PROPOSALS FOR RENEWABLE ENERGY SUPPORT MECHANISMS - FIJI

Draft Report

December 2014

Report to the UNDP

Formulation of an Independent Power Producer and Investment Framework for Developers of Renewable Energy Power Generation Projects in Fiji

(RFP/FJI0-007-14)

DRAFT

About IT Power

The IT Power Group, formed in 1981, is a specialist renewable energy, energy efficiency and carbon markets consulting company. The group has offices and projects throughout the world.

IT Power (Australia) was established in 2003 and has undertaken a wide range of projects, including designing grid-connected renewable power systems, providing advice for government policy, feasibility studies for large, off-grid power systems, developing micro-finance models for community-owned power systems in developing countries and modelling large-scale power systems for industrial use.

The staff at IT Power (Australia) have backgrounds in renewable energy and energy efficiency, research, development and implementation, managing and reviewing government incentive programs, high level policy analysis and research, including carbon markets, engineering design and project management.

About this report

This report is part of work commissioned by the UNDP to help Fiji meet its Renewable Energy Power Project (FREPP) goals. This work is intended to contribute to the revitalisation of the renewable energy market in Fiji, especially where Independent Power Producers are concerned. Of particular interest is the policy framework regulating both public and the private investments in renewable energy, and the incentives which could be applied to stimulate growth in the sector.

The work is divided into three components, a) the development of standard Power Purchase Agreements, b) the formulation of Investment Promotion Packages, and c) the assessment and development of Renewable Energy Incentive Schemes.

This report contributes to part c) and proposes renewable energy support mechanisms for Fiji. It adds to the previous reports on ‘Review of Existing Subsidy and Incentive Schemes - Fiji’ and ‘Review of International Renewable Energy Support Mechanisms’ and will be incorporated into the Final Report.

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1. INTRODUCTION

The UNDP funded Fiji Renewable Energy Power Project (FREPP) addresses 4 categories of barriers to the widespread application of Renewable Energy (RE)-based power generation in the country:

a) Energy Policy & Regulatory Frameworks;

b) RE Resource Assessments & RE-based Project Assessments;

c) RE-based Power Generation Demonstrations; and

d) RE Institutional Strengthening.

This project focuses on the third aspect— Renewable Energy-based Power Generation Demonstration. It is intended to contribute to the revitalisation of the renewable energy market in Fiji, especially where Independent Power Producers (IPPs) are concerned.

This project is divided into three components:

i) Review and development of an appropriate and standardised Power Purchase Agreement (PPA) for Fiji.

ii) Formulation of an investment promotion package, and organisation of an investor's forum.

iii) Assessment and development of renewable energy incentive schemes for Fiji.

The third component is then subdivided into three reports that (i) assessed the existing incentive schemes in Fiji, (ii) reviewed international experiences in such schemes and proposed schemes for Fiji, and (iii) in response to feedback on Report (ii), designed renewable energy incentive schemes for Fiji, including approaches to monitor and evaluate these schemes.

This is Report (iii), and **Section 2** firstly describes the process for designing, implementing and evaluating such incentive schemes. **Section 3** then summarises each of the schemes proposed for Fiji, identifies the parties Involved in design, implementation and evaluation, then explains how the assessment criteria can be used to evaluate them.

A word on definitions: Policies represent government objectives (eg. encouraging the construction of renewable energy), policy mechanisms are types of approaches to carry out such policies (eg. feed-in tariffs) while policy programs are actual implementations (eg. the feed-in tariff design for distributed generation proposed in this report).

2. PROGRAM DESIGN, IMPLEMENTATION AND EVALUATION

Processes used to drive the uptake of renewable energy can be divided into those which are primarily concerned with program design, those focussing on implementation and those concerned with eventual evaluation in order to test how well policy objectives have been met. Combined, these should form an ongoing process, where further program design and implementation follow on from the initial evaluation process, and so on, so that the mechanisms and programs can be refined and adapted to changing circumstances.

In this process, separation of powers between the 'designer', 'implementer' and 'evaluator' is important to reduce perceived or real conflicts of interest, especially where the evaluator is publicly reporting on outcomes that are relevant to public welfare and are important to informing revision of the program design. Managing the interface between each stage is very challenging for complex programs, while the need for program revision must be balanced with the need for investor certainty and the reduction of sovereign risk.

Figure 1 below illustrates one possible decision-making framework suitable for renewable energy support programs. A program is designed at the 'Governance' level, implemented by the 'Scheme Administrator', and evaluated by the 'Regulator'. For each of the policy mechanisms and programs proposed below, the roles and potential conflicts of interest of these various parties are discussed, as is the importance of independent evaluation - not only to ensure they do in fact operate well, but that they are *seen* to operate well and fairly.

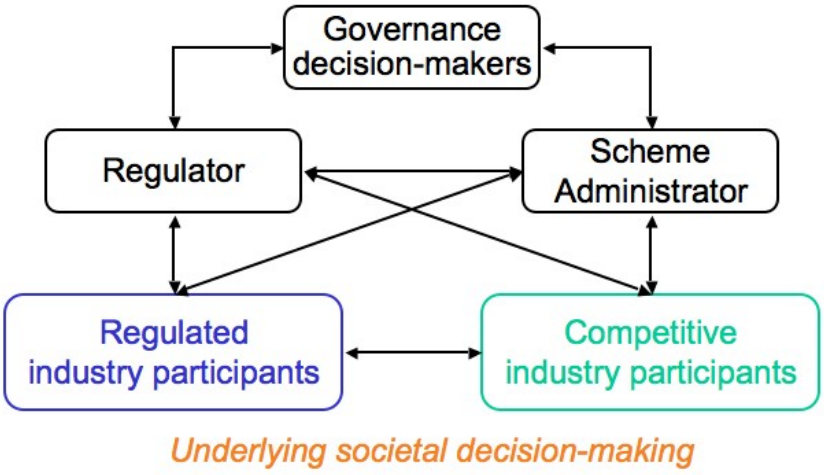

Figure 1. Decision-making framework for a competitive electricity industry (Passey et al., 2008)

Note: All arrows are bidirectional to indicate the two-way flow of influence between the various participants.

However, as illustrated in Section 3, in small jurisdictions such as Fiji, complete separation of powers is not always possible. The most likely compromises are where the Governance and Administration bodies are combined, but it is even possible for there to be overlap between the Governance body and the Regulated industry participant. In all cases it is most important that the Regulator is independent so it can effectively evaluate the scheme(s).

2.1.1. Program Design and Implementation

Energy stakeholders in Fiji have been through a detailed series of consultative policy development processes over the last few years which have resulted in a new Draft Energy Policy and support documentation, such as the Legislative Gap Analysis report, the SE4ALL Rapid Assessment and Gap Analysis report and the draft Strategic Action Plan. In addition, a range of programs, particularly in off-grid areas, have been implemented. The task here is to propose new programs and to provide a framework for the evaluation of existing programs, both of which are consistent with the principles enunciated above and which clarify responsibilities for governance, administration and evaluation. Responsibilities for these may change over time and will depend to an extent on whether or not the proposed new Energy Policy is implemented by the Government in part or in full. Hence, while the governance and administration responsibilities are described for each of the programs discussed below, the focus here is on program description and evaluation.

2.1.2. Program Evaluation

As discussed in Report (ii) of this study[1]: program evaluation by an independent 'Regulator' is critical to successful delivery and should be ongoing. It can be divided into:

1. **Monitoring** of uptake, issues and outcomes to facilitate evaluation
2. **Assessment** of monitored results to assess trends, costs and other aspects
3. **Recommendations for revision** and adaptation of programs, based on the assessments, to ensure they remain relevant, that lessons learned are acted upon and to respond to changing circumstances, including prices, new technologies or information. These recommendations are passed on to the 'Governance' level where adjustments can be made to the program design.

The following assessment criteria[2] can be used to evaluate programs once they have been operating for some time. For each of the programs proposed below, we describe how these criteria can be used to evaluate them.

- **Effectiveness:** How effective is the program at deploying plant that generate the expected amount of renewable electricity over a given timeframe?

[1] ITP 2014, Review of International Renewable Energy Support Mechanisms, Report to UNDP, November 2014.
[2] They are almost identical to those proposed by IRENA (2014) – Effectiveness, Efficiency, Equity and Institutional Feasibility.

- **Efficiency:** Is the program able to deliver renewable energy at low cost, and are there any other cost impacts?
- **Equity:** Are the costs and benefits of the scheme distributed fairly?
- **Administration:** Is the program difficult to administer, including any relevant auditing and compliance requirements?

3. RENEWABLE ENERGY SUPPORT MECHANISMS & PROGRAMS RECOMMENDED FOR FIJI

This section recommends mechanisms and programs for Fiji according to the four categories of electricity supply defined in Report (i) of this study[3]:

1. Central grid: large-scale centralised generators connected to the transmission network (MW in size)
2. Distribution grids: any generation connected to the distribution network (from kW to MW)
3. Mini-grids: Isolated minigrids, that in Fiji are currently generally powered by a diesel generator (kW)
4. Off-grid: Small isolated systems, that in Fiji currently generally consist of PV and possibly batteries (kW)

Fiji's current significant policy mechanisms and programs for each of these categories, and the recommendations made in Report (ii) of this study[1], are summarised in Table I and discussed below.

Table I. Current Significant and Proposed Renewable Energy Support Mechanisms and Programs for Fiji

Electricity Supply Type	Current Mechanism/Program	Mechanism/Program Proposed by IT Power
Central Grid	• Confidential Power Purchase Agreements (PPAs) offered by FEA to IPPs who offer to build systems and pass FEA's due diligence assessment.	1. Reverse auction where generation as well as network services, such as storage or voltage support, are called for, based on needs of electricity system. 2. Complementary mechanisms • Supportive grid-connection arrangements • Network maps • Training and accreditation

[3] ITP 2014, 'Review of Existing Incentives and Subsidy Schemes in Fiji, Report to UNDP', September 2014.

		• Resource monitoring • Retain tax benefits
Distribution grids	• Net metering (commercial) with conditions individually negotiated • Gross Feed-in tariff/net billing trial (residential)	1. Net metering transitioning to gross feed-in tariff for commercial and residential 2. Suggestions for residential feed-in tariff trial 3. Solar Schools program 4. Complementary mechanisms • Supportive grid-connection arrangements • Training and accreditation • Building and planning codes. • Government procurement • Standards and Information
Mini-grids	• SEFP • Community PV trial • PV/diesel hybrid systems	1. Combination of capital subsidies and feed-in tariffs 2. Solar schools program 3. Complementary mechanisms • Supportive grid-connection arrangements • Training and accreditation • Building and planning codes. • Government procurement • Standards and Information • System performance monitoring
Off-grid	• SEFP • Solar Home Systems (RESCOs)	1. Improvements to the SHS by RESCOs 2. Solar schools program 3. Complementary mechanisms • Supportive grid-connection arrangements • Training and accreditation • Building and planning codes. • Government procurement • Standards and Information • System performance monitoring

3.1. Support for Renewables on Central Grids

3.1.1. Recommendation 1: Initiate a competitive bidding process for new electricity supplies connected to central grids

Description

The Commerce Commission (CC) has recently ruled that all IPPs should be paid at least 33.08c/kWh for electricity fed into the grid. While this rate is based on avoided generation costs and therefore is certainly the minimum that should be paid for distributed generation (connected to the distribution network), some type of competitive bidding process (using 33.08c/kWh as the ceiling) could be used to identify the lowest market price for medium to large-scale centralised generation. Competitive bidding will offer a more transparent and equitable outcome than current processes. Such a process could also facilitate access to finance, via the SEFP or other sources.

Each call for capacity should use a single round sealed bid reverse auction process, possibly with a 'pre-qualification' round. In such a process, potential IPPs are given one opportunity to bid for the right to generate up to a specified quantity of electricity. The bidder specifies the quantity their project would supply, and specifies the price. The pre-qualification round may be used to identify the highest ranking bids, which can then submit a more detailed proposal. This pre-qualification round broadens the number of offers that may be made because it reduces the time and investment spent by IPPS who are uncertain of their chances of success.

It is important to recognise that each call for capacity may be filled most cheaply by a number of smaller bids. Indonesia is currently holding a series of 'Solar Auctions' for PPAs with a total quota of 180MW for 80 locations, where sizes range from 1MW to 6MW. The regions and system sizes are defined by the Ministry of Energy and Mineral Resources (ESDM), and auctions are conducted by the Directorate General of New & Renewable Energy and Energy Conservation (EBTKE). The lowest PPA to date has been 18.36 USc/kWh. These smaller sizes allow projects to be located closer to the source of demand and they can also be configured to provide grid support if necessary.

To avoid spurious or under-priced bids, penalties should apply to projects that do not proceed within a set time period. This is especially important if a 'pre-qualification' round is not used. Responsibilities for monitoring and system performance should be defined in the call, as well as penalties for under-performance.

It may be wise to start with a relatively small call for capacity, until local experience is developed with this sort of process. Later auctions can then be called as more generation capacity is required. In this case, the number and timing of auctions to be called should be clearly timetabled, and should specify aspects such as the capacity required, any locational preferences and conditions of connection. It is also important to keep the process as simple as possible, avoiding collusion and ensuring transparency and equal access to information by all interested parties.

Parties Involved in Design, Implementation and Evaluation

The FEA has the most knowledge and experience in evaluating IPP proposals for Fiji. However, as demonstrated by the recent CC ruling on 33.08c/kWh being the minimum that should be paid for independent power fed into the grid, there is clearly a perceived need for additional oversight. In this case, the FEA and the CC could jointly design the auction process, with possible input from the DOE. Thus, there would be overlap between the Governance body (CC) and the Regulated industry participant (FEA), however this should not be problematic as long as the process is transparent with the reasons for making decisions made publicly available. The Administrator (CC or FDOE) could then implement the process (run the auction), which could then be evaluated by the Regulator.

With Fiji's current governance structure, if the FDOE runs the auction, it would be both the Administrator and the Regulator. This is problematic because it is important that the Regulator is independent so it can effectively evaluate both the design of the scheme and how it is implemented. Two possible solutions are that (i) a separate regulatory arm of the FDOE is established, or (ii) a separate regulatory arm of the CC is established. In practice, a separate regulatory body may be established using resources from both organisations (hereafter referred to as FDOE-Reg). Note that even if the CC runs the auction, the FDOE-Reg will need to be established to evaluate other policy mechanisms and programs designed or implemented by the FDOE (discussed below). Thus, the responsible parties for an auction would be as suggested in Table 2:

Table 2: Regulatory Responsibilities for Competitive Bidding Process for New Central Grid Electricity Supplies

Role	Responsible party	Comment
Governance (design)	CC designs the auction process With input from the FEA and FDOE	There will be overlap between Governance body, Administrator and Regulated industry participant
Administrator (implementation)	CC or FDOE runs the auction	Transparent process needed with clear guidance on technical and financial requirements, plus capacity sought and timelines. Reasons for selections / rejections provided to all bidders.
Regulator (evaluation)	FDOE-Reg evaluates outcomes	Needs to be independent so it can effectively evaluate both scheme design and outcomes
Regulated industry participant	FEA	Sets the volume, locational preferences and connection

		requirements
Independent industry participant	Independent parties bidding in projects	Need to know the process is fair. Participation costs need to be minimised by provision of as much relevant information as possible. Need to provide financial credentials and be held to bid prices and timelines.

Evaluation of Outcomes

The outcomes of the auction need to be evaluated according to the criteria previously defined. Although the design should also be assessed before implementation, the following focuses on the evaluation of the outcomes. Note that both evaluations would use the same criteria, with the 'design evaluation' being *ex ante* (ie. of the expected outcomes) and the 'outcome evaluation' being *ex post* (ie. of the actual outcomes). The details of any required revision would of course depend on the outcomes of the evaluation, but should follow the process described above, that is, the outcomes of the evaluation would be passed on to the Governance body, who would then alter the process for future auctions.

Effectiveness

Has the auction process resulted in the targeted amount of generation capacity? This target generation capacity would have been determined and made public as part of the auction process.

Efficiency

An assessment of the efficiency of the auction process should separate the electricity generation cost outcomes from the government's administration costs (ie. the FEA and the CC). With regard to the generation costs: Has the auction process resulted in electricity generation that is considered to be least-cost? This would be compared to the costs of generators currently operating in Fiji and similar areas, and the 33.08c/kWh set by the CC. With regard to the administration costs (see below): this should not be viewed in isolation but should be compared to the costs that would be incurred through the processes the FEA would otherwise use. It could also be compared to the cost of implementing similar government programs or processes, and even be converted to a per kWh cost for the electricity to be generated under the PPA.

Equity

The equity impacts of the auction process should be simple to assess because it should result in lower cost electricity for end users, while not impacting on FEA's costs.

Administration

What was the final cost of designing and implementing the auction and selecting the successful IPP(s)? Note that the costs are likely to be higher for the first set of auctions as the relevant organisations familiarise themselves with the process.

3.1.2. Recommendation 2: Complementary mechanisms

Description

As discussed in detail in Report (ii) of this study[1], there is a range of complementary mechanisms that would help to identify and connect the most suitable and lowest cost generation options:

- Publicly available and consistent grid connection requirements for large-scale power plant.
- Network maps or processes to assist larger scale IPPs to undertake relevant network studies.
- Training and accreditation of FEA personnel, and staff of IPPs, on new technologies, interconnection equipment, monitoring systems.
- Continuation and perhaps expansion of monitoring of renewable energy resources, with publicly available data made available through a single web portal: wind, solar, biomass, hydro and as technology develops, geothermal, wave and tidal.
- Exemptions from import taxes should remain for renewable energy equipment.
- The 5 year tax holiday for renewable energy infrastructure investment should also remain.

The responsibilities for each of these are indicated in Table 3. Most of these are not new and already exist in some form in Fiji, and so the delegation of responsibilities is not described in detail. However, clarity may not currently be evident around governance, administration and evaluation, while formal processes and relevant data collection to facilitate evaluation may not yet have been established.

Table 3: Regulatory Responsibilities for Complementary Mechanisms to Support New Generation in Central Grids

Policy mechanisms	Governance (design)	Administration (implementation)	Regulator and Suggested Criteria (evaluation)
Grid connection requirements	FEA	FEA	FDOE or FDOE-Reg • Public availability • Ease of access • Adequacy of information • Cost of providing the service

Network maps	FEA	FEA	FDOE or FDOE-Reg • Availability • Ease of access • Adequacy of information
Training and accreditation	Department of Education, Heritage and Arts Accreditation bodies	Public and private training organisations	FDOE or FDOE-Reg • Course availability and price • Numbers of students • Student feedback
Resource monitoring	FDOE	FDOE	FDOE or FDOE-Reg • Range of data available • Ease of access to data • Quality of data
RE component Import tax exemptions	Government of Fiji	Revenue and Customs Authority	CC • Quantity and value of imports • Sources of imports • Types of products imported • Tax exemptions granted
RE investment tax holiday	Government of Fiji	Revenue and Customs Authority	CC • Number of companies seeking tax holiday • Types of investments cited • Value of tax holidays granted

3.2. Support for Renewables in Distribution Grids

Medium-scale grid-connected PV systems have recently been privately installed on FEA's grid at Viti Levu. They are connected under a net feed-in tariff where generation used onsite displaces the prevailing retail tariff and potentially reduces demand charges, while exported electricity currently receives up to 15c/kWh[4]. Hence, they are sized to offset onsite demand and minimise export. Several PV systems up to 250kW have been installed, with at least one 700kW PV system planned for an international hotel.

A residential grid-connect PV trial is currently being conducted by the FDOE as discussed in Section 3.2.2. It involves the installation of up to sixty 1.2kW or 2.4kW PV systems at no cost to the household, with PV output gross metered and net billed. Outcomes of this trail could be useful in formulating details of a feed-in tariff policy.

[4] Discussion is underway as to eligibility for the 33.08c/kWh rate set by the CC, although FEA is of the view that this is for "fully fledged" 24 hour power supplies only.

3.2.1. Recommendation 1: Net then gross feed-in tariff for all distributed generation

Description

According to the CC's ruling, medium-scale distributed generation (DG) systems connected to the grid should now be paid at least 33.08c/kWh for all exported electricity. We recommend that this should be adhered to by the FEA.

However, on a net feed-in tariff, as distributed generation reaches higher levels of penetration, it can reduce income to FEA. This is because the retail tariff consists of the transmission, distribution and retail (TDR) costs, as well as generation costs – and the on-site use of DG electricity means the customer avoids paying the TDR costs. Having a gross feed-in tariff based on the avoided cost of generation means that the system owner will pay for electricity use just like any other customer, and so will still pay all the TDR costs associated with that use. Therefore, as DG penetration reaches higher levels,[5] the FEA could consider moving to a gross feed-in tariff set at the avoided cost of generation.[6]

A net feed-in tariff should not be seen as a way to limit system size and so avoid potential technical impacts on the network. Financially-based mechanisms of any kind are a very blunt instrument to achieve technical outcomes. For example, as system costs decrease, a net feed-in tariff will become less effective in limiting system size, and such a tariff is much harder to make location-specific, to target areas of high penetration or where increased DG may be beneficial[7]. Technical issues should be addressed with technical measures – for example, inverters now commonly provide higher quality power than on many networks and ramp-rate controls can readily be used to minimise the impacts of changing output.

Customers will need to be confident that their investment will be able to be paid off at a reasonable rate, so the length of time over which tariffs will be paid must be clear and not able to be changed retrospectively (this also means that any gross feed-in tariff should not be imposed on systems installed under the net feed-in tariff, until their specified contract time is reached). If the value of the feed-in tariff needs to be changed (for example because the avoided cost of generation changes), the new rate should only apply to systems installed after the date the change is introduced. To facilitate changeover to the new tariffs over time, a set period of time (say 10 years) can be specified in the feed-in tariff contract.

If particular milestones are set (for example, MW installed, price decreases, or other measurable parameters), automatic yet gradual reductions in support should be built in from the start, and

[5] For example, when DG system generation reaches 10% of electricity sales.

[6] Ideally, the gross feed-in tariff would be set at the avoided cost of supply, which includes benefits such as avoided network augmentation costs where distributed generation reduces demand peaks. However, such benefits can be quite difficult to calculate and are site-specific.

[7] For instance, gross feed-in tariffs can be set at different levels for different locations. This is not as effective for a net FiT.

made known to the public. For example, net FiTs would no longer be available after 5 MW has been reached[8]. Similarly, information on DG systems and details of the tariffs, application requirements, standards and approval processes will still need to be made publicly available if the market is to be stimulated.

A higher feed-in tariff could potentially be offered for generation during peak demand periods or in grid constrained areas – with the level determined according to the additional value distributed generation may provide. This may require the installation of time-of use meters, although generators more likely to provide electricity during peak times could receive a default higher tariff. Higher tariffs could also be offered in order to promote a particular technology (for instance, mini-hydro, PV, small wind, small biogas generators), or a particular sector (commercial, residential, or community).

Parties Involved in Design, Implementation and Evaluation

The CC has already taken on the Governance role by stipulating the 33.08c/kWh tariff for exported electricity. This was based on input from the FEA and the FDOE, which should continue to be the case for any further development of such tariffs. PV installers would be the Competitive industry participants. The FEA is both the Administrator and Regulated Industry Participant, and so it is important that the Regulator, who assesses the feed-in tariff, is independent to all these bodies. This could be performed by the FDOE or by the same organisation that assesses the auction process discussed above (the FDOE-Reg), or could be outsourced to a private evaluator, overseen by the FDOE-Reg. The responsibilities for each party are discussed below and summarised in Table 4.

Evaluation Process

Effectiveness

How many renewable energy systems have been connected to the distribution network? This should be evaluated in terms of the different types of systems, their capacity, annual generation and locations. It could also include as assessment of any technical impacts, both positive and negative, which could be used to set future targets, and whether feed-in tariffs should be put in place to target systems to particular areas. Results would be used, in part, to determine the appropriate time to phase in gross metering.

Efficiency

An efficiency assessment should separate the electricity generation costs from the FEA's administration costs.

Although such as assessment of the electricity generation costs could include an assessment of the cost to FEA of the feed-in tariffs and a comparison to FEA's reduced generation costs, it is

[8] Note that this will require a register be kept of approved installations. This register will need to be publically available.

likely that this is best left to the current process initiated by the CC. This of course means that the CC should evaluate the level of the tariff paid to exported generation every two years or so, and that this evaluation should be informed by the increased levels of distributed generation driven by the feed-in tariff. Refer to Section 2.4.2 of the report 'Review of Existing Subsidy and Incentive Schemes – Fiji' for more discussion on the potential impacts on FEA's revenue of a gross feed-in tariff based on the CC's 33.08c/kWh tariff.

An assessment of FEA's administration costs (undertaken by the FDOE-Reg) would need to take into account the costs incurred by the FEA managing the grid connection process, compared to the normal costs of load connection. Any significant costs incurred by FEA could be converted into a per kWh cost and compared to the value obtained from the DG electricity. Again, these costs may be higher initially as the necessary procedures are put in place. The implementation of standard procedures, processes and paperwork should decrease such costs over time.

Equity

This consists of two components: (i) does the feed-in tariff rate represent FEA's avoided costs of generation, and (ii) are the benefits of the feed-in tariff distributed fairly amongst the population?

For (i), if the Efficiency assessment indicates this is not the case, the tariff should be adjusted so that it is. For (ii), on the basis that customers only install a DG system because it provides them with a benefit, DG installations should be spread equally across income groups. (Note that currently, only larger commercial customers have access to a feed-in tariff and this is only net of onsite use.) This assessment can be readily achieved through a survey at the time of connection of the DG system to the grid – which, in addition to income band, can document a range of other aspects including system type, cost, size etc, as well as reasons for installing.

If DG uptake is not even amongst income groups, measures can be put in place, such as requirements placed on installers for a percentage uptake by different income bands, to targeted information campaigns, and others that promote novel business models that require no upfront cost or provide targeted assistance to specific groups.

People who don't own their own house can also be disadvantaged, as can those who own their house but, for PV systems, don't have suitable roof space and good solar access (eg. structurally sound, good orientation, no shading, suitable tilt). Community financing options can help overcome some of these issues by allowing people without suitable houses to purchase a share in a community project, with commensurate payments or electricity bill reductions based on their share of electricity produced.

Note that not all customers will take up the option, yet it will be important to demonstrate that the benefits are shared – for instance, that electricity tariffs are reduced for everyone because of the avoided cost (of mostly diesel generation) being provided by renewable sources.

Administration

This should have relatively low administration costs for the customer and FEA, especially with standardised connection procedures apparently in place already. According to PV installers the administration involved in meeting the technical connection and billing requirements are not onerous, and so administration costs appear to be reasonable. It is unclear whether these procedures are equally suited to other technologies.

Table 4: Summary of Responsibilities for Distributed Energy Feed-in Tariffs

Role	Responsible party	Comment
Governance (design)	CC Input from the FEA and FDOE	Need to ensure all parties are in agreement on processes, target quantities and sizes
Administrator (implementation)	FEA	Overlap between Administrator and Regulated industry participant
Regulator (evaluation)	FDOE-Reg or 3rd Party overseen by FDOE-Reg	• Uptake levels, system sizes, locations and customer categories • Demographics • Administrative costs • Grid impacts • Impacts on FEA costs and subsidies • Timing of move from Net to Gross tariffs
Regulated industry participant	FEA	Ensure standardised and straightforward process are in place for grid connected approvals
Independent industry participant	Installers	Need to be provided with standardised processes for connection. Need to provide warranties and O&M schedules

3.2.2. Recommendation 2: Residential PV feed-in tariff trial

Description

This trial is currently being conducted by the FDOE. It involves the installation of either 1.2kW or 2.4kW PV systems at no cost to the household. Although it is referred to in the Legislative Gap Analysis report as the 'net metering trial', the systems will in fact be gross metered and net billed. This trial should be seen as quite separate to the above recommendation for an eventual gross

feed-in tariff for all distributed generation. Nevertheless, useful lessons will be learned in the trial, which may inform details of any widespread feed-in tariff program to be introduced.

Parties Involved in Design, Implementation and Evaluation

The FDOE has taken on the Governance role by designing the trial, and is also the Administrator because it is implementing the trial. The FEA is the Regulated industry participant and PV installers will be the Competitive industry participants. With the FDOE taking on both the Governance and Administrator roles, it is very important that the feed-in tariff is evaluated by a third party. This could be undertaken by the proposed FDOE-Reg or could be outsourced to a private evaluator overseen by the FDOE-Reg. The responsibilities for each party are discussed below and summarised in Table 5.

Evaluation Process

Effectiveness

A trial such as this has many potential benefits and the criteria used to assess its effectiveness reflect this:

1. How many systems were deployed, and how many of each size?
2. Was information distributed to the households taking part, describing what to expect, how the technology works, costs, performance, lifetimes, general maintenance aspects, and who to call in case of concerns?
3. Was a streamlined grid-connection application process and agreement with the FEA developed?
4. Was a streamlined installation process developed, that follows agreed standards and can significantly decrease installation costs, and was it shared with other installers?
5. Were data collected that can lead to a better understanding of the financial and technical impacts of distributed small-scale PV systems?

Efficiency

An efficiency assessment should separate the electricity generation costs from the administration costs. As for the gross feed-in tariff recommendation, an assessment of the efficiency of the feed-in tariff itself (not the trial), should be undertaken by the CC.

The administrative efficiency of trials such as this is difficult to assess because of the wide range of potential outcomes. Simple measures of efficiency include the administration costs per system installed and per total kW installed. Of course, the administration costs (which in this case will include the system costs) should be minimised as much as possible, but not to the point where the outcomes described above are jeopardised.

Equity

Similarly, the equity impacts of such a trial are difficult to assess. An unavoidable feature of such trials is that they only directly benefit the chosen households. As for the gross feed-in tariff recommendation above, people who don't own their own house can also be disadvantaged, as can those who own their house but don't have suitable roof space and good solar access. However despite these issues, such a trial should enable an improvement in equity by making net billing available to residential customers more generally. It can also be evaluated against diesel savings made by FEA, with environmental and economic benefits accruing to the whole population.

Administration

Being a trial, it will have high administration costs. It should ideally result in a streamlined grid-connection and billing process for future more widespread roll-out, which would then have lower administration costs, based on simple standardised connection agreements.

Table 5: Summary of Responsibilities for Feed-in Tariff Trials

Role	Responsible party	Comment
Governance (design)	FDOE	Already occurring
Administrator (implementation)	FDOE	Overlap between Governance and Administration which makes it even more important to have an independent regulator
Regulator (evaluation)	FDOE-Reg or 3rd Party overseen by FDOE-Reg	Important this be independent because of FDOE's roles in Governance and Administration. • System numbers and sizes • Information provided to households • Streamlined approval and connection processes • System monitoring and performance data collection • Network impacts
Regulated industry participant	FEA	Ensure standardised and straightforward process are in place for grid connected approvals
Independent industry participant	Installers	Need to be provided with standardised processes for connection.

		Need to provide warranties and O&M schedules

3.2.3. Recommendation 3: A Solar Schools Program

Description

PV systems have been installed on Fijian schools in the past, with the most recent being through the It's Time Foundation.[9] A Solar Schools program would formalise and coordinate the roll out of such systems to all schools. Solar systems at schools can be installed with a descriptive live data interface that allows school children to understand how and when electricity is being produced. This can be combined with relevant curricula material from kindergarten through high school and serve as a valuable means of increasing familiarity, knowledge and acceptance of the technologies, which can be carried into later life. Although other renewable energy technologies could be used, it is likely that using just one technology that is suitable for any location would simplify program administration. We have therefore chosen PV as the technology likely to be most suitable for widespread roll-out.

Installations at Solar Schools can be funded through a capital grant, in combination with the gross feed-in tariff described above. Given that the size of grid-connected system that would be installed at a school would most likely be financially viable, the capital grant could also go towards the development of educational materials, including the descriptive live data interface. Depending on the size of the capital grant, any income from the feed-in tariff (above that required to pay off the system) can be split: with some going to the school for on-going O&M costs and some being rolled back into the Solar Schools program to support more PV installations.

Parties Involved in Design, Implementation and Evaluation

Around F$2.4 million for equipment, etc was provided by EU. The Ministry of Education has had experience with Solar Schools through a program funded by the EU that targeted disadvantaged schools. Thus, the Ministry of Education, Heritage & the Arts and the FDOE could, in combination, take on the Governance role by designing the program, and the FDOE could be the Administrator and implement the program, in coordination with the Ministry of Education, Heritage & the Arts. FEA and the Schools themselves are the Regulated industry participants and PV installers will be the Competitive industry participants. Because the FDOE is potentially involved in both Governance and Administrator roles, third party evaluation could be undertaken by the FDOE-Reg or could be outsourced to a private consultancy overseen by the FDOE-Reg. The responsibilities for each party are discussed below and summarised in Table 6.

[9] See http://iitime.org/completed-projects/ for seven recently completed projects.

Evaluation Process

Effectiveness

This program is similar to the residential feed-in tariff trial in that it has multiple potential benefits. Thus, a number of different criteria can be used to assess its effectiveness:

1. How many systems were deployed, and how many of each size?
2. Was information distributed to the schools taking part, describing what to expect, how the technology works, costs, performance, lifetimes, general maintenance aspects, and who to call in case of concerns?
3. Was curricula material developed and used by the schools to illustrate the costs and benefits of PV systems?
4. Was a streamlined grid-connection application process and agreement with the FEA developed?
5. Was a streamlined installation process developed, that follows agreed standards and can significantly decrease installation costs, and was it shared with other installers?

Efficiency

Again, an assessment of the efficiency of the feed-in tariff itself (not the Solar Schools program), should be undertaken by the CC. The Solar Schools program will incur administration costs for government and for the FEA. As for the residential feed-in tariff, the administrative efficiency of measures such as this is difficult to assess because of the wide range of potential outcomes. Again, the administration costs for the FEA can be minimised through standardised connection procedures.[10] The simplest ways to assess the efficiency of this measure are according to the administration costs per system installed and per total kW installed.

Equity

It is important that this program does not disproportionately benefit wealthier schools. In fact, as occurred for the EU program mentioned above, it may be better to start the program with less wealthy schools, especially if the schools receive a financial benefit from the PV system. However, it would be unfair for wealthier schools to miss out on this opportunity, mainly because their students deserve to learn about renewable energy in action as much as students from less wealthy schools do. One option is to make the program available to all schools but to start with more disadvantaged schools, then progressively move to others, but allow wealthier schools to enter the program earlier than they would otherwise have been scheduled, if they wish, but under a smaller capital grant.

[10] Additional benefits may accrue to the FEA where PV systems are used to reduce load peaks and where inverters are configured to improve power quality.

Administration

Ideally the administration costs should be covered by the capital grant, at least initially, and possibly over time, by income from the feed-in tariff as the installed cost of PV systems decreases due to a combination of reduced capital and labour costs. Alternatively, as experience is gained by both schools and installers, government involvement will no longer be required, and any excess income from feed-in tariffs can be used for educational materials.

Table 6: Summary of Responsibilities for Solar Schools Program

Role	Responsible party	Comment
Governance (design)	Ministry for Education, Heritage & Arts Input from FDOE	Have experience with earlier Solar Schools programs
Administrator (implementation)	FDOE	Integration of curricula material into study programs will require separate negotiation to system installation processes
Regulator (evaluation)	FDOE-Reg or 3rd Party overseen by FDOE-Reg	• Numbers and sizes • Information provided to schools • Curricula material • Streamlined application processes • Streamlined installation processes
Regulated industry participant	FEA, Public Schools	
Independent industry participant	Installers, Private Schools	

3.2.4. Recommendation 4: Complementary mechanisms

The amount of distributed generation that local grids can readily accept will remain a site-specific issue. Nevertheless, the potential is increasing fast as technology and costs improve, so mechanisms should be in place to encourage appropriate installations and ensure they meet safety and quality standards. In addition to the complementary mechanisms recommended for centralised generation, which would also be useful for distributed generation, other options are listed below. The responsibilities for each of these are indicated in Table 7.

- Supportive grid connection arrangements and streamlined approval processes. Approval processes should include cost and time limits for connections of different sizes.

- Training and accreditation of installers of distributed generation systems.
- Building and planning codes could include targets for renewable energy contributions (this can be solar water heaters, PV and passive solar design)
- Government procurement, for public buildings and facilities. The aim should be to demonstrate a range of technologies, showcase different examples of applications, and publish cost and performance data.
- General provision of reliable, easy to understand information about renewable energy technologies, principles of operation, site selection, installation requirements, accredited installers, approved components and cost-effectiveness.

Table 7: Regulatory Responsibilities for Complementary Mechanisms to Support Renewables in Distribution Grids

Policy mechanisms	Governance (design)	Administration (implementation)	Regulator and Suggested Criteria (evaluation)
Standard grid connection requirements and processes	FEA	FEA	FDOE • Public availability • Ease of implementation • Adequacy of information • Cost of compliance
Training and accreditation	FEA / education institution certification	Public and private training organisations	FDOE • Course availability and price • Numbers of students • Student feedback
Building and Planning Codes	FDOE	Department of Local Government, Housing and Environment	FDOE-Reg
Government Procurement	CC	Finance Ministry (Attorney General's Department)	FDOE-Reg
Information	FDOE	FDOE	FDOE-Reg

3.3. Support for Renewables in Mini-Grids

About 600 community diesel power systems operate around the smaller islands, and have been installed between 1978 and 2013. According to the SE4ALL report, *"There are always a*

significant number of systems that are not functioning and awaiting spare parts and repair. The remote location and the large number of these systems (more than 500) render management and monitoring of these systems challenging. In most communities supply is restricted to a few hours a day (typically between 6 p.m. and 10 p.m.). ……Increasingly, DoE therefore promotes solar solutions for basic rural electrification and communities often choose solar electrification over diesel" (Government of Fiji, 2013, p20).

The FDOE is to trial the addition of PV to a small number of existing diesel systems, while the United Arab Emirates is supporting three PV/diesel hybrid systems for Government facilities on Vunisea, Lakeba and Rotuma. Following on from the trials, and incorporating lessons learned, there are several options to encourage other communities to add PV to their power systems, to reduce diesel requirements and/or to increase electricity hours.

3.3.1. Recommendation 1: Payment through capital subsidies and feed-in tariffs

Description

The renewable energy systems could be paid for through a combination of capital subsidies and feed-in tariffs.[11]

Capital subsidies: These are already provided for the diesel power systems, so could also be offered to private investors (including installers), again where this would reduce cross subsidies. Thus, the investor/installer would own the renewable energy system, not the government. The capital subsidies for the renewable energy systems will have to cover any higher upfront costs. This is of course counter-balanced by having zero fuel costs. Aid funding may continue to be needed to fund such subsidies, although SEFP loans could also be used.

Feed-in tariffs: These can be used as proposed for the grid-connected systems described above, to encourage private investment in RE generation, where this would be cost effective and reduce the cross subsidies currently needed for operating diesel systems. However, because the communities themselves are currently responsible for paying for the diesel fuel (that will be saved by the RE system), they should also be responsible for paying the feed-in tariff. The owner of the RE system would need some guarantee that they would be paid, and this could either be through some sort of pre-paid metering system or power purchase agreement with approved metering. Pre-paid meters were used for payments from residential customers provided with Solar Home Systems, but for various reasons, including supply and maintenance difficulties, they have now been abandoned. Alternative payment systems suitable for remote locations are needed, such as those used for mobile phones (which appear to be used widely, even on remote islands). These would help overcome the difficulties faced by some remote households that had to travel long distances to activate their pre-paid Solar Home Systems (Dornan, 2014). Where a mobile-based

[11] Note that this would necessarily be a gross feed-in tariff because the PV system would be feeding directly into the mini-grid.

payment method would not be suitable, previous payment methods, such as at the local post office, could be used as the default fallback option.

The owner of the PV system would also need to be provided with the option of removing the RE system (or disconnecting it from the mini-grid) after a specified period, if it is not being used or paid for to a specified extent. The level of the feed-in tariff would need to be calculated on a system-by-system basis, after taking into account the size of the RE system and the level of the capital subsidy. Nevertheless, if the Fijian government would like people on minigrids and main grids to pay the same amounts for electricity, for reasons of fairness and equity, common rates are most likely to be preferred.

The use of a feed-in tariff would help overcome a previous problem with the Renewable Energy Service Company (RESCO) program for Solar Home Systems, which was that the RESCOs were paid for maintenance regardless of whether or not the end-user paid their monthly fee – removing the commercial incentive for the RESCO to ensure that the systems functioned well (Dornan, 2014). With the model proposed here, the RESCO is only paid for the electricity the system produces, and the end-user only gets electricity if they pay for it.

The feed-in tariff could be set to at least cover the avoided fuel costs and the maintenance costs, with the capital subsidy set at such a level that the feed-in tariff results in, for example, a 5 year payback period. A system that was used only to reduce diesel use, and so had no batteries, would have lower up-front costs and maintenance costs, and so would likely require a lower capital subsidy and feed-in tariff. Of course, larger RE systems could require batteries to control their impact on the diesel generator ramp rate, however they would generally have a much lower capacity than the batteries needed for the system to operate for extended periods of time without any diesel backup.

Parties Involved in Design, Implementation and Evaluation

The FDOE has experience in the diesel and PV systems on minigrids and so is best placed to take on the Governance role and design the program. For the same reason it would also be the Administrator and implement the scheme. As for the residential feed-in tariff trial, with the FDOE taking on both the Governance and Administrator roles, it is very important that the program is evaluated by a third party. This could be undertaken by the FDOE-Reg or could be outsourced to a private consultancy overseen by the FDOE-Reg. The responsibilities for each party are discussed below and summarised in Table 8.

Evaluation Process

Effectiveness

The effectiveness of such a measure can be evaluated a number of different ways:

1. The number of renewable energy systems deployed.

2. The capacity of renewable energy systems deployed – compared to both the capacity of the diesel systems they are connected to and the total capacity of all diesel minigrids.
3. The annual generation and consequent reduction in diesel use.
4. Improvements in generation reliability and hours available
5. Higher customer number and or payments.

An evaluation of the effectiveness of this program should include an assessment of end-user satisfaction with the systems. These have been carried out in the past (eg. Dornan (2011) surveyed households on Vanua Levu in 2009), and can provide very useful information on how happy the end-users are with aspects such as system characteristics (eg. size), operation and maintenance, and suitability for the required services and cost.

Efficiency

An assessment of the efficiency of this program should separate the government's administration costs from the generation costs. The efficiency of the administration costs can readily be calculated by comparing them to the effectiveness metrics identified above.

The efficiency of the generation costs can most usefully be calculated for each system using the Levelised Cost of Electricity (LCOE) for each system and comparing it to the LCOE of diesel generation alone, noting that extra running hours may have been added. The LCOE calculation should be carried out both including and excluding the value of any capital subsidies. Efficiency can also be calculated according to the levelised cost of the reduction in fuel use. Equivalent calculations can be performed for the average of all RE systems installed under this program.

Equity

This program should improve equity by making cheaper electricity available to people on diesel grids for longer periods of time. Thus, the equity impacts can be measured by (i) the number of systems that are installed, (ii) the reduction in LCOE, and how close it comes to the tariff paid by customers on FEA's grids and (iii) improved electricity services, including reliability and number of hours available. Note that the capital subsidy, and current equivalent subsidies, such as those for Solar Home Systems, are not means tested, however it is likely that this would add further complication to a program that is already quite complicated.

Administration

This program could be quite complex to administer, depending on how it is designed, especially if funding is derived from a number of different sources (eg. capital component from aid or SEFP, and feed-in tariffs paid by users) – and this will be reflected in the efficiency assessment above. However, as experience is gained and streamlined processes are put in place, administration costs should decline. Ideally, the investor/installer would be responsible for collecting the feed-in

tariff payments from the end-users. Over time, it may even be possible for installers to apply for SEFP funding themselves. This would reduce government administration requirements to the development of standardised processes and occasional evaluation of the operations of the installers.

Table 8: Summary of Responsibilities for Renewables in Minigrids

Role	Responsible party	Comment
Governance (design)	FDOE	
Administrator (implementation)	FDOE	Overlap between Governance and Administration which makes it even more important to have an independent regulator
Regulator (evaluation)	FDOE-Reg or 3rd Party overseen by FDOE-Reg	• System numbers and sizes • Annual generation and reduction in diesel use • End-user satisfaction • LCOE
Regulated industry participant		
Independent industry participant	Installers	Need to be provided with standardised processes for connection to minigrids. Need to provide warranties and O&M schedules

3.3.2. Recommendation 2: Solar Schools

Description

Schools connected to mini-grids could be provided with a PV/battery system through the Solar Schools program discussed under the 'Distributed Generation' options above. Indeed, all the PV systems installed through the It's Time Foundation referred to above were for schools not connected to the main grid.

The 'Parties Involved in Design, Implementation and Evaluation' and the 'Evaluation Process' are the same as for the grid-connected Solar Schools program.

3.3.3. Recommendation 3: Complementary mechanisms

The complementary mechanisms are the same as for the renewable energy on distribution grids. In addition, the effectiveness of this approach should be monitored and evaluated at regular intervals to ascertain performance, long-term costs and issues arising.

3.4. Support for Renewables in Off-Grid Power Systems

3.4.1. Recommendation 1: Improvements to SHSs installed by RESCOs

Description

The current program for deployment of stand-alone Solar Home Systems (SHSs), which is delivered via Renewable Energy Service Companies (RESCOs), seems to be working reasonably well, with recommendations from previous evaluations (UNDP, 2010) having been implemented.

Originally customers received a 100W PV/battery system and paid $FJD50 up front and $FJD14/month for maintenance. Customers are now receiving a 270W PV/battery system that provides DC power as well as AC through a 300 W inverter. The FDOE retains ownership of all systems. For these larger systems the customer pays $FJD198 up front and $FJD18/month for maintenance (the first month is free and 5 months maintenance is included in the $FJD198).

Typically fees are collected by a nominated person and paid to the FDOE revenue collector when they visit. Maintenance checks are carried out every 3 months, with bulbs, components and performance assessed. Batteries are replaced on the next visit if their performance has deteriorated. Battery life is typically 18 months to 4 years and old batteries are returned to Suva for recycling.

RESCO contracts are awarded after a competitive bidding process every two years and thus are considered to provide an efficient service. The requirement for a customer contribution to the capital cost of the system encourages ‘buy-in’ by the people who benefit from the system, as does the monthly payment for maintenance.

However, there are three improvements that could be made, based on experience to date: (i) the option of larger systems, (ii) maintenance payments should be increased, and (iii) better payment options should be developed.

(i) Larger systems

It seems that some people would like larger systems and so these should be made available, possibly simply as multiples of the current 270W systems, to facilitate component standardisation and bulk purchase. People should also be given the option of larger batteries so that the batteries aren’t cycled so deeply and last longer. Whether or not existing cross-subsidies should be extended to larger systems will need to be considered by the Government. Regardless,

maintenance fees would need to be increased for these larger systems to cover the cost of replacement parts.

(ii) Higher maintenance payments

Payments for maintenance are likely to be too low over the long term to cover the long-term costs of routine inspection, repair and battery replacement. This is mostly due to high costs of transport to the islands and the relatively low battery life currently experienced (average 3 years, rather than the 7 usually anticipated, probably because of very deep cycling)[12]. The FDOE needs to compare the actual costs of maintenance with the revenue collected and adjust as necessary.

(iii) Improved maintenance and payment options

Another issue raised was the need for better payment options, which, as discussed for mini-grids, could be based on a pre-paid model accessed via mobile phone apps, or linked to other government service provision. The mobile phone app could also be used to notify the system maintainer of the need to bring particular spare parts. Currently, maintainers take some spare parts, such as lights and small components, but not batteries or panels. If they have to identify a problem they notify FDOE and take a replacement next trip. As part of their contract they are not allowed to make special trips, so people have to wait until the next 3 monthly round. Instead, end-users could be provided with a simple diagnostic checklist to identify obvious problems, which they could then send through the phone app to the maintainer – who could then order in any replacement parts and take them on the next scheduled trip.

Consideration should be given to training of one or more locals on each island to undertake routine system inspections and report to the RESCO. In time, they may be trained to undertake routine maintenance and be provided with spare parts. This could significantly reduce the need for travel-intensive maintenance trips and also improve customer satisfaction.

In addition, it is possible that as the sector becomes more mature, installers may wish to simply supply SHSs that they own and operate themselves and are paid through a feed-in tariff (much like the proposal above for mini-grid PV systems). Any changes to the current program, such as improved payment options, should bear this in mind. The Government would need to decide how or if subsidies are applied to power supplied by these private providers. These would only be needed if the tariff charged is higher than regulated tariffs applying for main grid-connected customers.

Parties Involved in Design, Implementation and Evaluation

The FDOE has experience in SHSs delivered by RESCOs and so is best placed to take on the Governance role and make design changes to the program. For the same reason it would also be

[12] Note that larger batteries could also be considered. This would add to the up-front costs. More effective, or the addition of, battery regulators can prevent deep cycling, but can be bypassed. The indications are that systems are smaller than actually required.

the Administrator and implement the program. Third party evaluation could be undertaken by the FDOE-Reg or could be outsourced to a private consultancy overseen by the FDOE-Reg. The responsibilities for each party are discussed below and summarised in Table 9.

Evaluation Process

The following discusses the effectiveness, efficiency, equity and administration aspects of the overall SHS program, not just the improvements suggested here.

Effectiveness

The effectiveness of such a measure can be evaluated a number of different ways:

1. The number of renewable energy systems deployed.
2. The capacity of renewable energy systems deployed.
3. The annual generation.
4. The percentage of people with access to electricity for at least 4 hours a day.
5. Number of customers who pay their monthly fee.

As for mini-grids, an evaluation of the effectiveness of this program should include an assessment of end-user satisfaction with the systems.

Efficiency

An assessment of the efficiency of this program should separate the government's administration costs from the generation costs. The efficiency of the administration costs can readily be calculated by comparing them to the effectiveness metrics identified above. The efficiency of the generation costs can most usefully be calculated for each system using the Levelised Cost of Electricity (LCOE) for each system and comparing it to the LCOE of diesel generation, or of the costs of kerosene lamps displaced (hours of light per FJD). Equivalent calculations can be performed for the average of all PV systems installed under this program.

Equity

This program should improve equity by making electricity available to people who otherwise wouldn't have it. Thus, the equity impacts can be measured by (i) the number of systems that are installed, and (ii) comparing the LCOE to the tariff paid by customers on FEA's grids.

Administration

This program is quite complex to administer, and this will be reflected in the efficiency assessment above. However, as experience is gained and streamlined processes are put in place, administration costs should decline. If, over time, the sector develops to the extent where installers do in fact simply supply SHSs that they own and operate themselves, government

administration requirements would be reduced to the development of standardised processes and occasional evaluation of the operations of the installers.

Table 9: Summary of Responsibilities for Renewables in Minigrids

Role	Responsible party	Comment
Governance (design)	FDOE	
Administrator (implementation)	FDOE	Overlap between Governance and Administration which makes it even more important to have an independent regulator
Regulator (evaluation)	FDOE-Reg or 3rd Party overseen by FDOE-Reg	• System numbers and sizes • Annual generation and reduction in diesel use • End-user satisfaction • LCOE
Regulated industry participant		
Independent industry participant	Installers	Need to be provided with standardised processes for connection to minigrids. Need to provide warranties and O&M schedules

3.4.2. Recommendation 2: Solar Schools

Description

Schools that are not connected to any grid could be provided with a PV system through the Solar Schools program discussed above. This could be used to either supplement power from a diesel generator or as a stand-alone system with batteries.

As for the Solar Schools on mini-grids, the 'Parties Involved in Design, Implementation and Evaluation' and the 'Evaluation Process' are the same as for the grid-connected Solar Schools program.

3.4.3. Recommendation 3: Complementary mechanisms

The complementary mechanisms are the same as for renewable energy on mini-grids. More local capacity development for routine system maintenance could be a cost effective means of

overcoming current issues of long lead times for servicing and component replacement, which in turn impacts customers' willingness to pay.

4. CONCLUDING SUMMARY

This report has proposed twelve policy mechanisms or programs to promote the uptake of renewable energy in Fiji. The process of design, implementation and evaluation is critical to the success of these mechanisms. A decision-making framework has been proposed, through which design, implementation and evaluation can occur. For each proposed mechanism or program, the Fijian government departments that should be involved in these processes have been identified.

The report has also identified the need for an independent regulatory body capable of evaluating the design and implementation of these mechanisms and programs. The evaluation should take into consideration their effectiveness, efficiency, equity and administrative impacts. The criteria for evaluating these impacts for each of the proposed mechanisms have been identified. A range of complementary mechanisms is also required, and these have been identified, as have the relevant government departments and criteria for assessment.

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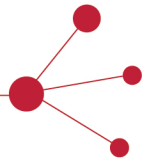

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