to benefit from a FiT, was not reached between 2010 and 2014. As determined through legislative provisions, this evaluation considered the unallocated units from previous years. Figure 4 refers.

Figure 4: Variance between the yearly legal capping on the maximum amount of renewable energy exported to the National electricity grid whilst benefiting from a FiT and the estimated renewable energy generated each year



3.2.7 Figure 4 raises the following issues:

a. Post 2015, public awareness on the potential benefits of PV RES was increasingly evident. Moreover, participants in such Schemes considered that the FiT together with the Government grants, when available, constituted an economically viable venture. Additionally, technological improvements implied that investment in PV RES became more affordable while developments within the local industry also implied that competition influenced downwards the cost of PV installations.

b. Participation in earlier Schemes was considerably lower than in later ones. Conversely, to the situation depicted in the previous paragraph, awareness on the potential benefits emanating from PV RES was still limited and the industry was still in its early years of development. National Authorities sought to mitigate these circumstances through generous FiTs and grants, as shall be further discussed in Section 3.4 and 3.5 of this Chapter.

Predetermined FiT Scheme specific capacity related targets were generally attained

3.2.8 The second exercise sought to determine the extent to which FiT Scheme specific targets were attained. However, the required information to undertake such an analysis, namely Scheme specific targets as well as status reports of applications received from Schemes' subscribers was only available for nine FiT Schemes. This evaluation showed that these targets, which pertained to the more recent FiT Schemes, were generally attained.[11] Table 6 refers.

Table 6: Variance between the specified FiT Scheme capping and the estimated renewable energy generated[12]

FiT Scheme	FiT Scheme specific target	Estimated allocated PV capacity	Difference between FiT Scheme specific target and the estimated allocation		FiT Schemes' Uptake
(No.)	(kWp)	(kWp)	(kWp)	%	%
15	4,000	4,000	0	0	100
16	4,000	4,000	0	0	100
17	4,000	4,000	0	0	100
18	4,000	3,927	(73)	(1.8)	98.2
19	6,000	5,481	(519)	(8.7)	91.3
21	11,000	9,702	(1,298)	(11.8)	88.2
26	8,000	8,000	0	0	100
28	4,200	3,256	(944)	(22.5)	77.5
29	18,000	18,000	0	0	100

3.2.9 Table 6 raises the following issues:

a. Although extended to end June 2018, Scheme 28 remains on track to attain the predetermined subscription targets.
b. The uptake of the remaining eight Schemes depicted in Table 6 on average exceeded 97 per cent.
c. As at 3 January 2018, Scheme 29 was oversubscribed by more than 21MWp (around 40 applications) even though the closing date was scheduled for June 2018.
d. The target with respect to Scheme 18 was marginally missed by just 1.8 per cent.
e. Although Schemes 19 and 21 were not fully subscribed by 8.7 and 11.8 per cent respectively, it is to be noted that the capping of these schemes, at 6MWp and 11MWp respectively, was higher than the previous ones.

3.2.10 The foregoing coupled with the indications obtained through the first evaluation undertaken (see paragraph 3.2.5) shows that uptake of FiT Schemes increased over time. The results attained through both exercises corroborated each other's conclusion in that uptake of PV FiT

[11] It is to be noted that evaluating the appropriateness of the targets set was beyond the scope of this audit.
[12] Closing date for Schemes 28 and 29 is scheduled for 29 June 2018.

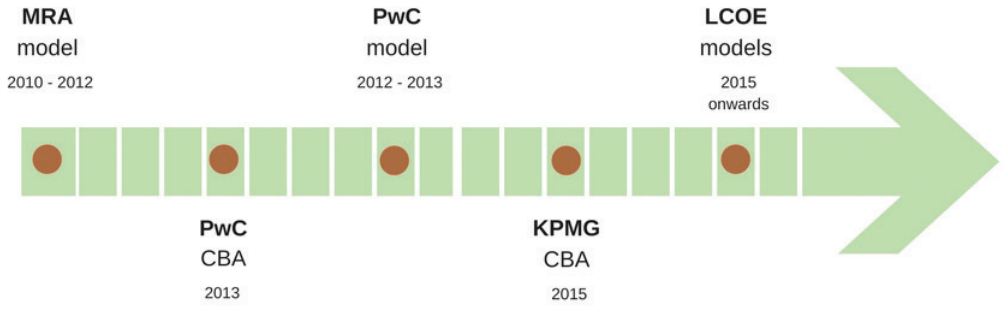
Schemes was generally positive. This state of affairs can also be triangulated with the progress attained through the generation of solar energy over time – a situation that critically contributes towards the attainment of the 2020 target.

3.2.11 Two main factors contribute to the positive uptake of FiT Schemes. Firstly, increased public awareness of the potential benefits of solar energy encouraged participation. Secondly, although FiT rates decreased, together with the respective grants, they are still perceived as an appropriate incentive to encourage investment in PV RES.

3.3 Despite the methodological refinements, policy inputs are still required to determine the FiT Schemes' rates

3.3.1 The determination of FiTs for PV Schemes entails the use of economic models. To this effect, the methodology used by National Entities to determine the FiT rate has been evolving over the years to ensure that the incentives available are sufficient to stimulate the development of indigenous RES whilst ascertaining that no overcompensation would ensue. An optimal FiT is one that manages to reach a balance between incentivizing the public to participate voluntarily in schemes through a reasonable payback period and containing the costs incurred by Government. The FiT and complementary grants constitute important factors to the overall cost incurred to attain the 2020 obligations cost-effectively. Figure 5 provides an overview of the methodological developments in determining FiT rates.

Figure 5: Economic models used to determine the optimal FiT



3.3.2 Until mid-2013, the Malta Resources Authority (MRA), now known as the Regulator for Energy and Water Services (REWS), was the Governmental Entity responsible of devising such FiT Schemes. The optimal tariff for the first few PV FiT Schemes was mainly determined through expert judgement based on an assessment of different scenarios for the residential and non-residential sectors, as well as, the need to kick-start public and private investment whilst supporting the development of a competitive local industry. The initial Government support required to generate sufficient interest necessitated an attractive FiT. This was partly to compensate for the relatively expensive cost of PVs at the time as well as to serve as an appropriate incentive to encourage participation in these Schemes.

3.3.3 MRA commissioned the development of a more detailed economic model to PricewaterhouseCoopers (PwC) during 2012, intended to identify more accurately the optimal FiT. This model was used to calculate a range of Internal Rate of Return (IRR) corresponding to the different configurations of PV installations. Thus, the optimal tariff for PV FiT Schemes 11 to 14, as presented in Table 5,[13] was calculated using a bottom-up approach with a target IRR of between 9.1 and 11.7 per cent.

3.3.4 The task of identifying the optimal tariff for PV Schemes was then handed over to the OPM-Energy and Projects, who applied the same methodology that was eventually tweaked to reflect market developments and aligned with the Guidelines on State aid for environmental protection and energy 2014-2020 applicable from 1 July 2014. Given the limited availability of local data at the time, costs were based on EU spot prices of PV panels, international prices of inverters, and estimates of Balance of Systems costs from quotations.

3.3.5 Two Cost Benefit Analysis (CBA) exercises commissioned by the former MRA, also contributed towards establishing the optimal FiT for a number of PV FiT schemes, namely, Schemes 20, 25 and 27. The first CBA, dated March 2013, was carried out by PwC. This exercise was primarily intended to analyse the promotion of RES within the domestic sector, highlighting the negative project Financial Net Present Value (FNPV) and the negative Economic Net Present Value (ENPV), thereby supporting Government's call for an EU grant. KPMG performed the second CBA exercise, dated May 2015, in order to support the call for EU funding through the European Regional Development Funds (ERDF) under Malta's Cohesion Policy Programme 2014-2020, thereby contributing towards attaining the target of 10 per cent energy generated from renewable sources in the gross final energy consumption by end 2020. The cost of these CBAs amounted to €22,420 and €18,585 respectively.[14]

3.3.6 More recently, the Energy and Water Agency (EWA) took over the responsibility of designing PV FiT Schemes. As from 2015, EWA adopted a slightly different model that was notified to and approved by the European Commission (EC) Directorate-General for Competition. This model estimates the maximum Levelized Cost of Electricity (LCOE) for a PV installation based on the Capital Expenditure (CAPEX), the Operational Expenditure (OPEX) as well as the Weighted Average Cost of Capital (WACC) and hence determines the maximum level of support which can be provided. EWA updated CAPEX and OPEX figures in line with data submitted by applicants for the most recent FiT Schemes as well as international PV panel prices. WACC assumptions were based on an analysis performed by Oxera Consulting LLP. Despite the developments within, the economic model in question does not consider variables such as the uptake of previous FiT Schemes and the expected uptake of the Scheme under consideration.

[13] The tariff duration with regard to Schemes 11 to 14 was relatively short as this was introduced at a time of high market uncertainty, partly attributable to the introduction of anti-dumping tariffs by the EC.

[14] Source: REWS.

3.3.7 Nevertheless, despite the more detailed economic models adopted and CBAs commissioned by Governmental Entities to identify the optimal FiT, this review noted that expert judgement as well as input from stakeholders also played an important role in determining the ultimate FiT. Cases in point relate to the following:

a. A policy decision was taken to gradually reduce FiTs and phase-out the grants for commercial projects. This decision was particularly related to the PV installations that benefitted also from a grant on the initial capital expenditure, since these projects were still viable even without a FIT. To this end, the FiT for Scheme 3 as presented in Table 5, was reduced gradually from €0.20 per kWh to €0.15 (Scheme 5) then €0.11 (Scheme 6) and eventually to the applicable proxy for the market price, that is, the marginal cost of energy generation and distribution.

b. The CBA exercise undertaken by KPMG in 2015, discussed in paragraph 3.3.5, indicated the FiT rate of €0.15 per kWh for the first six years. National Entities noted that this CBA was the main methodology utilised to calculate the optimal FiT rate for Schemes 20, 25 and 27. However, these three FiT Schemes were issued with a tariff of €0.16,5 per kWh for the first six years. EWA contended that this course of action was necessary to sustain the development of PV RES at the time, particularly as the level of grant was reduced.

3.4 Case studies showed that the payback period for FiT Schemes' subscribers ranged from five to nine years

3.4.1 Five case studies of FiT schemes showed that the payback period for PV installations ranged from an average of five to nine years. The payback period lends itself as a criterion to determine the extent to which specific FiT Schemes constituted an appropriate financial incentive for subscribers. As National Authorities did not establish such a performance indicator, this study subjectively set a ten-year period as an appropriate payback period. This criterion constitutes half the expected lifetime of PV installations.

3.4.2 This review was constrained to focus on five case studies rather than on all of the 29 FiT Schemes since information relating to the cost of capital expenditure and in instances to the respective grants, was not readily available. To derive such information, it would have required a manual review of all FiT Scheme applications. Information, which would enable the determination of the payback period, was only readily available for Schemes 1, 2, 20, 25 and 27. This evaluation was principally based on the prevailing FiT rate and any grant issued to sustain the capital outlay by participants. Moreover, this exercise considered the following factors and assumptions:

a. The total investment cost and the total grant on the initial capital outlay;
b. A discount rate of 2.5 per cent;
c. A PV installation lifetime of 20 years;
d. The yearly established proxy for the market price;
e. An assumption that from 2017 onwards the proxy for the market will remain constant at €0.07,25 per kWh;

f. An assumption that FiT subscribers on a 'partial basis' arrangement sell 47.6 per cent of the renewable energy generated; and
g. An assumption of one per cent annual decrease in renewable energy generation due to a gradual loss in PV efficiency levels.

Table 7: Payback period with respect to a number of PV FiT Schemes

Scheme	Feed-in Tariff (FiT)		Capital Outlay	Grant on Investment	Payback Period
	Rate (€/kWh)	FiT Period (No. of Years)	(€)	(€)	(Year)
1- Malta (Sep 2010 to Dec2012)	0.25	8	30,019,041	12,187,073	8
1 – Gozo (Sep 2010 to Dec 2012)	0.28	8	4,565,018	1,843,937	7
2 (Jan 2013 to Apr 2015)	0.22	6	53,493,198	20,535,148	5
20 (Jul 2015 to Jun 2016)	0.16,5	6	15,540,492	4,813,766	9
25 (Jul 2015 to Dec 2016)	0.16,5	6	17,994,464	5,481,821	9
27 (Jul 2017 to Dec 2018)	0.16,5	6	3,981,757	1,226,416	8

3.4.3 Table 7 shows that the average payback period of capital outlaid by Scheme subscribers ranged between five and nine years. This payback period is below the ten year benchmark established for the purpose of this audit. Additionally, this payback period implies a better rate of return on investment for Schemes' subscribers if the capital outlay on PV installations was invested at a risk-free rate of interest.

3.5 Discounted additional costs incurred by Government to support the development of PVs through FiT Schemes is on a downward trend

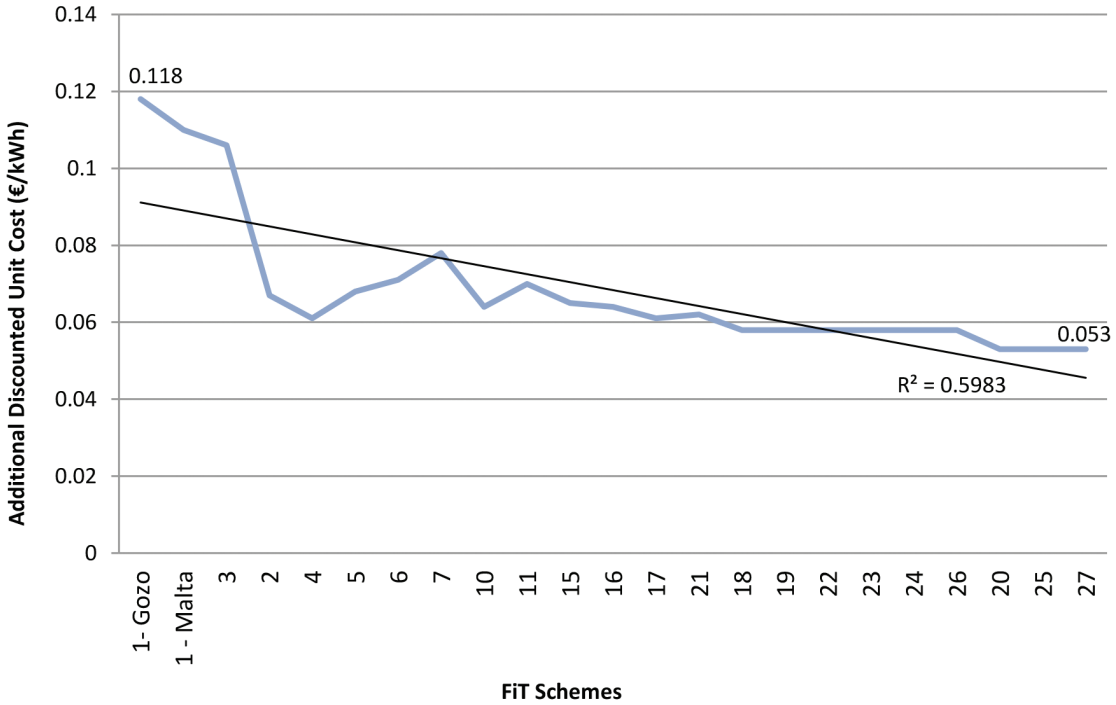
3.5.1 The cost of reaching the 2020 target through the contribution of PV RES is the difference between the FiT rates and the marginal cost of producing conventional energy as defined by the proxy for the market price. Additionally, this cost also considers the grants issued to support the Schemes' subscribers with respect to the cost of capital for PV installations. The main criteria adopted for the purpose of determining the extent to which such costs represented value for money relate to a decline in additional costs over time. A decline in the additional discounted unit cost (€ per kWh) would indicate that Government is increasingly being able to incentivize Schemes' subscribers to invest in PVs at lower FiTs. Moreover, as portrayed in the next Chapter, these costs can be assessed within the context of cooperation mechanisms.

3.5.2 Determining the resultant additional discounted costs incurred per kWh of renewable energy generated by each Scheme was subject to a number of factors and assumptions, namely:

a. A total grant not exceeding 50 per cent of the initial capital outlay;
b. A discount rate of 2.5 per cent;
c. A PV installation lifetime of 20 years;
d. Consideration of the yearly established proxy for the market price;
e. An assumption that from 2017 onwards the proxy for the market price will remain constant at €0.07,25 per kWh;
f. An assumption that FiT subscribers on a 'partial basis' arrangement sell 47.6 per cent of the renewable energy generated; and
g. An assumption of one per cent annual decrease in renewable energy generation due to a gradual loss in PV efficiency levels.

3.5.3 In accordance with the above factors and assumptions, Figure 6 plots the resultant additional discounted cost per kWh for the different FiT schemes over the assumed 20-year lifetime of PV installations. These calculations also consider the grants issued to support the capital outlay. A more detailed presentation of the information outlined in the Figure below is available at Appendix I.

Figure 6: Additional discounted unit cost of different FiT Schemes



3.5.4 Figure 6 clearly shows that the cost incurred by Government in terms of the additional expenditure per unit of renewable energy generated through PVs is on a decreasing trend. Additional discounted unit costs peaked at €0.11,8 per kWh with respect to PV FiT Scheme 1 (Gozo). Conversely, the lowest additional discounted unit cost resulted with respect to Schemes 20, 25, and 27 at €0.05,3 per kWh. The foregoing implies that the NAO established criterion relating to lower additional discounted unit costs over time was fulfilled.

3.6 Indications show that the Communal PV Farm at il-Fiddien is proving a costly initiative for Government

3.6.1 Since October 2016, EWA accepted 366 applicants to form part of the first National communal PV project. The main subscription criterion was the lack of access to a private roof where a PV system could be installed. These applications translated into approximately 3,700 PV panels located at Fiddien limits of Rabat, with a total capacity of 997kWp that is envisaged to generate around 1500 Megawatt hour (MWh) annually. The main principles of this scheme involve that subscribers invest in a 'green fund' in return for a dividend, equivalent to the established tariff of €0.15 per virtual kWh for the first six years and €0.10,5 per virtual kWh until the twentieth year. Additionally, Government is paying a FiT rate of €0.15 per kWh to the Water Services Corporation, who owns and manages the Fiddien Communal Farm.

3.6.2 As portrayed in the preceding paragraph, the costs to Government associated with this project are categorized on two levels. Although mutually exclusive, in reality, the additional costs incurred by Government to generate a unit of electricity from this Communal PV farm are the sum of these two cost elements.

3.7 Conclusions

3.7.1 FiT Schemes have generally proved beneficial in kick starting and sustaining the use of PV RES. These circumstances contribute towards Malta's quest to reach obligatory targets by 2020. Whilst more effort is required in this regard, Malta's position is such that the attainment of these targets is now significantly more than just a possibility. This position was made possible through an investment, by end 2017, of €84 million through FiTs as well as the provision of an additional €60 million grants on investment through EU funds. The question which then arises relates to the extent to which such expenses constitute value for money. For the purpose of this performance audit, the NAO established three main criteria, which to varying degrees, can be considered as having been fulfilled.

3.7.2 Firstly, FiT Schemes' uptake has shown an increasing trend over time. This implies buy-in of the FiT Schemes from potential subscribers. Schemes' uptake is closely related to the second value for money criterion. To this effect, the payback period for subscribers' capital outlay was deemed appropriate on two counts. On average, the payback period ranged between five and nine years – well below half of the expected 20-year lifetime of PVs. The third value for money criterion related to the estimated discounted additional value of each unit of renewable energy generated through PVs, expressed in € per kWh, which decreased significantly over time. The foregoing constitutes a significant incentive for National Authorities to seek further ways to exploit PV RES.

3.7.3 All of the initiatives undertaken with respect to PV RES to-date, focused on the exploitation of indigenous resources. While these, as initiatives in themselves, are proving to be cost effective, value for money considerations are further emphasized on a macro level, namely through the propagation and nurturing of an industry which contributes to the environment and the National economy.

3.7.4 Malta, nonetheless, still has other avenues for the exploitation of RES through cooperation mechanisms, as outlined in the Renewable Energy Directive. The next Chapter of this Report evaluates such possibilities and presents a comparative analysis based on projections.

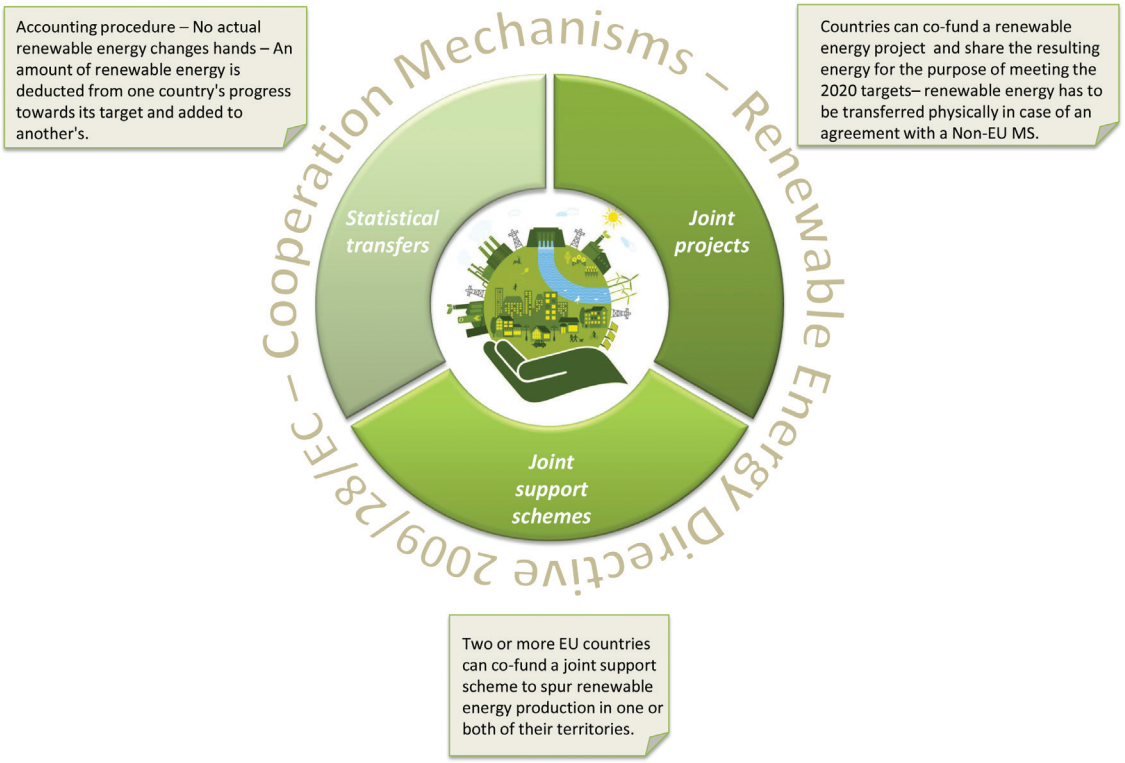
Chapter 4

Cooperation Mechanisms

4.1. Introduction

4.1.1. Cooperation mechanisms provide a spectrum of instruments, which can be adopted by EU Member States (MSs) in their quest to increase their utilisation of Renewable Energy Sources (RES) and in view of attaining obligatory EU targets. Directive 2009/28/EC, which was transposed into Maltese law through Legal Notice 538 of 2010 on the 'Promotion of Energy from Renewable Sources Regulations', establishes and regulates cooperation mechanisms. These mechanisms mainly relate to statistical transfers, joint projects and joint support schemes. Figure 7 refers.

Figure 7: Cooperation mechanisms emanating from the Renewable Energy Directive 2009/28/EC



4.1.2. This analysis principally focused on the potential purchasing of statistical transfers and the implementation of joint projects. Malta, similarly to other MSs, can benefit through adopting cooperation mechanisms in various ways. Firstly, they provide Malta with a fallback position as such instruments could be used to complement the indigenous RES mix for EU 2020 target purposes. Secondly, they provide alternative approaches to the indigenous RES mix. Thirdly, they serve as a useful benchmark to evaluate the cost-effectiveness of the indigenous PV RES policy option that Malta has adopted until now.

4.1.3. Government has not yet commissioned sufficiently detailed studies to determine the potential benefits that could emanate from cooperation mechanisms. To date, minimal initiatives have been undertaken in terms of bilateral arrangements, particularly in the light that discussions within EU institutions relating to an overall increase in the EU RES contribution for 2030 from 27 to 35 per cent of the total consumption are ongoing.[15] Nonetheless, bilateral arrangements would prove key, particularly if draft preliminary agreements are deemed as useful instruments to exploit the potential benefits of cooperation mechanisms.

4.1.4. Within this context, this Chapter sought to determine the extent to which:

a. statistical transfers could support the current policy related to an indigenous PV RES; and
b. joint projects may address Malta's intrinsic geographical limitations in terms of the footprint available for PV installations whilst ensuring the attainment of the 2020 target in a cost-effective manner.

4.1.5. In line with the scope of this audit, the findings and conclusions presented in this Chapter focus solely on cooperation mechanisms in relation to the exploitation of RES through PV installations.

4.2. The opportunity exists to determine the extent to which statistical transfers may contribute further to the current RES mix

4.2.1. Statistical transfers provide the opportunity for Member States to procure renewable energy from other MSs which have exceeded their 2020 target in lieu of the domestic generation of RES. This implies that an amount of renewable energy may be deducted from one country's excess and credited towards the other's target. Hence, this constitutes an accounting procedure where no actual energy changes hands.

4.2.2. A case in point relates to the agreement signed between Luxembourg and Lithuania in October 2017 for the purchasing of statistical transfers by the former, since the latter had already exceeded its mandatory renewable energy target in 2015. This course of action, which is tantamount to hedging, clearly highlights the potential cost-effectiveness associated with

[15] http://www.europarl.europa.eu/news/en/press-room/20180112IPR91629/meps-set-ambitious-targets-for-cleaner-more-efficient-energy use

such arrangements. However, due to the commercial sensitivity associated with this type of agreement, which is also dependent on the bilateral relationship that exists between the two MSs, this audit did not have access to the terms and conditions of such an arrangement, including the financial arrangements agreed. More recently, a similar agreement involving Luxembourg and Estonia has been signed.

4.2.3. This review noted that the present indigenous PV RES policy option is not sufficiently backed with detailed studies to ascertain that such an approach constitutes the most cost-effective policy option, particularly, with respect to the purchasing of statistical transfers. To this end, EWA has provided documentation to sustain past efforts in this regard. Such efforts particularly relate to a case where a European Economic Area (EEA) country approached Malta with the aim of selling statistical transfers. Documentation available shows that EWA has not rigorously followed-up this approach since 2015/2016, as it was deemed that the potential existed for the 2020 targets to be attained through indigenous PV RES.

4.2.4. The only attempt by Governmental Entities to assess the financial feasibility of cooperation mechanisms between MSs was undertaken in 2014 through the ECOFYS case study. This study analyzed the possibility of both a joint project as well as statistical transfers between Malta and Italy.

4.2.5. However, as confirmed by EWA, the several issues of concern identified through the ECOFYS study have not yet been addressed. These issues range from parties' obligations, which in the case of statistical transfers have to be established through bilateral discussions, to issues of risk sharing such as identifying which of the MSs could incur any penalties associated with the non-completion of joint projects.

4.2.6. The price for purchasing statistical transfers is dependent on a number of variables, including the:

a. availability of MSs who have exceeded their mandatory renewable energy target - As at end 2015, 11 MSs had recorded such a positive result.[16] Nonetheless, the overall EU28 RES share attained by 2015 stood at 16.4 per cent, with a projected RES share of 21 per cent by 2020. The latter figure implies that there will only be an overall surplus of one per cent that would be available for MSs to trade as statistical transfers.[17] Moreover, circumstances could change unexpectedly, such as the recent approval by the European Parliament (EP) to increase the 2030 renewable energy generation target from 27 to 35 per cent of the total consumption, thus affecting the supply of statistical transfers on the market.

[16] Trends and Projections in Europe 2017, Tracking Progress Towards Europe's Climate and Energy targets, EEA report no. 17/2017, page 38.
[17] Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions, Renewable Energy Progress Report, Brussels 1.2.2017, COM(2017) 57 final, page 10.

b. time at which Malta would need to buy such statistical transfers - The closer to 2020, the higher the potential demand by the other MSs who have not yet reached their respective mandatory target for renewable energy generation thus influencing the price upwards.

c. quantity of statistical transfers which Malta would need to purchase - The relatively small amount required might influence the price upwards for two main reasons a) diseconomies of scale would be an influencing issue and b) it would potentially place National Authorities at a disadvantage when negotiating to procure a relatively small amount of statistical transfers.

d. success or otherwise of bilateral discussions - This may also have a direct influence on the agreed price, as other form of benefits rather than financial could also be taken into consideration during such arrangements.

4.2.7. Commercial sensitivities coupled with a lack of published information, implies that there is a vacuum concerning the availability of published statistical transfers' market prices. In such circumstances, the NAO is not in a position to conclusively determine the extent to which the procurement of statistical transfers would have been more favourable than the indigenous generation of PV RES.

4.2.8. In the absence of market information on statistical transfers, it can only be concluded that such an option is not without its advantages. For instance, statistical transfers can facilitate the attainment of EU targets, and consequently minimising the risks of incurring European Court of Justice (ECJ) imposed financial penalties. Statistical transfers would imply that Malta's limited space and land are not stressed any further. These advantages have to be seen against the potential disadvantages of statistical transfers, namely those related to the security of supply and the reduction of emissions that would otherwise result by being constrained to generate an equal amount of energy through conventional means to meet the local demand for electricity. The procurement of statistical transfers would also influence negatively the number of green jobs within the Maltese economy.

4.2.9. Nonetheless, the above pros and cons of statistical transfers have to be analysed within a financial context conditioned by the market price of statistical transfers. To this end, the NAO was constrained to benchmark against the European day-ahead baseload wholesale electricity price index for the third quarter of 2017, that is, the average price of €0.03,8 per kilowatt hour (kWh).[18]

4.2.10. On extrapolating this scenario, it can be argued that there would be similarities to the market price of statistical transfers. This state of affairs, coupled with technological improvements in the production of RES leading to a higher supply, further emphasizes that the market price of statistical transfers would have been influenced downwards. It can be concluded that the

[18] https://ec.europa.eu/energy/sites/ener/files/documents/quarterly_report_on_european_electricity_markets_q3_2017_finalcover.pdf

opportunity exists that National Authorities comprehensively study whether statistical transfers should feature more prominently in Malta's RES policy rather than being just a back-up to the eventuality that obligatory targets are missed.

4.3. Projections show that joint projects would be a more expensive alternative to indigenous PV RES generation

4.3.1. Article 11 of the Renewable Energy Directive 2009/28/EC stipulates that MSs may cooperate on joint projects to generate energy from renewable sources. The renewable energy generated through similar joint projects is then shared according to the agreed proportion, with the intent of contributing to the respective National 2020 obligatory targets.

4.3.2. This audit sought to evaluate the extent to which embarking on joint projects would be a financially viable option. This assessment assumed three different scenarios. All three cases assumed the potential implementation of a PV RES project in Italy. This particular scenario was selected for the following reasons, namely:

a. Space availability to implement large scale project, thus addressing Malta's major intrinsic limitation with respect to the exploitation of PV RES;

b. Italy's experience in implementing similar large scale projects, including various PV setups and related technologies, thereby facilitating the estimation of the cost of capital investment required;

c. Similar climatic conditions to maximise the output from PVs in terms of the amount of renewable energy generated; and

d. Strong bilateral relationship where Malta shall be the major beneficiary in terms of the renewable energy generated since Italy has already achieved its mandatory target for 2020.

4.3.3. The assumptions and factors of this presumed project were chosen on the basis of extensive research including the actual specifications of six large-scale PV projects that were carried out in Sicily during recent years. As outlined in detail in Appendix II, a number of assumptions were adopted reflecting industry best practices as well as a discount factor of 2.5 per cent. Table 8 presents the estimated discounted cost per kWh of the renewable energy generated through the three different presumed scenarios.

Table 8: Three assumed scenarios relating to a presumed 50 MWp PV installation in Sicily

Scenario (No.)	Description of the presumed scenarios for a potential joint project as a form of cooperation mechanism	Discounted cost per kWh of renewable energy generated (€)
1	Maintenance Agreement for a 50MWp PV Farm	0.11,4
2	PPP Agreement for a 50MWp PV Farm	0.10,5
3	Communal 50MWp PV Farm	0.15,7

4.3.4. The first scenario considers a maintenance agreement between Malta and Italy, with respect to a presumed new 50MWp solar PV project to be installed in Sicily. In this scenario, Malta will be benefitting from all the renewable energy generated in terms of contribution to the mandatory 2020 target as Italy has already attained its RES target. In the circumstances, it is realistic to assume that Malta would incur all costs associated with the capital expenditure and installation of this PV project.

4.3.5. In this case, the benefits for the other party to such an agreement would be the profit associated with the construction of the solar power plant, the maintenance related profit to ensure its proper upkeep, as well as the rent of the land in use by the ground-mounted fixed-orientation PV installation. The value of the rent for the required footprint of approximately 0.7 square kilometres was based on 5 per cent of the asking price of similar parcels of agricultural land in Sicily. Assuming a 20-year lifetime for such a project, with a discount rate of 2.5 per cent and, selling the electricity generated at a prudently set value of €0.03,8 per kWh, then the cost per unit of the renewable energy generated over the lifetime of this joint project would be around €0.11,4.

4.3.6. The second presumed scenario relates to a Public-Private Partnership (PPP) agreement, whereby the private investor is expected to finance the building, installation, commissioning, operation and maintenance of the 50MWp PV installation in Sicily. The Government of Malta will benefit from selling the electricity generated, whilst effecting annual payments to the contractor, which, over the lifetime of the project, would cover all the expenses, including maintenance, insurance and rent, as well as generate a subjectively established profit of 20 per cent of the initial capital investment. The benefits for Italy in this case mainly relate to the income associated with the rent of the land occupied by the PV power plant and other benefits such as maintenance.

4.3.7. Contrary to Scenario 1, this arrangement does not require Malta to finance the significant amount of initial capital investment required, which, including installation and grid connection could amount to around €141 million. As shown in Table 8, Scenario 2 would result in a cost per unit of renewable energy generated of €0.10,5.

4.3.8. The third presumed joint project scenario between Malta and Italy adopts the same concept of the Communal PV Farm already implemented at il-Fiddien, Malta. In this case, subscribers would be tantamount to shareholders through investing to sustain the cost of the project's capital, in return for a FiT for the renewable energy generated. Grid-connection related costs such as long-distance cables and substations could be significant and hence will have to be incurred by Government, to enable a FiT in the range of €0.15 per kWh for the first six years and €0.10,5 per kWh from the seventh to the twentieth year, with a reasonable payback period for participants. These rates and conditions are based on those prevalent in the Fiddien Communal Farm.

4.3.9. Similarly to the other two scenarios, the benefits for the other MS party to this joint project would mainly include the profits related to the provision and maintenance of such plant, as well as the rent of the land. As shown in Table 8, the third scenario relating to a presumed communal PV farm in Sicily to be funded by investors in return for a reasonable FiT, resulted to be the most expensive option. Over the 20-year project lifetime the cost per unit of renewable energy generate would equate to around €0.15,7 per kWh, when applying a discount rate of 2.5 per cent and selling the electricity generated at €0.03,8 per kWh.

4.3.10. As shown in Table 8, the three presumed scenarios for a joint project between Malta and Italy, exceeded the discounted additional unit costs that would be incurred by Government to finance the FiT Schemes for PVs. This is particularly evident with respect to the more recent FiT Schemes that resulted in an estimated additional unit cost of €0.05,3 per kWh as referred to in paragraph 3.5.4. Moreover, as already noted in Chapter 1 of this Report, the indigenous PV RES option has other environmental as well as economic benefits, namely the reduction in air emissions from energy generation, the improved security of supply and the creation of more green jobs.

4.4. Conclusions

4.4.1. To date, initiatives undertaken with respect to PV RES have focused on the indigenous generation of renewable energy. The NREAP 2015-2020 considers cooperation mechanism as outlined in the Renewable Energy Directive in the context of back-up if Malta fails to attain its EU obligatory targets or if this option provides higher net benefits. The analysis presented in this Chapter showed that the opportunity exists for National Authorities to consider more actively the extent to which cooperation mechanisms, particularly statistical transfers, can contribute cost-effectively in Malta's quest to reach its renewable energy target by 2020. To this effect, this Chapter discussed cooperation mechanisms through two instruments namely, statistical transfers and joint projects.

4.4.2. The Renewable Energy Directive, which outlines the option for statistical transfers, allows EU countries with more abundant and cheaper renewable energy sources to cooperate with other countries to reach their National renewable energy target at lower costs. The additional costs to the Government of Malta relating to FiT Schemes, which include ERDF co-funding arrangements,

are declining over time. Although information on the prevalent costs of statistical transfers remains mostly illusive, research undertaken for the purpose of this audit showed that the market price of statistical transfers has also declined. In cases, there is evidence that countries traded statistical transfers at a lesser cost than the discounted additional costs incurred by Government to finance the indigenous generation of renewable energy through PVs. These circumstances, however, must be viewed within the broader context of the local environment and the National economy.

4.4.3. On the other hand, based on currently available information and prevailing circumstances, this review provided indicators that joint projects with other countries will not necessarily yield a more favourable outcome than the indigenous generation of PV RES or the procurement of statistical transfers.

4.4.4. The analysis presented in this Chapter intended to obtain deeper insights into the potential of cooperation mechanisms within Malta's context. While this review elicited indicators, these cannot be considered as conclusive due to the widespread information lacunae.

Appendix I: Discounted additional cost of renewable energy through PV FiT Schemes

FiT Scheme	Feed-in Tariff		Grant on Investment	Renewable energy generated	Total discounted additional cost for clean energy	Discounted additional cost of clean energy through PVs per kWh
	Rate (€/kWh)	FiT Period (Years)	(Y/N)	(kWh)	(€)	(€/kWh)
1 - Malta	0.25	8	Y	221,107,439	24,370,776	0.110
1- Gozo	0.28	8	Y	35,280,386	4,164,854	0.118
2	0.22	6	Y	646,666,909	43,239,851	0.067
3	0.20	7	Y	150,668,169	15,897,606	0.106
4	0.17	7	Y	12,293,996	755,140	0.061
5	0.15	7	Y	33,217,564	2,260,945	0.068
6	0.11	7	Y	19,652,188	1,398,643	0.071
7	0.18	20	N	137,010,452	10,689,570	0.078
8	0.17	20	N	No Connections		N/A
9	0.17	20	N	No Connections		N/A
10	0.16	20	N	56,962,092	3,659,699	0.064
11	0.17	20	N	40,561,685	2,853,806	0.070
12	0.16	20	N	No Connections		N/A
13	0.16	20	N	No Connections		N/A
14	0.15,5	20	N	No Connections		N/A
15	0.16,5	20	N	69,286,244	4,505,866	0.065
16	0.16	20	N	106,474,242	6,849,494	0.064
17	0.15,5	20	N	68,852,523	4,182,960	0.061
21	0.15,5	20	N	117,196,074	7,283,549	0.062
18, 19, 22, 23, 24, 26	0.15	20	N	273,477,458	15,991,003	0.058
20, 25, 27	0.16,5	6	Y	412,327,243	21,973,076	0.053
28	0.15,5	20	N	No connections		N/A
29	0.14,5	20	N	No connections		N/A

Appendix II: Assumptions and factors with regard to the joint projects' benchmarking exercise

Assumptions and Factors	Maintenance Agreement	PPP Agreement	Communal PV Farm
A PV Farm of 50 MWp	✓	✓	✓
A total capital investment cost including installation and connection to the electricity grid of €141 million based on average of 6 projects carried out in Sicily	✓	✓	✓
A PV installation lifetime of 20 years	✓	✓	✓
A fixed yearly maintenance cost of one per cent on the initial capital investment	✓	✓	✓
An inverter replacement cost of 11 per cent of the total capital investment cost in year 11 of the project	✓	✓	✓
An annual rent of €283,000	✓	✓	✓
An annual insurance cost of one per cent on capital investment	✓	✓	✓
A selling price of €0.03,8 per each kWh generated	✓	✓	✓
A decommissioning cost of €5 Million in year 21 of the project	✓	✓	✓
A discount rate of 2.5 per cent	✓	✓	✓
A profit element of 20 per cent for the PPP contractor		✓	
A capital investment by subscribers of €1,495 per kWp			✓
A FiT of €0.15/kWh for the first six years and €0.10,5/ kWh from the seventh to the twentieth year is to be provided to subscribers			✓

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