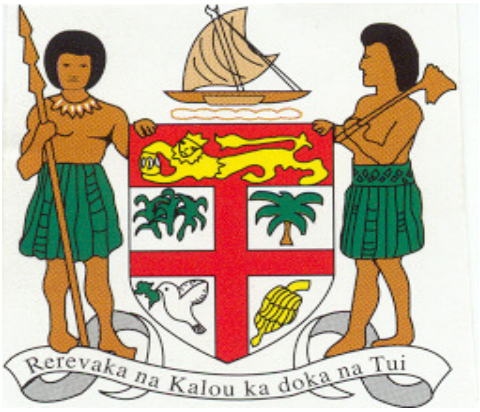

Review of the Fiji National Energy Policy

Status of Implementation of the 2006 Energy Policy and Strategic Action Plan and Mainstreaming into National Planning

Final Report

July 2013

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Department of Transport
Ministry of Strategic Planning, National Development and Statistics
Ministry of Foreign Affairs – Climate Change Unit
Reserve Bank of Fiji
German Technical Cooperation (GIZ)
United Nations Development Programme

The energy policy review process was supported by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (German Technical Cooperation) and the Secretariat of the Pacific Community (SPC) through the Coping with Climate Change in the Pacific Island Region (CCCPIR) programme, and by the United Nations Development Programme (UNDP) Pacific Centre.

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Executive summary

Guided by the *Roadmap for Democracy and Sustainable Socio - Economic Development* and the *2006 National Energy Policy*, Fiji has made significant progress over the last six years in the area of access to modern energy and in increasing the share of renewable energy sources in electricity generation. In view of these developments, the Government of Fiji has decided to undertake a review of the National Energy Policy (NEP) and the accompanying Strategic Action Plan. Support for this review is being provided from the German Technical Cooperation (GIZ) through the Coping with Climate Change in the Pacific Island Region (CCCPIR) programme, which is jointly implemented by the Secretariat of the Pacific Community (SPC) and GIZ. The United Nations Development Programme (UNDP) also provides support for the review.

The NEP review provides an excellent opportunity for Fiji to update national energy targets and strengthen its institutional and legislative framework in order to improve implementation of the policy. This is also an opportunity for Fiji to align itself with the United Nations Sustainable Energy For All (SE4ALL) objectives: 1) to ensure universal access to modern energy services; 2) to double the global rate of improvement in energy efficiency; and 3) to double the share of renewable energy in the global energy mix.

This implementation status and mainstreaming report is a key piece of preparatory work that will underpin the drafting of a new energy policy. The objective of this report is to assess the extent to which the existing NEP and Strategic Action Plan have been implemented and incorporated into other policies, plans, and processes. The report also provides recommendations on how the new energy policy can be mainstreamed more effectively.

Energy policy and planning

The 2006 NEP foresaw a significant institutional restructuring of planning and regulation in the energy sector. In particular, it foresaw new legislation (an Energy Act) that would empower the Department of Energy (DoE) to become Fiji's central policy-making and planning entity for the energy sector. Unfortunately, no such legislation was developed and the energy sector continues to lack a single coordinating entity. DoE remains largely focused on detailed implementation in specific areas, in particular energy efficiency and rural electrification, rather than focusing on sector-wide planning and regulation which have greater potential to bring about change and development in the sector.

DoE's ability to carry out policy and planning of the energy sector is also constrained by limited financial and human resources. DoE has made several attempts in the past to change its staffing structure in order to reflect higher-level sector planning and policy work but the proposed changes were not approved by the Public Service Commission.

Effective sharing and management of energy information is another serious challenge to improving energy planning. The culture of restrictive information still prevails. Numerous recent energy sector studies in Fiji and the wider Pacific region have identified the poor quality of national and regional energy sector data as an important factor in limiting

opportunities for policy, planning, rational decision-making and future performance improvement.

Key recommendations:

- DoE appears to be the most relevant entity to be given a clear legal **mandate in a planning, regulation, coordination, and monitoring** role with respect to energy policy. All technical and planning regulatory functions held by FEA, such as preparing nation-wide development plans, developing IPP policies, and licensing would need to be re-allocated to DoE. The Commerce Commission should continue to be responsible for the implementation of economic regulation (i.e. pricing and competition regulation).

- DoE should not be expected to combine a high-level policy and planning remit with responsibility for detailed implementation – such as delivering operational subsidies, installation of equipment etc. Transforming DoE into a planning and regulation unit would require **adequate resourcing for these new functions and a gradual re-allocation of those functions that do not fit with the new remit** to other public and private sector entities.

- There needs to be some form of **overarching inter-departmental committee** which has responsibility for overseeing the implementation of the NEP. This will ensure effective cooperation between DoE and other Government departments and agencies, in particular the Department of Transport.

- All relevant energy resource information, feasibility studies and project **data needs to be openly shared and managed** in order to improve energy planning and to attract reputable private sector developers to Fiji's energy sector.

Grid-based power supply

The power sector in Fiji has been performing relatively well in comparison with other utilities in the region. It has the potential to continue transforming Fiji's entire energy sector into a more sustainable, environmentally friendly operation while providing greater energy security and independence.

The cost of imported fossil fuel for power generation is currently around 100 million FJD per annum. Much of this could be avoided if Fiji can fully utilise its renewable resources, for example in the form of geothermal, hydro, and solar. Resource assessments are needed to fully understand this potential. Fiji Electricity Authority (FEA) has adopted a goal of at least 90% of electricity generation to be renewable based by 2015 (which follows from the NEP 2006 goal of achieving 50% renewable energy). The total investment this requires (estimated to be in the order of FJD 1.5 bn) cannot be financed in the public sector alone and requires the mobilisation of private capital in the form of IPP developments.

Unfortunately, despite the fact that numerous prospective private investors have come and gone over the last twenty years, the only non-FEA generation of electricity which is connected into the national grid is a seasonal side-product from two state-owned enterprises, the Fiji Sugar Corporation (FSC) and Tropik Wood. During the same period, not a single sole-purpose privately owned IPP project has come to fruition. There is an urgent need to

address issues such as access to information, access to capital and improvement of the general business climate.

Fiji's failure to attract private capital in the electricity sector is related to the institutional challenges described above (under energy policy and planning). FEA has been in operation for decades as a State-owned Enterprise without effective regulatory oversight and hence has determined the conditions for potential private participants, which may not always been in accordance with good economic principles (for example tariffs offered by FEA are not sufficient to IPPs and the selection of new generation projects is opaque).

Key recommendations:

- An **IPP framework** needs to be developed that includes benchmark prices for each FEA grid based on avoided cost, clear procurement rules for IPP projects, and standardised contracts.

- The regulatory framework for FEA needs to be strengthened, particularly if FEA is to be partially privatised. The manner in which electricity tariffs are set is not transparent. A formal **regulatory contract** which is published, includes investment plans, and is supervised by the Commerce Commission would make regulation more robust, as well as give FEA certainty over future cost recovery.

- The **electrification obligation on FEA** should be made explicit, including making it conditional on economic viability and accompanying it with clear rules on subsidies so that FEA is not left financially disadvantaged.

- There should be a requirement for a **comprehensive Power Development Plan (PDP)** that is updated on an annual or biannual basis and reviewed by a planning and regulatory authority and builds on the present PDP developed by FEA.

- A **grid asset management plan** should be prepared detailing the operation and maintenance programme and costs for managing the grid and associated generation. This plan should be regularly updated and reviewed by a planning and regulatory authority.

- A clearly defined framework should be put in place for **connecting small scale renewables** and decentralised generation to the grid.

Rural electrification and access to electricity

The 2006 NEP set a target of 85% having access to electricity in rural areas by 2011. Data from the census in 2007/08 showed that approximately 81% had access, and there have been significant efforts by DoE and FEA under the Government funded rural electrification programme since then. This reflects a good improvement over the last decade (rural electrification was approximately 69% in 2003) but rural access is still significantly less than the 96% of the urban population with access.

There are question marks around the sustainability of the Government funded rural electrification schemes – community operated models often lead to deteriorated and

inoperable diesel or micro-hydro systems, while the maintenance of solar home systems is heavily subsidised on an ad-hoc basis by the Government (through DoE). Many countries in the Asia-Pacific region are now putting more emphasis on grid-based electrification, with subsidies directed at this rather than other delivery models, except in cases of truly remote communities.

It seems that DoE is the likely candidate to continue managing the implementation of remote systems, although it should focus more on procurement and monitoring (for example procuring private contractors for installation and servicing) rather than hands-on implementation.

Key recommendations:

- A national **electrification master plan** should be developed that shows how each un-electrified area should be served (FEA grid extension, diesel based mini-grid, solar home systems, etc.).
- A framework for providing **on-going operational subsidies** for rural electrification (such as an Electrification Fund) needs to be defined and adequate funding secured.
- The different **delivery models** for isolated systems (including RESCO and community-operated models) need to be reviewed and consolidated to take account of sustainability concerns and new available technologies.

Renewable energy

Arguably one of the areas where energy policy in Fiji can have the greatest impact is in encouraging the research and development of renewable energy resources, in particular the development of large-scale hydro, wind, and potentially geothermal sites for the use of grid-based power generation. Fiji is well endowed with a variety of renewable energies and development of these should be encouraged where these are the least-cost means of supply.

Achieving the stated 2006 NEP goal of 50% renewables in the energy sector by 2015 implies that renewable energy will need to represent approaching 90% of electricity generation (given the small contribution from transport). The likelihood of achieving this goal is constrained by the difficulties facing private investors (see above) and limited data on resource potential, although FEA has laid out plans for achieving this goal in its Power Development Plan to 2020 .

Key recommendations:

- Renewables should be encouraged where these are the least-cost means of supply. This requires a **comprehensive assessment of the resources and different technologies** using up-to-date costs and then measures to overcome barriers. This assessment should be an on-going process.
- Lack of access to resource data has been a strong impediment to private sector project development in the past and there should be a requirement that **all resource information be published**.

- **Incentives frameworks** for small scale renewable generators, including embedded generation need to be developed (as above under grid-based power supply).

Transport

The transport sector is the main user of imported fuel. The NEP 2006 stated that 30% of transport fuel should be from alternative sources such as Liquified Petroleum Gas (LPG) and bio-fuels by 2010. This has not been achieved and as at 2012 only 4.4% of land transport uses alternative sources.

The Government has introduced a number of incentives to import more efficient vehicles for public and private land transport. These measures will have quantifiable long term impacts and should be monitored carefully, particularly with respect to the future use of electric vehicles, although this depends on grid-based electricity being from renewable sources or there is no true move away from dependency on petroleum products.

Key recommendations:

- At present the Department of Transport is developing a **new transport policy** for Fiji. The new energy policy should set out broad themes for energy in the transport sector, such that they can be further developed in the transport policy.

- Improving **vehicle standards**, providing incentives to import **fuel-efficient vehicles**, improving **road conditions**, and improving **congestion management** have been identified as the key focus areas for improving the efficiency of the transport sector, particularly with respect to land transport where the most gains can be made.

Petroleum

While there is general agreement on the desirability of reducing the volume and cost of imported petroleum products, the potential to do so is limited. The 2006 NEP did not specifically focus on petroleum.

There are still however some possible options available to Fiji to try and reduce the cost of imported fuels. Bulk procurement is one option, along the lines of the approach that Samoa has taken. However moving to such an approach would require investment in new storage facilities and would risk damaging Fiji's relationship with the oil companies, so this is not a realistic option for Fiji at the present time. The other option is to review the pricing arrangements for imported fuels. Previous studies have shown that there is significant potential to reduce the final price of fuel by negotiating directly with oil companies and by thoroughly reviewing the price templates they submit.

Key recommendations:

- Launch a thorough **review of the pricing arrangements** for petroleum with a view to reducing the final delivered price.

- ❑ Review the **relative pricing of different imported fuels**, giving consideration to tax rebates for more environmentally friendly fuels such as LPG.

Bio-fuels

The DoE successfully operates a pilot programme of introducing a bio-fuel blend (20% CNO, 80% diesel) as a fuel for rural electrification schemes. In addition, two major feasibility studies in the area of bio-fuels were carried out in 2008 with technical assistance support from the World Bank. The studies conclude that molasses based ethanol production of 10 million litres per annum would be a financially attractive option if all taxes and levies on fuel ethanol were waved. CNO based biodiesel production, however, was not considered financially viable. This shows clearly that the economics of bio-fuel production and use in Fiji need to be carefully analysed. While superficially attractive, experience suggests that many of the claims made for bio-fuel production are unrealistic.

Fiji's outer islands may still represent a niche market situation where an under-utilised resource (coconuts and land) could be used to replace a critical and costly imported commodity (diesel fuel) while generating local employment and revenue.

Key recommendations:

- ❑ Fiji should continue to explore the options for widespread use of bio-fuels, but all recommendations and actions should be **based on rigorous analysis** showing they are cost-benefit positive.

- ❑ The **production of coconut oil** in remote islands as a substitute for imported fuels should continue to be encouraged.

Energy efficiency

Among the options available to contain energy consumption are the improvements of energy supply-side efficiencies by reducing energy losses in the supply chain, and energy demand-side efficiencies achieved through consuming less energy for the same level of service.

In the 2006 NEP the Government commits itself to facilitate greater energy efficiency in the industrial and other sectors. The DoE has established a Demand Side Management (DSM) unit that has focused on appliance labelling for refrigeration technology and the development of training material for an energy efficiency school programme. It has also successfully run public awareness and education campaigns. FEA also maintains a DSM unit.

Despite these various initiatives, there is still no clear quantifiable energy efficiency target across all of the sectors.

Key recommendations:

- ❑ Continue running public **education and awareness** campaigns

- ❑ Evaluate the potential for launching energy efficiency projects in **public buildings** as demonstration projects

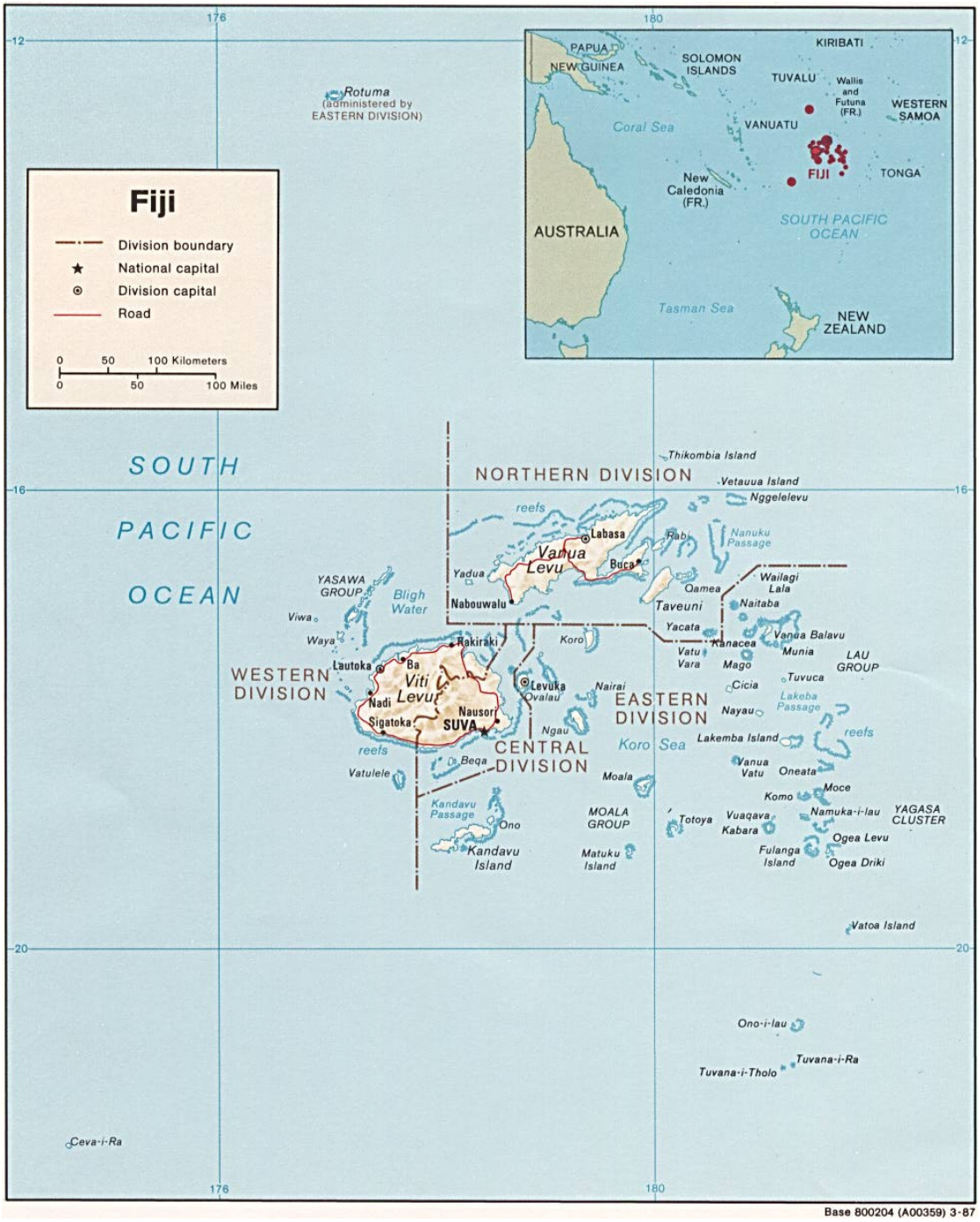
- ❑ Review relevant **codes and standards for building** industry and industrial operations

- ❑ Institute **information systems** so that a verifiable data trail is created and energy savings can be reasonably verified

Abbreviations and acronyms

ACP	Africa Caribbean Pacific Organization
ADB	Asian Development Bank
APEC	Asia Pacific Economic Cooperation
CC	Commerce Commission
CCCPIR	Coping with Climate Change in the Pacific Island Region programme
CROP	Council of Regional Organizations in the Pacific
DoE	Department of Energy
DFI	Development Finance Institution
EC	European Commission
EEZs	Exclusive Economic Zones
EE	Energy Efficiency
EIB	European Investment Bank
EU	European Union
EDF	European Development Fund
FDI	Foreign Direct Investment
FEA	Fiji Electricity Authority
FJD	Fiji Dollar
FREPP	Fiji Renewable Energy Power Project (GEF)
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GIZ	German Agency for International Cooperation
GIS	Geographical Information System
IPP	Independent Power Producer (private single purpose investor)
PSD	Private Sector Development
NEP	National Energy Policy
NEF	National Energy Forum
PPA	Pacific Power Association, Power Purchase Agreement
PIC	Pacific Island Country
PPI	Private Participation in Infrastructure
PPP	Public Private Partnership
PCCPP	Peoples Charter for Change, Peace and Progress
PSD	Private Sector Development
RBF	Reserve Bank of Fiji
RE	Renewable Energy
RESCO	Renewable Energy Service Company
RDSSED	Roadmap for Democracy and Sustainable Socio - Economic Development
SAIDI	System Average Outage Duration
SAIFI	System Average Interruption Frequency Index
SOE	State Owned Enterprise
SE4ALL	Sustainable Energy for ALL (UN Initiative)
SPC	Secretariat of the Pacific Community
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
TA	Technical Assistance
WB	World Bank

Map of Fiji


Fiji
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SOLOMON ISLANDS
KIRIBATI
TUVALU
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WESTERN SAMOA
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TONGA
New Caledonia (FR.)
AUSTRALIA
SOUTH PACIFIC OCEAN
Tasman Sea
NEW ZEALAND
Rotuma (administered by EASTERN DIVISION)
SOUTH PACIFIC OCEAN
NORTHERN DIVISION
WESTERN DIVISION
EASTERN DIVISION
CENTRAL DIVISION
Thikombia Island
Vetauua Island
Nggelelevu
Labasa
Rabi
Nanuku Passage
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Yadua
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Wailagi
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YASAWA GROUP
Bligh Water
Nabouwalu
Taveuni
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1 Introduction

1.1 Background to Fiji energy policy

In November 2006, the Fiji Government endorsed its first National Energy Policy (NEP) and associated Strategic Action Plan, which has since guided the work of the Department of Energy (DoE) and the development of the energy sector. The stated objectives of this policy were:

- Strengthen the capacity for energy planning through appropriate policy, regulatory and implementation frameworks and effective and efficient management
- Enhance energy security through greater participation and collaboration within the industry
- Increase access to affordable and reliable electricity services
- Research, promotion and utilisation of renewable energy applications.

Under each stated objective, a policy framework describes the strategic moves the Fiji Government intended to make in order to develop and expand the country's energy sector. The policy was accompanied by a detailed Strategic Action Plan that listed numerous activities all geared towards achieving the above objectives. While a preliminary review of this plan reveals that not all activities were successfully completed, the energy sector in Fiji has seen significant growth in demand for services and infrastructure.

The Roadmap for Democracy and Sustainable Socio - Economic Development (RDSSED) 2009– 2014 which is aligned to the Peoples Charter for Change, Peace and Progress (PCCPP) sets out a framework to achieve sustainable democracy, good and just governance, socio-economic development and national unity. The key foundation of the Roadmap is the PCCPP, which was compiled through a nationwide consultation process, involving a wide range of stakeholders. The objective of the Roadmap is to implement policies to achieve the Vision of "A Better Fiji for All", which is consistent with the Peoples Charter. To achieve this vision, the overarching objective is to rebuild Fiji into a non-racial, culturally vibrant and united, well-governed, truly democratic nation that seeks progress and prosperity through merit-based equality of opportunity and peace.

In the Roadmap, the Fiji Government sets the energy sector goal as "To facilitate the development of a resource-efficient, cost effective and environmentally – sustainable energy sector".

In view of the developments in the six years since the formulation of Fiji's first energy policy and noting the objectives set this year by the United Nations Sustainable Energy for All (SE4ALL) initiative[1], the Government of Fiji has decided to undertake a review of the national energy policy and the accompanying Strategic Action Plan. Support for this review from the German Technical Cooperation (GIZ) is being provided through the Coping with Climate Change in the Pacific Island Region (CCCPIR) programme, which is jointly implemented, by the Secretariat for the Pacific Community (SPC) and GIZ. The United Nations Development Programme (UNDP) also provides support for the review.

In addition to drafting the new energy policy and Strategic Action Plan, the review includes:

- An implementation status and mainstreaming analysis (this report);
- A rapid assessment and gap analysis exercise to establish the baseline for the three objectives of SE4ALL for Fiji and to identify gaps and support needed; and
- An analysis of the existing legislative framework and recommendations for any possible legislative changes to facilitate the future development of the energy sector for the benefit of the nation.

1.2 Rationale for policy review

The impact of high and volatile fuel prices on Fiji's macro-economy is significant. The need to reduce reliance on imported fuels and thus safeguard foreign reserves is considered key in ensuring macro-economic stability for Fiji. Against this background, the Reserve Bank of Fiji (RBF) and the DoE are looking to continue and grow partnerships with key stakeholders in efforts towards a more sustainable and efficient energy sector in Fiji. In order for Fiji's energy sector to become sustainable, significant investments need to be made within the next ten years and the Fiji Government believes that a significant part of the required funding can be mobilised from private sector sources.

In many countries the power and energy sectors, in particular the renewable energy segment, have produced remarkable successes in private sector participation supported by feed-in laws and independent power producers to energy efficiency services. As Governments retreat from their previous role as owner and operator of infrastructure facilities, new emphasis is placed on their ability to establish sustainable regulatory arrangements that carry credibility with investors and protect consumers at the same time. The challenges to create effective enabling

[1]The three of objectives of SE4ALL by 2030 are: 1) Ensuring universal access to modern energy services; 2) Doubling the global rate of improvement in energy efficiency; and, 3) Doubling the share of renewable energy in the global energy mix.

environments for private sector participation and regulatory institutions are significant for most Pacific Island countries including Fiji. Besides effective regulatory regimes, the availability of adequate financial and human resources and market size and its characteristics are key factors influencing the implementation of reforms and the sustainability of private sector investment.

Key reasons for the review arise from the need to address the following:

1. To improve overall reliability, security of supply and quality of energy services, as well as reducing import expenditures for fuel and continuing work on accessibility;

2. To strengthen the regulatory framework in the energy sector;

3. To update national targets and discuss if there is a need for revised and/or new targets, with due regard given to the objectives set by the SE4ALL initiative; and

4. To strengthen implementation of policy including improved coordination between stakeholders and mainstreaming energy across sectors.

1.3 Scope of the policy review

Against the background described above, the Fiji Government has commissioned a policy review which will consider, amongst others, promoting reforms in macroeconomic policy, improved legislation, adequate institutional arrangements and efficient financial measures related to the enabling environment for public and private investments in sustainable energy in Fiji. The scope of the assignment is as follows:

1. To review the current energy policy and where necessary propose a revised or new energy policy.

2. To prepare a revised Strategic Action Plan component, formulated to align with existing Government of Fiji planning and monitoring frameworks.

3. To establish the baseline for the three objectives of SE4ALL in Fiji and to identify gaps and support needed through a rapid assessment and gap analysis.

4. To review the existing legislative framework including identification of necessary changes or additional legislation(s) needed to implement the revised or new energy policy.

1.4 Scope of the mainstreaming analysis

The Terms of Reference (ToR) requires assessing the status of mainstreaming the 2006 energy policy and Strategic Action Plan at the national and local levels, including the level of integration into key Government planning and budgetary processes. The assessment should cover mainstreaming of the existing energy policy within main Government ministries and agencies and also key organizations outside Government in the private sector and civil society.

The analysis provided in this report assesses the main linkages and key gaps between the existing energy policy and Strategic Action Plan and the incorporation of these into other policies and plans and into implementation practices and processes. This mainstreaming report also includes recommendations on how gaps can be addressed and how mainstreaming of energy policy within and outside Government can be improved.

1.5 Methodology

The action items identified in the 2006 NEP were separated into the following areas:

1. Energy planning
2. Power supply – grid based
3. Power supply – rural electrification
4. Renewable energy
5. Transport
6. Petroleum
7. Bio-fuels
8. Energy efficiency

The 2006 NEP was organised around the four themes of planning, energy security, power sector and renewable energies, which led to some overlap in coverage. For example, the petroleum sector is covered under energy security but is also an issue in power generation. The organisation of the report into the eight topics above is intended to help clarify the discussion of mainstreaming in this report.

This report has been compiled with full consultation and participation of key actors (private sector, public institutions, NGOs, financial institutions, development partners, civil society representatives) within the relevant sectors. A key event was the National Energy Forum (NEF), hosted by DoE in partnership with the RBF on the 3rd and 4th April, 2013 at the Holiday Inn, in Suva, Fiji.

The NEF attracted representatives from a considerable variety of public, private and civil society organizations and development partners. The Prime Minister opened the event signalling high level support for the policy review. In total, 106 people attended the Forum using the capacity of the venue to its absolute limits. The discussions at the Forum were open and sometimes critical. Many participants expressed innovative ideas on how to improve energy sector management, regulation and energy sector performance. Feedback from the NEF has been incorporated into this report (see to Annex 4 for a summary of the discussions). Also important was the subsequent cross-sectoral meeting amongst government ministries, departments and agencies, held on 19th April 2013, the minutes of which are provided in Annex A1.

1.6 Acknowledgements

This report has been compiled by a consulting team comprising: Gerhard Zieroth (Team Leader), Tatiana Tumenggung (Institutional and Legal Specialist), Conrad Holland (Power Sector Specialist), Richard Bramley (Economist), and Herb Wade (Renewable Energy Specialist).

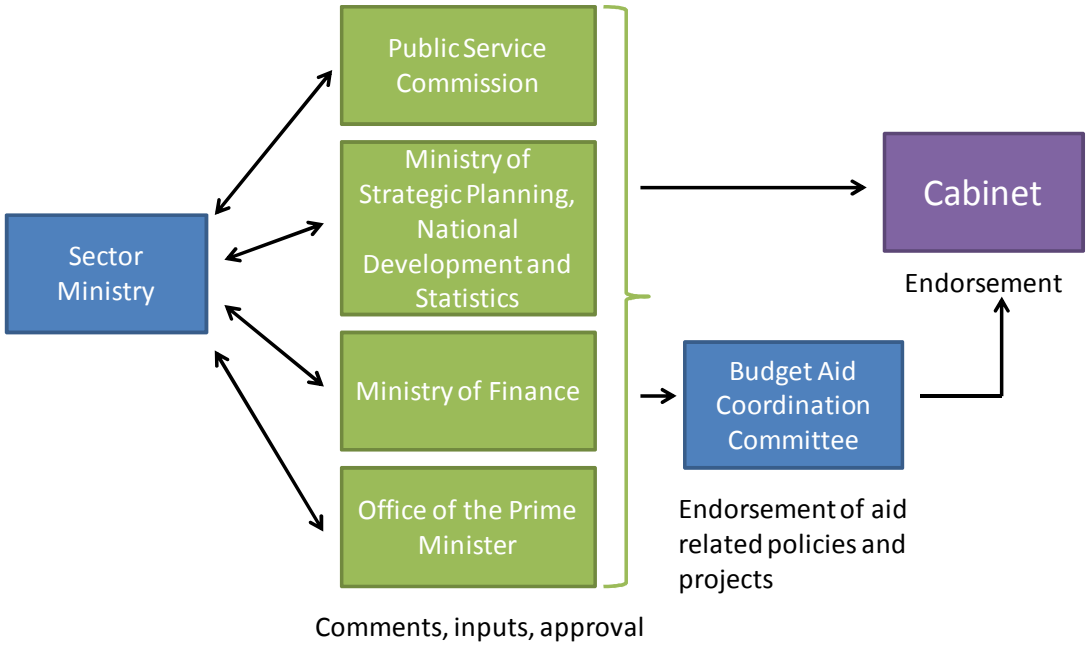
The findings presented here are based on a thorough review of the available documentation and broad consultation with all the relevant stakeholders. The stakeholders have contributed open and productive discussions which have assisted greatly in the preparation of this report. The findings of the report are also based on input from the staff of the DoE and the Ministry of Strategic Planning, National Development and Statistics as well as the inputs of the National Energy Policy Review Advisory Committee.

2 Summary of Government Planning Processes

The framework for turning policies into implemented actions is of critical importance to energy planning. This section of the report summarises current government planning processes with the aim of identifying entry points for mainstreaming of the new energy policy and strategic actions plan.

With regard to policy formulation, polices are currently made at the sector Ministry level and then forwarded to key Ministries in the Fiji Government (PSC, MSPNDS, MoF and Office of the Prime Minister) for comments and inputs. Once comments have been provided and these policies are agreed to by these key Ministries, then a policy is taken to Cabinet for endorsement. All the donor aid related policies and projects are taken to Cabinet after endorsement by the Budget and Aid Coordinating Committee (BACC). This process flow is shown in Figure 1 below.

Figure 1 Policy formulation flow chart



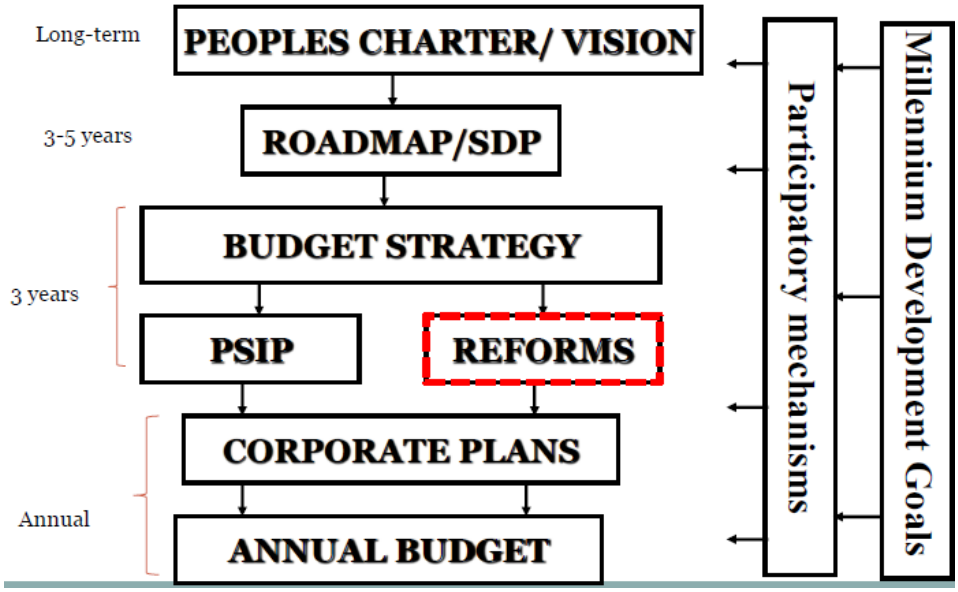
Source: Ministry of Strategic Planning, National Development and Statistics, 2013

The policy framework summarised in Figure 2 below shows the budgetary planning process. The overarching policy document is the People's Charter which sets the long-term policy framework. From that comes the Roadmap for Democracy and Sustainable Socio - Economic Development 2009-2014 (RDSSED) / Strategic Development Plan (SDP) which sets 3 to 5 year framework for overarching policies. The Road Map/SDP is reviewed every three years at which time new government policies and plans, such as the new energy policy, are taken into account.

The Budget Strategy takes account of the current and projected macro-economic situation and provides the macro-economic framework for the budget. The Budget strategy is dovetailed to the policies in the Roadmap/SDP. Reforms, which are

contained in the Roadmap/SDP, are critical for growth and in reaching the National vision. The Public Sector Investment Programme (PSIP) is a pipeline of well developed projects that are in line with Roadmap/SDP policies and provides the important linkages between planning, policy and the budget. The PSIP ensures that projects in the budget are driven by policy priorities. In other words, the PSIP should drive the Government's capital budget.

Figure 2 Policy and budget framework



Source: Ministry of Strategic Planning, National Development and Statistics, 2013

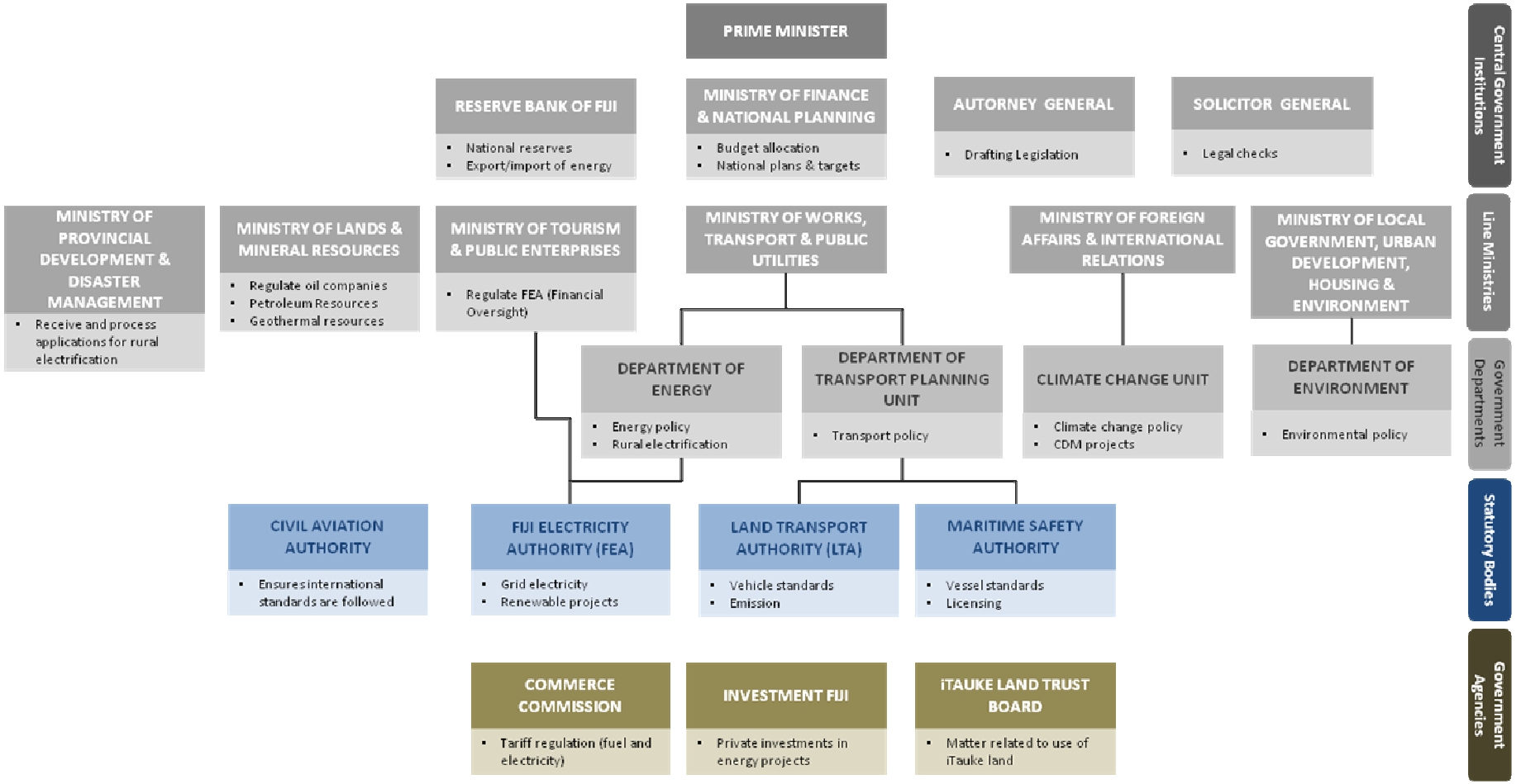
These policy priorities are further disaggregated through Ministries' Corporate Plans, which outline the sector policies/strategies of ministries that are closely aligned to the policies in the Roadmap/SDP. All Government agencies are required to complete Corporate Plans which are updated on an annual basis. These Corporate Plans are driven by the Roadmap/SDP, the reform process and the PSIP pipeline of projects. The Annual Budget is the culmination of these efforts and the policy framework is designed to ensure that the priorities of Government, as described in the Roadmap/SDP, are translated into budget measures in the annual budget and corporate plans and through projects in the PSIP.

The annual corporate plan and budget allocation is likely to be the level where the new strategic action plan can be integrated into the standard planning process. Budget allocation could be made on a yearly basis for the planned activities of the strategic action plan and integrated into the standard planning process through the Ministry Corporate Plan and Annual Budget request.

With regard to Budget, once all projects and programmes are appraised by MSPNDS and MoF, then these are taken to the Cabinet Sub-Committee on Budget (CSB) which then approves the recommendations made by MSPNDS and MoF, after which these are taken to Cabinet for endorsement. All the reforms are monitored by Public Sector Reform Steering Committee (PSRSC).

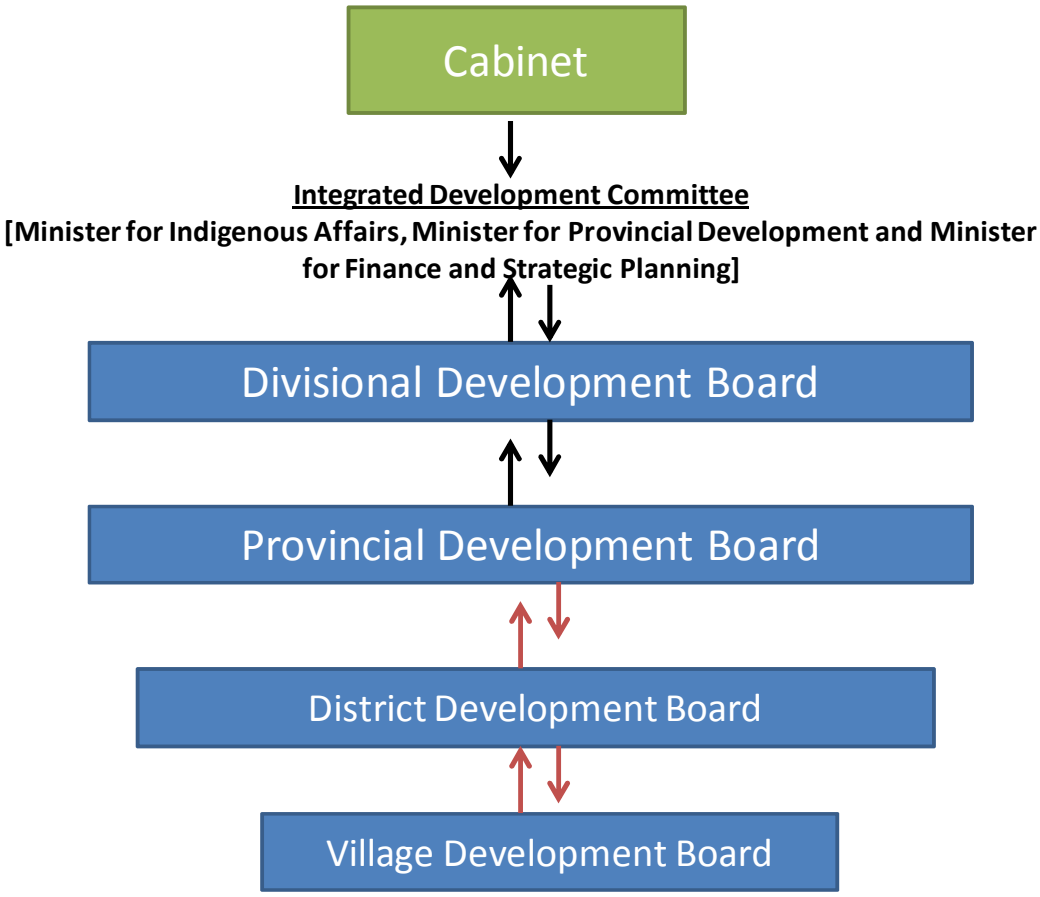
In Figure 3 below an institutional map of the government ministries, departments and agencies which have a significant role in the development of the energy sector is given. This diagram is not exhaustive but captures the main actors and their roles.

Figure 3 Institutional map of the energy sector



Another key element of the planning framework which is relevant for the mainstreaming of the new energy policy and strategic action plan is the link between the national level planning and local level planning and implementation. In this context this report notes the structure of the National Development Board given below in Figure 4.

Figure 4 Development Board Structure



Source: Ministry of Strategic Planning, National Development and Statistics, 2013

In general the Provincial Development Board (PDB) and the Divisional Development Board (DDB) are the forum for planning and consultations on key development issues that affect the Division. These assist the Divisional Commissioner in providing strategic directions of development at the Divisional and Provincial level and hence provide assistance to the Integrated Development Committee and to the Cabinet in providing directions for areas for development at different levels.

For example, the list of identified capital projects (PSIP) for each Province are scrutinized and discussed, initially during the PDB which then follows through the DDB forum where projects are prioritized further and approved for submission to

the National Steering Committee or Integrated Development Committee (NSC/IDC) of the Ministry of Rural & Maritime Development and National Disaster Management. The members of the NSC/IDC consist of the representatives from relevant project implementing agencies and stakeholders and are chaired by the Permanent Secretary for the Ministry. The lists of projects for all the four divisions are finally endorsed at the NSC/IDC forum for onward submission to Ministry of Strategic Planning, National Development & Statistics for inclusion in the PSIP budget process. Note that the Projects are not submitted up to the Cabinet under this process.

Figure 4 shows six levels of consultation and planning starting at the Village level and ending with the Cabinet. The energy policy and strategic action plan will need to be disseminated to each of these levels in the appropriate format and manner and how this will done should be considered at the national level. The aim would be to facilitate rapid mainstreaming and implementation of the different elements of the policy and particularly the strategic action plan at all the different levels.

3 Assessment of implementation and mainstreaming

This section provides an assessment of the status of implementation and mainstreaming of the 2006 NEP and Strategic Action Plan. The analysis was undertaken with inputs from the DoE and the Advisory Committee as well as a wide range of other stakeholders. The section is organised into eight areas, as listed in Section **Error! Reference source not found.**. For each area, the status of implementation of the 2006 NEP and Strategic Action Plan is described and any other policies and developments in the energy sector (existing or new) not captured in the 2006 NEP are documented.

3.1 Energy planning

3.1.1 Status of implementation

In its 2006 NEP document DoE states that '*Government must demonstrate the ability to plan, develop, implement and manage energy sector development plans. It is therefore necessary that Government maintain an energy planning office that is equipped with the right level of resources in terms of staffing and funding. One of the principal functions of the energy planning office will be to ensure that appropriate energy policy issues are effectively addressed through sustainable mechanisms that support and promote Government's social and economic development plans*'.

This in turn led to the formulation of the first strategy under the energy planning theme which would form the basis of all further action: 'Empower the Department of Energy to manage the national energy policy framework'. This was accompanied by strategies to enhance cooperation among ministries and other agencies and communication and consultation with stakeholders.

The status of implementation of these strategies and actions under them is shown in Table 1, overleaf. The general picture is disappointing. While public awareness has been increased, other strategies have only been implemented partially or not at all. In particular, DoE remains under-resourced and does not have the expected central role in developing energy policy. The reason for under-resourcing of DoE must be seen in the context of government's allocation of scarce resources amongst competing departments and sectors. The Ministry of Public Enterprises' central role in the reform of state owned enterprises (SoEs), in particular FEA, seems to be a key constraint on DoE's movement towards a policy development authority.

Table 1 Summary of status – energy planning

	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
Strategy 1.1.1[2]	**Empower the Department of Energy to manage the National energy policy framework**	**No**	**Severe shortcomings exist. DoE lacks specialists in project development, financial and economic analysis and policy. Most of 75 staff are involved in technical operations and contract management for rural electrification schemes that have been outsourced to private sector contractors.**	**Yes**
1.1.1.1	Establish and formalize an appropriate staffing structure for DoE	No	3 submissions made to Public Service Commission over the last five years. No approval received for any of them, mainly because of Government wide freeze on recruitment. (Initial structure was put in place since the inception of the Department. Superficial or reactive changes have been made to the structure with new responsibilities that have been taken on by the department. There is a need to re-look at the roles and responsibilities as well as at remuneration levels.	Yes
1.1.1.2	Develop an institutional training plan for DoE staff	No	There is no funding for training in DoE budget. DoE took up sporadic training opportunities as when offered and funded by donors. There is a small budget provided that needs to be strengthened.	Yes
Strategy 1.2.1	**Develop/review/enforce appropriate frameworks for the energy sector**	**No**	**DoE lacks expertise in legal matters, planning and regulation. It has no authority to enforce any regulation**	**Yes**
1.2.1.1	Develop a National Energy Bill	No	Preliminary discussions were held on the matter with Attorney General's office, but no concrete work.	possibly
1.2.1.2	Review and finalise the draft Renewable Energy Based Rural Electrification Bill	No	No legal expertise in DoE, no budget to hire legal consultants. Preliminary discussions were held on the matter with Attorney General's office.	possibly
1.2.1.3	Review and finalise the Rural Electrification Policy	No	1993 Rural Electrification Policy still in draft format. DoE lacks expertise in policy development. There is also a shortage of staff.	Yes

[2] In this and subsequent implementation tables, the numbering used follows that in the 2006 NEP to allow ready reference.

	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
1.2.1.4	Review the Electricity Act	?	Public Enterprise Ministry commissioned a review of the Electricity Act in 2011, but no information on this review has been made available to DoE. DoE has repeatedly requested the report drafted by the Australian law firm Minter Ellison, but has not received any information.	possibly
1.2.1.5	Introduce legislation for bio-fuel use in industry and automobiles	Yes	Legislation on the introduction of E10 and B5 fuel blends was drafted by AG's office in 2011 but has not yet been decreed as there is no local production of ethanol or biodiesel (vegetable oil esters). This has been gazetted in 2011 but is still implemented on a voluntary basis depending on supply.	possibly
Strategy 1.3.1	**Ensure greater cooperation on energy initiatives with other sectors**	**Partly**	**DoE has a low profile in the Government administration and has had difficulties to engage other stakeholders and to obtain information on key issues such as the reform of FEA. The initiative of the Reserve Bank to hold the National Energy Forum provides an opportunity to form a standing committee of key stakeholders**	**Yes**
1.3.1.1	Convene frequent meetings with other stakeholders to share information	Partly	Permanent Secretary of the ministry is a member of FEA board and the director of energy participates in board meetings on his behalf. Discussions were held with Department of Environment and regional organisations (SPC) There is no regular event where key stakeholders would meet. The department also actively participates in the Government's Integrated Rural Development (IRDP) under the Ministry of ITaukei and Provincial Development.	Yes
1.3.1.2	Collaborate with other sectors to develop and implement technical and project management trainings in communities	Partly	Some training on PV grids performed in cooperation with USP and local solar companies. Shift from diesel systems to PV not yet fully reflected in community training. The maintenance of the SHS systems are outsourced to private companies. However, trainings are undertaken for village technicians to undertake minor maintenance works.With regards to Biofuel, training isprovided to the mill managers prior to and during installation of the mills.	Yes

	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
1.3.1.3	Participate in relevant national, regional and international meetings and commitments	Yes	There is no funding for overseas travel. DoE participated in national, international and regional meetings held in Fiji (Forum Secretariat, SPC etc) but can only travel to meetings outside Fiji when donor funding can be sourced.	Yes
1.3.1.4	Collaborate with local, regional and international energy agencies, research institutions and other sectors to implement energy initiatives	Yes	Partners include USP, FNU, GIZ, IRENA, SPC, SPREP, Forum Secretariat, UNDP/GEF, UNEP, UNESCAP, ASIANA, World Bank and IUCN	Yes
1.3.1.5	Establish a mechanism for sharing of sector specific information (e.g. tourism infrastructure projection).	Partly	Webpage main tool for sharing information. DoE has however no dedicated webmaster who would be responsible to update page regularly. There is no structured database of relevant documents at DoE and data often needs to be derived from other sources such as RBF and the Bureau of Statistics.	Yes
1.3.1.6	Establish a National Energy Advisory Board.	No	No initiative taken prior to the policy review project. There is an opportunity now to carry the momentum of the National Energy Forum forward and convert the energy policy review steering committee into a national advisory committee. The Attorney general's office and the department of environment are candidates to pull in.	Yes
Strategy 1.3.2	**Strengthen public awareness on energy programmes, projects and developments**	**Yes**	**Focal area of DoE activities.**	**Yes**
1.3.2.1	Develop and implement a yearly awareness programme on energy projects and developments	Yes	DoE displays projects at Government referral centre. Brochures and posters have been produced and DoE's webpage is also used to promote awareness The Department currently undertakes awareness campaigns (importance of energy, energy-saver measures,) on different media, TV, radios, newspapers, magazines, brochures/pamphlets, road shows, newsletters etc. Meetings are undertaken with various organisations to showcase the work that the department is doing.	Yes
Strategy 1.4.1	**Ensure an up-to-date and user-friendly system of collection, management and dissemination of energy information.**	**No**	**This is one of the most challenging issues affecting the quality of energy policy and planning. DoE needs a new focus on knowledge and data management.**	

	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
1.4.1.1	Collect energy data on a regular basis	Partly	Aggregate petroleum import data from bureau of statistics, MoU on petroleum data reporting proposed to three oil companies but only one (Total) signed MoU (has however not yet delivered any data). No automatic data sharing with other agencies in the sector.	Yes
1.4.1.2	Maintain an up-to-date energy information database system	No	No activity. SPC energy section has confirmed however, that resources are available to support DoE in database development. The new FREPP project also has a database component.	Yes
1.4.1	Regular update of website	Partly	No dedicated webmaster, updating sporadic, data available on webpage not comprehensive.	Yes
1.4.1.3	Mapping of existing projects and potential sites using GIS	No	GIS would be an ideal management tool for rural electrification projects and resource mapping (wind, solar, hydro, geothermal). However, no GIS expertise in DoE and no software package is available (Mapinfo or Arcinfo). DoE is currently working with SPC to establish a first GIS map.	Yes

SUMMARY

Status	Strategies	Actions
Fulfilled	1	5
Partially fulfilled	1	5
Not fulfilled	3	9
Unknown	--	1

3.1.2 Review and commentary

Development of an Energy Bill

The energy planning theme covers an entire range of strategies and actions that all aim at improving the performance and capabilities of DoE and at strengthening of its institutional roles and responsibilities. The 2006 energy policy considered the establishment of DoE as the main energy planning authority in the country as central to effective energy sector management. One of its first listed activities was the development, enactment or decreeing of legislation (the Energy Act) that would have given DoE statuary mandates to perform planning and energy sector oversight. In this area only preliminary consultations were held with the Attorney General's office. In addition there was a review of the Electricity Act performed by an Australian law firm in 2011. Unfortunately, this report has not been made available to the DoE and the Advisory Committee for the energy policy review.

This is perhaps one of the most critical shortcomings with regard to implementing the 2006 NEP as written. It suggests a need to identify what are the causes of the reluctance to legislate and whether these relate to the appropriateness of DoE becoming the planning authority. It should be noted that the approval of the 2006 energy policy coincided with the onset of political events in 2006 which led to the removal of the government of the time.

DoE funding

A first indication of empowerment is the budget allocation that the sector receives. The following table shows developments over the last six years. While the allocation of around 0.2% of Government budget to energy between 2007 and 2010 indicates that empowering DoE was not very high on the Government's agenda, the significant increases in 2011 and in particular in 2012 show that there is now more recognition of the sector's importance.

Table 2 Government energy budget (000 FJD)

	2007	2008	2009	2010	2011	2012
Total Gov Budget	793,678	741,806	801,399	756,766	776,290	838,386
Fuel and Energy	1,228	1,431	2,040	1,528	3,225	22,500
Percentage	0.2%	0.2%	0.3%	0.2%	0.4%	2%

Source: GoF

Human resource development

Besides funding, empowerment of a Government unit mainly happens through development of the DoE's human resources. The 2006 NEP emphasises this with three actions planned:

- Establishment and formalisation of an appropriate staffing structure for DoE – While DoE did some serious internal work in this area, it never succeeded with its three submissions to the public service commission, which is the Government entity that must approve such plans. One of the reasons is a general recruitment freeze in Fiji's civil service, and this may not, therefore, indicate a particular failure to mainstream the NEP.

- An institutional training programme for DoE - it has been observed during the 2006 NEP formulation that DoE then had no senior staff with experience in planning, regulation, legal, economics, financial analysis, data management or other fields required to perform high level sector planning. Unfortunately, to date, this situation has not improved much. Most of DoE staff is at technician level with remarkable practical skills in dealing with hardware installations, but there are still no economists, lawyers, statisticians or qualified knowledge managers.

- Creation of legal and regulatory frameworks for the energy sector – This involves a number of actions (such as development of energy and rural electrification bills) that the DoE could not perform, simply because it has no legal expertise and/or no budget to hire specialist consultants. However, some of the specific actions listed in DoE's strategic plan have been undertaken outside DoE: A review of the Electricity Act has been performed in 2011 under the Public Enterprise ministry which hired the Australian Law firm Minter Ellison to perform the review. Unfortunately, however, the results of this review have not been shared with the DoE. Legislation on the introduction of E10 and B5 fuel blends was drafted by AG's office in 2011, and was gazetted. It has not yet been decreed as there is no local production of ethanol or biodiesel (vegetable oil esters).

The above information indicates that the new energy policy and action plan should be realistic with regard to the availability of specialised staff within DoE.

Coordination and cooperation

The third strategy under the planning theme refers to an ongoing constraintin Fiji's energy sector planning and management: a lack of coordination and cooperation across the many actors (as seen in Figure 3 in Section 2 above). In particular, there is a lack of cooperation between the numerous stakeholders with sometimes

overlapping mandates and/or roles. This report identifies the following government and state agencies with stakes and roles in energy sector management:

- **The Ministry of Works, Transport and Public Utilities** hosts the DoE and has some role of overseeing FEA as a public utility.
- **The DoE** is responsible for energy policies and plans (although its practical capacity to develop these is currently limited, as discussed above), energy efficiency and conservation, renewable energy (RE) and rural electrification.
- **The Ministry of Foreign Affairs and International Cooperation** maintains a climate change unit which is Fiji's Designated National Authority (DNA) for the Clean Development Mechanism (CDM).
- **The Commerce Commission** is established with a statutory mandate to independently authorise adjustments to the tariff and oversees non-discriminatory access to FEA's grid. It also regulates maximum prices for petroleum products throughout the various divisions of the country.
- **The Ministry of Public Enterprises & Tourism** overseas business performance of FEA as a state owned enterprise. It also scrutinises FEA's corporate plan and statement of corporate intent.
- **The FEA** is the national utility responsible for urban, peri-urban and rural grid electricity supply.
- **The Public Works Department** manages extension of mini-grids from Government Stations.
- **Ministry of Provincial Development and Disaster Risk Management** who receive and process applications for rural electrification.

The institutional map presented in Section 2 provides an indication of energy sector management in Fiji. It shows a rather complex structure, which lends itself to streamlining.

In order to address the lack of cooperation between the stakeholders, the 2006 policy and strategic action plan had formulated a number of actions including the convening of frequent stakeholder meetings, the participation in national, regional and international events and joint training activities for rural communities. While these actions have been partly undertaken and had some successes – in particular with regard to developing partnerships with agencies such as IRENA, IUCN, UNDP and GIZ - the most critical action remains unfulfilled: the establishment of a high level advisory committee that would guide the sector and facilitate high level decision making. Such a committee would improve coordination and provide DoE with an opportunity to influence stakeholders in other segment of Government.

It should be noted that some progress has been made recently. The joint organisation of the National Energy Forum with the RFB and the meeting of a cross-sectoral group of government agencies to discuss the NEP review (see Annex A1) are promising initiatives that could facilitate the establishment of a national energy advisory committee in the future. The opportunity exists to use the momentum created by the policy review to create the advisory/coordination committee/board.

Public awareness

Under the strategy 'Strengthen public awareness on energy programmes, projects and developments' DoE has performed numerous awareness programmes on energy projects and developments. This has been a focal area of DoE, which certainly produced some notable results. DoE has regularly displayed projects at the government referral centre and has produced and distributed information material such as video, brochures and posters. DOE has also been running an Energy Saver Competition as a tool to encouraging energy saving in all the sectors. In addition the DoE's webpage is also used to promote awareness on energy matters. It is not easy to determine the quantitative impact of the awareness programmes conducted by DoE. It is, however, safe to assume that such measure help to mainstream energy awareness in the broader population.

Knowledge management

The last strategy under the planning theme relates to knowledge management. The need to streamline and improve data and information management was seen as a major challenge when the 2006 NEP was formulated. The strategy aims to establish an up-to-date and user-friendly system of collection, management and dissemination of energy information. The actions detailed under this item include the establishment of both an up to date energy database system and a GIS based project information system as well as collection of primary resource data.

The lack of up to date project information becomes very clear when assessing, for example, DoE's information on the rural electrification schemes it has installed. Basic information such as location and size of installations are collated on an Excel spreadsheet but there is no information on the performance of the schemes, numbers of customers served or fuel use.

Unfortunately, knowledge management could not be mainstreamed as intended in the plan. Talks were held with SOPAC and SPC to assist in database development but concrete action has not been taken so far. Some successes in resource assessments have been achieved within DoE and through outside assistance. DoE for instance commissioned a bathometric survey of a potential wave power site in Southern Viti Levu[3]. An example of the lack of data management and coordination

[3] SPC – SOPAC Report PR 148, 2013

is provided by the hydro and geothermal surveys undertaken by JBIC. While these appear to suggest promising potential, the details of the geothermal survey have been held by the Department of Minerals since 2008 and were only made available to DoE in April 2013. The results of the hydro and geothermal surveys information are listed as Annex A4.

It is clear that knowledge management remains one of the most serious challenges in improving energy planning. The culture of restrictive information that still prevails within the administration needs to be changed and relevant resource information, feasibility studies and project data needs to be openly shared in order to attract reputable private sector developers to Fiji's energy sector. It is suggested that all feasibility studies and resource assessment data be put in the public domain in order to create a level playing field. FEA's notion that it cannot release information that could be used commercially by a third party (an investor) seems to be at odds with the government's intention to attract IPP investors to Fiji's energy sector.

Other apparent gaps in the current knowledge management framework lie in the lack of a robust monitoring and feed-back system that should be ideally performed by the unit that does the planning and in transparent assessment criteria that can be used for analysis to support planning and policymaking. At present there are no clear guidelines on how financial or economic assessments of projects, investments or technologies are being performed and it would be recommendable to adopt guidelines (such as the ADB's) in order to determine the relative merit of a particular solution based on standardised assessments.

3.1.3 Future developments

It is anticipated that DoE be able to significantly improve its planning capacity through technical assistance provided as part of a number of different projects launched in partnership with development partners. Of particular note is the Fiji Renewable Energy Power Project (FREPP) because it includes a large component focused on institutional reform, regulatory frameworks, and the establishment of an energy database. This project was endorsed by the GEF Secretariat on the 1st of December 2011 but is unlikely to get fully underway until the completion of the new energy policy.

3.2 Power supply – grid based

3.2.1 Status of implementation

For the purposes of this report grid-based supply is defined as being related to the Fiji Electricity Authority's (FEA) three main systems, namely:

- Vitu Levu Integrated System (VLIS),
- Vanua Levu System (Labasa & Savusavu) and
- Ovalau System.

Isolated rural grids fed by diesel gensets and/or renewables and stand-alone power supply in remote locations and outer islands are covered in the next section on rural electrification.

The implementation of actions relevant to grid-based power supply is summarised in the table overleaf. Following this is a more detailed description by key area relating to grid-based supply.

Table 3 Summary of status – power supply grid based				
Reference	**2006 policy/action**	**Fulfilled?**	**Explanation**	**Relevant to future?**
Strategy 2.2.1	**Mobilise the private sector in the development of indigenous energy resources**	**No**	**Despite 20 years of discussions, very little has been achieved. There are two SOE's generating electricity as a side-product and supplying FEA on a seasonal basis, but no sole-purpose private sector IPP project has achieved financial closure despite a large number of proposals and expressions of interest. The generation expansion plan notes however that IPP involvement will be required to finance the plan.**	**Yes**
2.1.1.1	Develop a private public partnership framework for the development of indigenous energy resources	No	No PPP or IPP framework in place. No sole-purpose IPP projects have achieved financial closure in the 20 years since IPP involvement in generation was first mooted. Some work by FEA, Public Enterprise Ministry and Commerce Commission but minimal involvement of DoE. No specialised know how in DoE, which needs to be explored further.	Yes
2.3.3.1	Develop and implement a Strategic Master Plan for power generation using biomass and bio-fuel	No	DoE lacks expertise in strategic planning for including biomass and bio-fuel in the generation mix. The FEA power development plan mentions biomass generation by IPP. Despite the attempt of various prospective IPP developers active in this area, no projects have come to fruition, There have been comments by investors that FEA PPA tariff is too low..	Yes
2.3.3.2	Implement a programme that ensures all electricity supply for the national grid are generated through renewable energy sources	Partly	Outside the control of DoE which lacks a regulatory function to influence RE investments FEA has a target to generate 90% of power from RE by 2015 which is addressed in the generation expansion plan contained in the PDP. DoE director partly involved as member of the FEA board. The Director sits in on behalf of the PS Works, Transport & Public Utilities	Yes
3.1.1.1	Develop and implement a national electrification master plan covering both grid and stand-alone systems	Partly	Some progress has been made in both grid based and standalone rural electrification. FEA have developed a Power Development Plan (PDP) document, which covers the expansion of the grid, including generation to 2020. The PDP should be regularly updated on an annual or biannual basis. FEA could consider making an Executive Summary of the PDP available online.	Yes

Reference	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
3.1.1.2	Develop a private, public partnership framework for power projects	No	Some work by FEA, Public Enterprise Ministry and Commerce Commission (minimum feed-in tariff of 25.65 cents for firm power) but no enabling framework. Complex processes for new investors are a major barrier together with very restrictive information policy. No competitive model to procure IPP projects, no financial closure of any of the proposed projects. A new UNDP/GEF funded project has started at DoE. This project aims to find out why there was so little progress in private participation in the power sector despite the fact that approximately 20 prospective IPP developers have been interested in developing projects.	Yes
3.1.1.3	Finalise the regulatory framework for the power sector.	No	The regulatory regime is not robust, this was elaborated in a regulatory review performed by independent consultant in 2007 (Maunsell). No implementation of any of the recommendations has been subsequently implemented. FEA is self-regulating in all aspects other than tariff (regulated by Commerce Commission and Cabinet).	Yes
3.1.1.4	Review the policy of a standardised national electricity tariff.	No	Tariff study performed by a former manager of FEA but no information on the outcome this study has been made available to the DoE or the Advisory Committee.	?
3.1.1.5	Review tariff setting mechanism	No	Mandate of Commerce Commission and Ministry of Public Enterprise, no involvement of DoE in the process. No information on tariffs available at DoE and the DoE and Advisory Committee were not able to access the recent FEA tariff review. There is a general lack of transparency in the process.	?
3.1.4.2	Provide electricity to 45 additional communities annually (FEA)	Partly	FEA rural grid expansion funded by Government budget and FEA (where IRR for the project is greater than 10%). Budget constraints exist to achieve the target of 45 new schemes p.a. Increasing the target, combined with adequate funding, has the potential to significantly improve electrification on a scale that isolated solar and diesel systems will struggle to achieve.	Yes

Reference	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
4.1.2.3	Assess and replicate renewable energy technologies to meet the energy needs of different communities. This will include the use of bio-fuel for stand alone diesel gensets, micro-hydro, different models of biogas digesters, different designs for solar home systems, and wind energy based hybrid power systems	Partly	Comparative least cost assessment of technologies/resources still pending. Fast moving market developments in PV sector requires standardized levelized generation cost models to be available and frequently updated to reflect development. Biofuel activities to be closely monitored by DoE as financial performance of these projects not yet clear. Economics of ethanol production from molasses unclear as sugar industry is in decline (ADB). Production of ethanol is sensitive to scale economies and reliability of feedstock supply and needs on-going assessment	Yes

SUMMARY

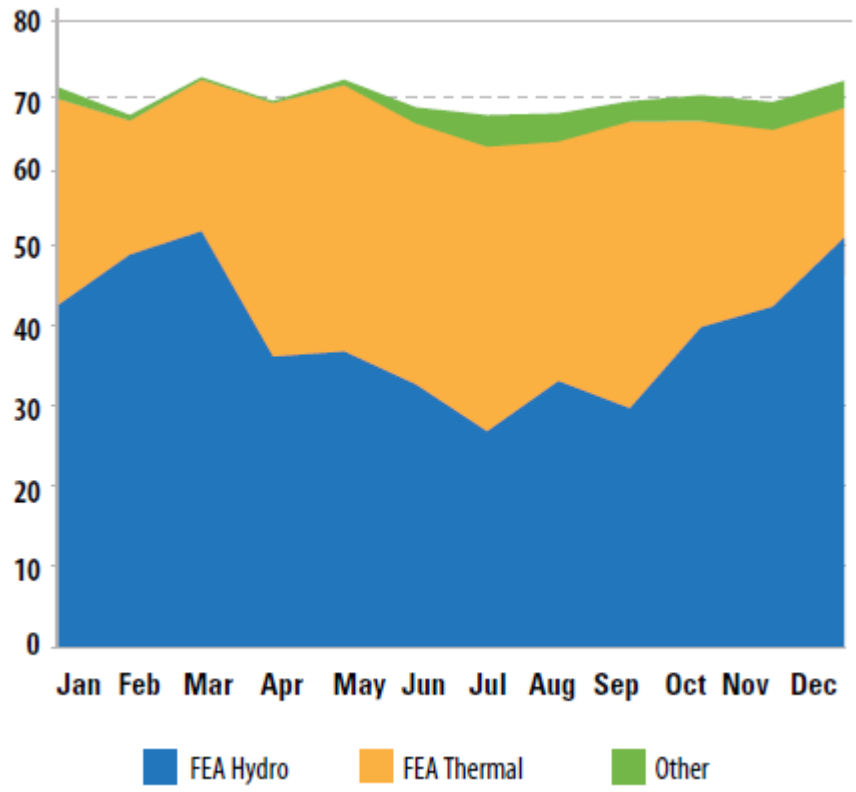
Status	Strategies	Actions
Fulfilled	--	--
Partially fulfilled	--	3
Not fulfilled	1	7
Unknown	--	--

3.2.2 Review and commentary

2.2.2.1 Generation mix

The generation supplying the grid is predominately based on renewable hydropower as shown in the figure below.

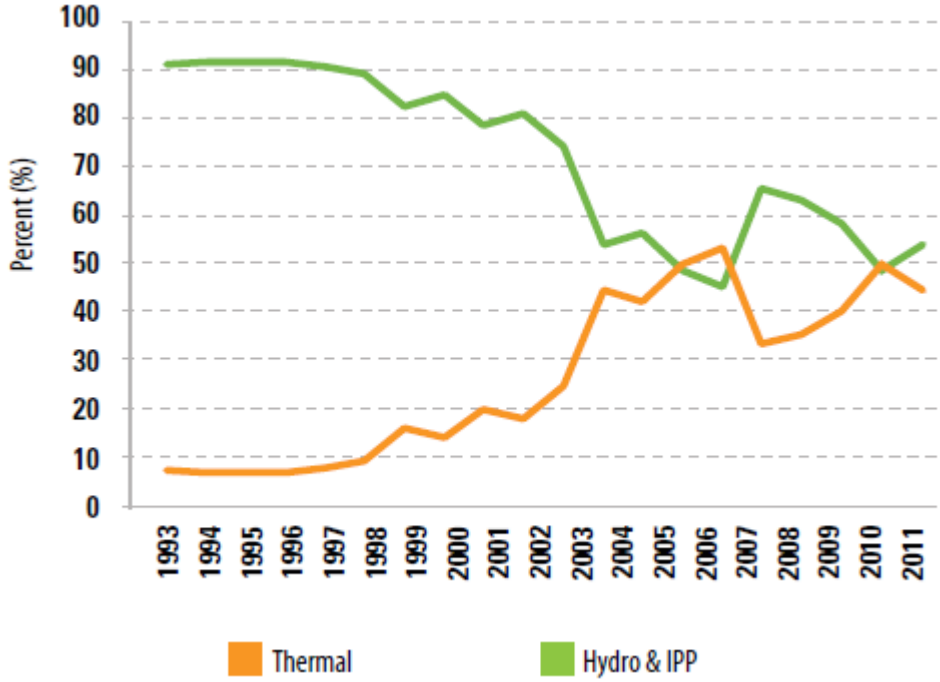
Figure 5 Monthly generation mix in GWh, 2011 (GWh)



Source: FEA Annual Report 2011

The average generation mix for 2011 was 55% hydro, 40% diesel and heavy fuel oil (HFO), 1% wind with the other 4% provided by the co-generators Tropik Woods and FSC. The figure below shows the hydro and diesel generation mix in the FEA system from 1993 to 2011.

Figure 6 Historical hydro/diesel generation mix 1993 - 2011



Source: FEA Annual Report 2011

2.2.2.2 Power development plan

A Power Development Plan (PDP) was prepared by FEA in 2011 covering the years 2011 to 2020. A PDP is a key document for managing the expansion of the grid and associated generation. A PDP is a forward looking document often issued in tandem with an Asset Management Plan that details the optimal management of the existing grid and generation assets. The FEA PDP plan includes the following components.

- ❑ Year wise demand projection (MW) and energy projection (GWh) 2011-2020 for the 3 FEA Grid Systems;
- ❑ Year wise generation expansion plan;
- ❑ Transmission and substation expansion plan, including grid; transformers
- ❑ Distribution expansion plan; and
- ❑ An investment plan covering generation, transmission and distribution for each of the 3 FEA Systems.

The PDP anticipates that existing isolated grids within VLIS, Vanua Levu System and Ovalau will be connected to the main grid over time. However, isolated rural houses and villages will not be connected.

2.2.2.3Demand projection

The power demand projection in MW peak and energy demand in GWh/annum underpins the PDP. The FEA PDP has a single case demand projection which has been cross checked by different methodologies[4] and against demand projections carried out by others[5]. The table below Table 4 shows the grid power and demand projection to 2020.

Table 4 Demand projection, power & energy 2013 - 2020

Year	Viti Levu Integrated System (VLIS)		Vanua Levu System		Ovalau System	
	Peak Demand (MW)	Energy Demand (GWh)	Peak Demand (MW)	Energy Demand (GWh)	Peak Demand (MW)	Energy Demand (GWh)
2013	172.2	921.8	19.6	97.1	3.1	16.1
2014	181.6	969.5	22.3	110.1	3.3	17.2
2015	189.6	1011.0	24.5	120.9	3.6	18.7
2016	195.5	1042.5	26.6	131.0	3.9	20.3
2017	201.3	1073.4	28.1	138.0	4.2	21.9
2018	207.2	1105.1	29.5	145.1	4.29	22.2
2019	213.3	1137.5	30.9	152.0	4.34	22.6
2020	219.5	1170.8	32.2	158.4	4.4	23.0

Source: Power Development Plan for Fiji (2011 to 2020), 2010

Expansion planning

The generation expansion plan is based on a) the underlying power demand and b) driving down the blended cost of generation through greater use of renewable generation. The table below outlines the generation expansion plan for 2013 to 2017

[4]As noted in the PDP the demand projection has be verified with a) partial end use and b) regression analysis

[5]Draft Report on Review of Electricity Tariff Rates

Table 5 Generation expansion plan 2013 - 2017

Project Name	Project Type	Capacity (MW)	Year	Remarks
VituLevu Integrated System (VLIS)				
Vuda	Biomass – Thermal	18	2013	Committed, IPP
FSC Lautoka	Biomass – Thermal	6	2013	Committed, IPP[6]
Wailoa Downstream	Hydro	7	2014	Committed, FEA
Qaliwana	Hydro	10	2014	Committed, FEA
FSC Rarawi	Biomass – Thermal	20	2015	Proposed, FEA/IPP
Namosi	Hydro	40	2017	Future, not committed
Nausori	Biomass – Thermal	40	2017	
Vanua Levu				
Labasa	Biomass – Thermal	7.5	2013	Committed, IPP
Wairiki	Biomass – Gasification	4	2013	Committed, IPP
Savusavu	Geothermal	4	2013	Proposed, FEA/IPP
Savusavu	Geothermal	4	2017	Proposed, FEA/IPP
Labasa	Biomass – Thermal	7.5	2017	Future, not committed
Biomass	Biomass – Thermal	7.5	2017	
Ovalau				
Nasinu	Biomass – Gasification	3	2013	Future, not committed
Viro-Stage 1	Biomass – Gasification	1.8	2013	
Viro Stage 2	Biomass – Gasification	0.6	2017	

Source: Power Development Plan for Fiji (2011 to 2020), 2010

The generation expansion plan is indicative in the later years. The transmission and substation expansion planning is provided in detail in the PDP to 2017 and covers the voltages 132kV to 33kV.

The distribution expansion planning covers the expansion of the FEA 11kV and 415/240V network to 2020. The distribution expansion planning in the PDP has been carried out at a macro level rather than by detailed bottom up planning. This is probably sufficient given the short planning horizon for distribution expansion.

[6] This has subsequently changed. It will be FSC hydro generation from Ba, around 40 MW.

Investment needs

The total investment required from 2011 to 2020 in generation, transmission, substations and distribution is considerable. The investment required (with and without IPP involvement in generation expansion) is detailed in the table below.

Table 6 Power sector investment needs (FJD) 2011 - 2020

Island	Year	Generation		Transmission	Distribution
		With IPP	Without IPP		
VLIS	2011-2015	288,100,000	749,980,000	263,017,200	100,800,000
	2016-2020	0	126,720,000	5,306,000	41,472,000
Vanua Levu	2011-2015	0	113,280,000	31,812,000	32,886,000
	2016-2020	0	33,920,000	$0	10,080,000
Ovalau	2011-2015	0	16,704,000	1,322,140	1,629,000
	2016-2020	0	576,000	80,000	450,000
Total	**2011-2015**	**288,100,000**	**924,964,000**	**296,151,340**	**135,315,000**
	2016-2020	**0**	**161,216,000**	**5,386,000**	**52,002,000**

Source: Power Development Plan for Fiji (2011 to 2020), 2010

These requirements will need to be taken into account in the revised policy and, in particular, the ability of FEA to finance them and the role of the private sector in delivering investments.

FEA's efficiency performance

A benchmarking study[7] carried out for a group of 21 Pacific Island power utilities including FEA in 2010-2011 concluded that FEA's performance is among the better utilities in the region. The analysis looked at specific fuel consumption, capacity factors, system losses and numbers of customer to each employee to assess relative efficiencies.

Regulatory reform and private sector participation

What stands out in terms of achieving the objectives of the 2006 NEP is the lack of private sector investment in the power sector. Despite 20 years of discussions, there are still only two SOE's generating electricity as a side-product and supplying FEA on a seasonal basis. There are no sole-purpose private sector IPP projects completed,

[7] *Performance Benchmarking for Pacific Power Utilities*, December 2011, prepared by the Pacific Power Association (PPA) with the support of the Pacific Infrastructure Advisory Centre (PIAC) and the Secretariat of the Pacific Community (SPC). http://www.ppa.org.fj/publication-report/

despite a large number of proposals and expressions of interest being submitted. FEA continues to refer to the co-generators Tropic Woods and FSC as IPPs but this confuses the issue. These power producers are SOE's that feed excess power into the FEA grid on a seasonal basis, while what is needed to achieve the targets of the 2006 energy policy are new private investors that supply bulk power on a reliable and year-round basis.

The difficulties of attracting private investment have been recognised for some time. In 2005, DoE together with the Chief Executive Officer of the Ministry of Public Enterprises and Public Sector Reform requested assistance from SOPAC to review regulatory arrangements in Fiji's power sector, in order to determine why private sector participation in power generation has been restricted to a long-term maintenance contract for Kinoya power station. A review under the SOPAC-based Danish-funded PIEPSAP project came to the conclusion that regulatory strengthening would be required to effectively attract IPP investors. It stated:

> '*…From an examination of current regulation of the FEA system it is clear that an appropriate legal and institutional framework substantially exists already. Existing legislation, particularly the Commerce Act and Public Enterprise Act, gives GoF agencies broad regulatory mandates to scrutinise FEA's planning, operations and transactions. These regulatory powers tend to be discretionary and the regulatory agencies lack the staff and resources to act. The situation is not uncommon. Legal and institutional changes can be made relatively quickly, but implementation of the new arrangements requires resources and the responsible agencies are often under-resourced and unable to discharge their new regulatory duties*.'

The review recommended that the potential for conflicts of interest should be reduced by expanding the regulatory responsibilities of the Commerce Commission, to include other regulatory functions undertaken by FEA, as and when the Commission is ready to receive them. The report also developed a detailed implementation plan on how to strengthen the regulatory framework in the power sector, which is essentially summarised in the table below.

Unfortunately none of the recommendations made in the 2005 study have been implemented up until now and many participants in the National Energy Forum in April 2013 raised the same concerns about an inadequate regulatory framework that triggered the regulatory review in 2005.

The regulatory reform proposals of the 2005 review are presented below in Table 7.

Table 7 Regulatory reform programme		
Reform Initiative	**Implementation Plan**	**Agent**
Tariff Reviews / Adjustments	Develop formal tariff review and price adjustment procedures	CC / Consultant
	Develop template for determining interim tariff adjustments	CC / Consultant
	Commission Tariff Study (every 3 to 5 years)	Consultant
	Manage public education programme to explain tariff adjustments	CC / consultant
PPP Procurement:	Develop PPP regulations governing all stages of procurement	Consultant
	Prepare model RFP and model PPA documentation for use, as appropriate, in competitively soliciting PPP bids.	Consultant
	Prepare a PPP procurement manual setting out GoF requirements with respect to procurement processes, responsible agencies, required studies, approvals and consents, contract documents, review processes, etc.	Consultant
System expansion Planning:	Prepare formal procedures by which national priorities are accounted for in power system planning, including specification of inputs, assumptions and criteria (e.g. system reliability, self-sufficiency targets, environmental constraints).	CC / FEA / DoE

Source: Maunsell, Regulatory Review FEA, 2005

Outside the regulation of the electricity industry itself, the lack of private investment may well also reflect the wider perception of the investment and business climate in Fiji. This perception is reflected in the World Bank's Ease of Doing Business Survey. In the category 'Starting a new business' the 2012 survey the World Bank ranked Fiji as No 138 of 183 surveyed countries, well below the Pacific regional average of 93. The categories investor protection, access to finance, dealing with construction permits, registering businesses and enforcing contracts have all seen downgrades between 2011 and 2012. This trend is also reflected in the findings of the ADB's Private Sector Assessment of 2011 which states:

> *'The general business climate in Fiji is not conducive to attract sufficient private capital and investment levels have never been lower since independence. Unfortunately, many of Fiji's regulatory requirements remain difficult for business to comply with. Business start-up requirements act as the gateway through which businesses enter, and thereafter contribute, to the formal economy. Cumbersome processes and high transaction costs tend to keep businesses in the informal sector which hinders their access to credit, as well as their ability to settle contract disputes through the legal system. Little progress has been made in streamlining and speeding*

up the overall registration process. It currently requires physical visits to at least five different agencies and takes between 32 and 40 days to complete – well above international best practice of one day. The registry maintained by the Office of the Registrar of Companies (ORC) is also not computerized making public access to registry information time consuming and difficult to obtain. Moreover, other agencies involved in the start-up process also maintain separate registries that are not synchronized with the ORC registry. This means businesses must provide the same registration information over and over again to each agency. It also makes it difficult for agencies to communicate with one another about a particular business or person because there is a lack of a unique identifier across the registries'[8].

The difficulties for a private sector investor who wants to invest in an IPP project was illustrated during the National Energy Forum by the representative of Vuda Renewable Power Development (VRPD) who described the difficulties and frustrations (including some of those described in the ADB's assessment above) this company encountered in endeavouring to move the 18 MW biomass generation project in Vuda forward.

[8] ADB – Fiji Private Sector Assessment Invigorating Private Sector Investment Draft Manila, November 2011

3.3 Power supply – rural electrification

3.3.1 Status of implementation

The National Energy Policy reinforces the Government's commitment to rural electrification. It affirms the use of Renewable Energy Service Companies (RESCOs) in the provision of electricity access (as set out in the Charter for Renewable Energy Based Rural Electrification with Participation of Private Enterprises), alongside FEA grid extensions and community-operated systems (as outlined in the Rural Electrification Policy of 1993).

The existing policy framework puts the responsibility for electrification largely with DoE's Rural Electrification Unit (REU). It does not address in any detail the obligations on FEA for rural electrification.

In addition to the policies and actions shown in Table 8 overleaf, the NEP also provides the following criteria for prioritising areas of Fiji to electrify:

- Contributions from the villages. Villages where contributions to the required up-front investment exceed the current 10 % compulsory contribution[9].
- Focal villages and settlements where joint infrastructure development is possible and infrastructure service packages promise to trigger economic development.
- Areas identified as most likely to optimise income-raising and socio-economic benefits from electricity supply.
- Locations where environmental protection and rural development measures are complemented by electricity supply.
- Locations where organizational initiative is demonstrated as adequate to assure reliable and expanded supply.
- Villages where electrification complements social, economic, and environmental priorities of localities.

In addition, the following procedures are now applied by DoE but are not formally documented[10]:

[9] As below, this has now been reduced to 5%

[10] Based on interviews with the Rural Electrification Unit at DoE, March 2013

- The 10% capital contribution from communities to rural electrification schemes has been revised to 5% in 2007/08 and is sometimes subject to political influence. There is also a limit on the maximum Government capital subsidy per household of FJD 6,000 as of 2012.

- Communities that select RESCO solar home systems prepay 6 months of maintenance rather than make a capital contribution.

- The IRR threshold for extensions to the FEA grid without capital contribution is now 4%.

Table 8 Summary of status – rural electrification

2006 policy/action	Fulfilled?	Explanation	Relevant to future?
Policies contained in National Energy Policy (but not explicitly described in the Strategic Action Plan)			
A medium term objective is to establish an independent energy sector regulator that's role will include licensing of RESCOs	No	No progress has been made towards establishing an independent regulator.	Yes
Legislation is to be developed to clarify the role of RESCOs in rural electricity expansion	No	No such legislation has been developed as yet. It is planned that it will be developed under the current FREPP project.	Yes
Government will apply central procurement measures, equipment subsidies and tax exemptions, such that RESCOs and off grid managers can balance costs and revenues at affordable tariff levels	Partly	While Government procurement has been effective in establishing new schemes and incentives have been put in place such as waiving of duty on renewable energy imports, the costs of contracting RESCOs are mostly not being fully recovered from tariffs. There is potential for consolidating RESCOs to improve economies of scale and reduce costs.	Yes
Government will allow RESCO retailers to adjust tariffs to ensure that reliable performance is viable on a site-by-site basis, and to ensure adequate financial incentive is in place for expansion of supply in rural areas. RESCO tariffs will remain subject to Government approval in order to balance consumer and supplier interests	Partly	While Government in theory can allow different RESCO charges on a site-by-site basis, the full RESCO model (as envisaged in the Policy and Charter) is not being applied in Fiji. RESCO's operate as contracted in effect – paid by DoE to provide a service rather than being funded from customer tariffs. Charges/tariffs are not generally sufficient to cover the costs of contracting RESCOs and DoE also faces significant challenges relating to collection of charges (due to a lack of availability of suitable prepay meters). As a result DoE is currently covering the shortfall, i.e. there is effectively a government subsidy that is not being taken into account / properly recorded.	Yes

	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
	The policy framework will encourage private sector participation to enable a move away from large capital cost subsidies for rural electrification	Partly	The use of RESCOs (contractors) to maintain solar home systems is on the increase in Fiji and has been somewhat successful. While not requiring a large capital cost subsidy, the Government is still effectively providing a large operating subsidy and, based on experience overseas, is probably unavoidable in most cases. The use of a uniform electricity tariff in Fiji means that private systems are largely an unprofitable enterprise and there has been no significant increase in privately operated grids. This could potentially change if FEA is reformed, however there are also likely to be other major barriers to the implementation of such systems in Fiji, as evidenced by the challenges faced in successfully encouraging small-scale private electricity provision around the world.	Yes
	A long-term investment programme does not exist and funding of projects remains inadequate	No	No long-term investment programme exists.	Yes
	There are unresolved issues regarding long-term secure access to native land for development projects, including development of rural electrification	No	Although there are procedures for obtaining land in Fiji, it is often viewed by private investors as cumbersome and difficult to implement.	Yes
	The RESCO model will be further developed as a means to accelerate subsidised rural power supply with active participation of private sector service providers. As a long term objective Government will reduce its role in RESCO type electricity supply and focus on improving the enabling and regulatory framework for expanded RESCO operations	Partly	See (4). The RESCO model has been widely used to provide solar home systems, however the full RESCO model (where RESCOs collect tariffs) is not being applied, and DoE is effectively providing operational subsidies. Therefore DOE's role has not been significantly reduced (it is still actively involved in the operation and maintenance of solar home systems).	Yes
	The Government will also develop mechanisms for measuring and ensuring reliable performance of rural electrification schemes	?	Unknown	Unknown

	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
	Government will facilitate the sustainable production and management of solar power and non-grid electrification systems, such as the further development of solar home systems (SHS), solar pump water supply systems, solar systems for schools and clinics and solar water heating systems for homes and institutions	Partly	See (4). The RESCO model has been widely used to provide solar home systems. However its sustainability is still questionable and the demand for solar home systems still far outstrips the ability of the Government to provide. It is uncertain whether solar home systems are seen as a permanent form of electrification, or an interim solution, pending grid electrification?	Yes
	Strategic action plan			
2.1.1	Training of RESCOs/ESCOs on installation, operation, maintenance, repair, and replacement of stand alone systems (2.1.1)	Partly	Some training has been provided by DoE, however this is largely focused on diesel-based systems. RESCOs/ESCOs operating in remote islands often receive no training due to a lack of DoE resources.	Yes
2.1.1	Training of RESCOs/ESCOs on financial and management of stand alone systems (2.1.1)	Partly	DoE carries out technical training, but training of RESCOs in financial management does not take place given that RESCOs are not involved in the collection of tariffs. Some training is provided to community operated systems.	Yes
2.3.3	Develop and implement a Strategic Master Plan for power generation using biomass and bio-fuel (2.3.3)	No	No Strategic Master Plan for biomass and bio-fuel specifically has been developed	Yes
3.1.1	Develop and implement a national electrification master plan covering both grid and stand-alone systems (3.1.1)	Partly	FEA has developed a Power Development Plan, however no national electrification plan has been developed for stand-alone systems. Such a plan will need to be developed by the Government (given that FEA does not own or operate stand-alone systems).	Yes
3.1.1	Develop a private, public partnership framework for power projects (3.1.1)	Partly	See (5)	Yes
3.1.1	Review the policy of a standardised national electricity tariff (3.1.1)	Partly	See (5). This is currently being reviewed as part of the reform of FEA however it is uncertain what impact it will have on rural electrification.	Yes

	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
	Assess and replicate renewable energy technologies to meet the energy needs of different communities. This will include the use of bio-fuel for stand alone diesel gensets, micro-hydro, different models of biogas digesters, different designs for solar home systems, and wind energy based hybrid power systems (4.1.2)	Partly	While DoE has done some research into the applicability of new renewable energy technologies, there remains insufficient resources/capacity to undertake resource assessments (including the procurement of equipment and the preparation of documents for assistance from international development partners). Some of this work will be undertaken as part of the current FREPP project, however there is likely to be on going future work needed. There remains an outstanding question as to whether most of the small-scale renewable technologies are a sustainable solution for electrification in Fiji.	Yes

SUMMARY

Status	Strategies	Actions
Fulfilled	--	--
Partially fulfilled	6	6
Not fulfilled	4	1
Unknown	2	--

3.3.2 Review and commentary

Approximately 49.1% of Fiji's population lives in rural areas (as at 2008). Current urbanisation trends indicate that, by 2030, this will decrease to around 39%.[11]

Over the period since preparation and issuance of the NEP, electrification appears to have continued to improve significantly. Of the rural population, approximately 81%currently had access to electricity (as at 2007/08)[12] and although no more recent data is available, this percentage is likely to have increased further since. This reflects a significant improvement over a relatively short period – rural electrification was approximately 69% in 2003[13]– but it is still significantly less than 96% of the urban population with access to electricity (as at 2008)[14].

The tables below summarise the delivery methods used to provide electricity access to rural areas in Fiji[15]. Grid supply from FEA is the dominant supply source. Off-grid supply is dominated by diesel mini-grids. This somewhat masks the fact that in recent years the biggest change has been in the number of solar home systems installed, which have had a significant impact on electrification. However it is still clear that the widespread use of renewable energy envisaged in the NEP has not been achieved.

[11]A review of good practices and lessons learned from Asia and the Pacific – Case Study 7, Fiji Rural Electrification Program, UNDP, 2012

[12]Preliminary data from 2007 Census (Fiji Islands Bureau of Statistics) suggests 81.4%, while the 2008-09 Household Income and Expenditure Survey for Fiji suggests 77%.

[13]2002-03 Household Income and Expenditure Survey

[14]Preliminary data from 2007 Census and the 2008-09 Household Income and Expenditure Survey for Fiji (Fiji Islands Bureau of Statistics)

[15]A breakdown by population is not currently available

Table 9 Breakdown of installed capacity in rural areas by technology type (2013)

Type		No. of installations	Installed capacity (KW)
Solar home systems	100W	2,400	429
	270W	700	
Hydro based mini-grids	100KW	1	130
	30KW	1	
Diesel-based mini-grids	Biofuel blended (20%)	4	14,191
	Diesel Units (10 – 50 kW)	631	
Grid-based supply from FEA	FEA Rural Electrification	487	NA
Total		4,224	14,750

Source: DoE

Table 10 Breakdown of rural households electrified by type (2008)

Type	Number of households	Percentage of households
Grid-based supply from FEA	42,774	49%
Village plant	12,775	15%
Own plant	5,887	7%
Others	598	1%
None	25,087	29%
Total	86,523	100%

Source: 2008-09 Household Income and Expenditure Survey for Fiji, Fiji Islands Bureau of Statistics

Of the unelectrified households, only 10%are considered to be located close enough to the FEA national grid or existing Government networks to make extension of the grid economically viable[16].

3.3.3 Other policies and developments

There are a number of key policy documents relating to rural electrification that underlie and expand on the policies contained in the 2006 NEP, but which are not referenced in the policy itself. These include:

- ❑ Rural Electrification Policy (1993)

[16]Charter for Renewable Energy Based Rural Electrification with Participation of Private Enterprises (2003), this estimate may have changed significantly in the last decade

- ❑ Charter for Renewable Energy Based Rural Electrification with Participation of Private Enterprises (2003)

- ❑ Roadmap for Democracy and Sustainable Socio - Economic Development 2009 – 2014.

The Roadmap notes that there are weaknesses in the delivery mechanisms under the current Rural Electrification Policy, and lack of access to electricity is identified as a key constraint to rural development. The other policies are summarised in the two boxes below.

Box 1 Rural Electrification Policy (1993)

Defines the objectives underlying rural electrification. Objective is to provide 24 hour continuous electricity to all potential consumers in Fiji. Specific targets (such as 90 villages per year, all villages by 2004) are outdated. Another notable statement is that rural electrification is primarily for social development but economic development will also be taken into consideration.

Stipulates an annual rural electrification budget of FJD 6 million.

Provides six types of electrification schemes that villages can choose from:

1. Diesel generator scheme
2. Village solar lighting
3. Focal point solar lighting
4. Supply from FEA
5. Supply from centralised generating plant (extension of an isolated grid managed by the Public Works Department)
6. Hydro-electric scheme

Sets out REU duties. These include reviewing community applications and assisting them in the application process. And for community-operated schemes (not an extension of an FEA or other centralised grid) assisting with:

- ❑ Design and construction of schemes
- ❑ Disbursement of Government subsidies
- ❑ A training commitment to villages/settlement to enable them to operate and maintain their electricity schemes safely and effectively.
- ❑ The operation of Government power stations

Sets out the process for application and construction of community operated schemes:

- ❑ Villages apply for a scheme, select a type of scheme (aided by the REU), and make a contribution of 10% of the total capital cost of the scheme.
- ❑ Construction begins once DoE manpower is available and Government budget is available for capital costs.
- ❑ Villages then own the scheme and are responsible for operation and

maintenance

- ❑ Villages get a three year grace period (for non-extension schemes), during which time the Government funds operations and maintenance (and makes arrangements for it to be carried out)
- ❑ Villages must operate a sustaining fund, where they will regularly contribute to future replacement costs. DoE staff will be a signatory on withdrawals from the account.

Sets out the requirements for grid extension by FEA, including:

- ❑ Villages are connected through grid extension without requiring a capital contribution where the financial internal rate of return on investment is greater than 15%.
- ❑ For an IRR between 0 and 15% a capital contribution is required
- ❑ If the IRR is negative then the community must pay the full cost of the extension.
- ❑ Thereafter FEA owns, operates, and maintains the extensions.

Box 2 Charter for Renewable Energy Based Rural Electrification (2003)

The Charter effectively expands the Rural Electrification Policy by introducing the use of RESCOs as a method of implementing solar home systems.

Allows the capital requirement for renewable energy generation to be paid over a term of at least 10 years through collection of periodic fees that cover both the capital payment requirement and operation and maintenance costs

Sets out role of DoE and RESCOs in rural electrification using renewable energy. This includes DoE selecting areas for electrification, leading the design and purchase of initial systems and parts, procuring RESCOs, being the owner of systems, and setting reference tariffs. RESCOs operate and maintain the systems and are fully paid for those services.

Sets out financial arrangements for rural electrification using renewable energy. Allows for RESCO's to lease systems from DoE and earn a return on assets accordingly, in which case RESCO's are responsible for collecting tariffs.

It expects a set of implementation arrangements to be applied, including:

- ❑ RESCO legislation based on the charter
- ❑ A RESCO pricing framework developed by DoE
- ❑ Funding from the Fiji Government for RESCO rollouts
- ❑ RESCO public awareness programme,
- ❑ Review and training of DoE staff

Communities that have existing rural electrification schemes are excluded from applying for RESCO-based solar home systems.

A review of the Rural Electrification Policy and Charter and the experience in their implementation has identified the following issues, which will need to be addressed under a revised policy:

- The electrification targets contained in each are outdated
- Both RESCOs and community-operated models have faced significant challenges in implementation and do not seem to be sustainable solutions. The challenges facing RESCOs are discussed in brief above. Those facing community operated schemes include:
  - Many communities never make adequate payments into a sustaining fund. This often results in systems falling into disrepair.
  - Communities also struggle with the technical requirements needed to operate and maintain systems on a regular basis.
  - Some schemes also suffer from irregular fuel supplies which constrains the affordability of purchasing bulk fuel supplies.
- The technology models identified in the Rural Electrification Policy need updating to reflect the options now available in Fiji (including diesel-solar hybrids).

This suggests that the process of reviewing the policy should include an overall review of the approach to rural electrification in Fiji. In any case, there would be value in bringing the Rural Electrification Policy and the Charter into a single integrated document. The consolidated policy would be easier to understand and consistent throughout.

In regards to funding, the annual rural electrification budget of FJD 6 million that is stipulated in the Rural Electrification Policy has not always been implemented in practice. The budget allocated averaged around FJD 3.6 million between 1994 and 2007[17].Budget constraints mean that DoE gets more applications for new rural electrification schemes than it can satisfy and will struggle to provide on-going operational subsidies (in the form of maintenance contracts) for solar home systems.

Fiji receives some assistance from development partners for rural electrification which is focused on technical assistance, including the World Bank's Sustainable Energy Financing Project and the United Nations Development Programme's Fiji Renewable Energy Project. Other development partners, including China and Japan, have made funding available for the installation of solar home systems.

[17]A review of good practices and lessons learned from Asia and the Pacific – Case Study 7, Fiji Rural Electrification Program, UNDP, 2012

3.4 Renewable energy

3.4.1 Status of implementation

The status of implementation of the 2006 NEP with respect to renewable energy is summarised in the table overleaf. Following this, each action is discussed in more detail.

Table 11 Summary of status – renewable energy				
	2006 policy/action	**Fulfilled?**	**Explanation**	**Relevant to future?**
Strategy 4.1.1	**Promote appropriate standards, guidelines and codes of practice for renewable energy projects**	**Partly**		
4.1.1.1	Adapt appropriate standards for local use	Partly	Standards for bio-fuel have been established. There are no clear standards set by Government specifically for other types of renewable energy other than electrical standards adopted by FEA for grid power systems. The standards being recommended by SEIAPI for its members including for design and installation aspects may be adopted or modified where applicable.	Yes
Strategy 4.1.2	**Ensure the use of renewable energy resources for social and economic development needs**	**Partly**		
4.1.2.1	Assess and quantify renewable energy resource potential	Yes	Resource data for the main islands are well developed for hydro, solar, wind and geothermal with reasonable resource data for bioenergy and ocean energy. Some additional work on bioenergy resources appears needed such as for biomass used for cooking and local energy. USP has been a continuing partner in this resource assessment effort.	Yes
4.1.2.2	Design and implement a renewable energy infrastructure development programme	No	Though better than pre-2006 policy situation, there is limited long-term, detailed renewable energy infrastructure development planning even though the goal of 50% renewables by 2015 has been set since 2006. Most renewable energy development seems to continue to be ad hoc without genuinely integrated planning. The only long-term planning document integrating renewable is FEA's Power Development Plan to 2020 which lays out plans to reach 90% renewable energy electricity.	Yes

	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
4.1.2.3	Assess and replicate renewable energy technologies to meet the energy needs of different communities. This will include the use of bio-fuel for standalone diesel gensets, micro-hydro, different models of biogas digesters, different designs for solar home systems, and wind energy based hybrid power systems	Partly	Replication is occurring but there appears to be no planned internal assessment or critiques of existing renewable energy projects other than reports at the time of commissioning of projects or reviews within one year of commissioning. Most project problems occur after five years or more and projects such as the solar home system implementation project need a thorough and honest review before further large-scale replication. Projects seem to be replicated without good assessment of the project that is the basis for replication. Such longer term assessments of renewable energy projects that have been carried out appear to have been done by outside agencies at their initiative, not that of Government, and vary widely in their methodology and quality.	Yes
4.1.2.4	Provide incentives for the importation and use of renewable energy technologies	Yes	There have been lowered duties for some renewable energy materials and there have been production incentives for bio-fuel through tax holidays for new producers, import tax reductions for materials used for bio-fuel production, Government requiring its use in some vehicles, mandating use of blends, and lowering duties for fuels that are to be blended with bio-fuels and duty free import of chemicals used for bio-fuel production. Note that 15% VAT is still charged on the duty free imports.	Yes

SUMMARY

Status	Strategies	Actions
Fulfilled	--	2
Partially fulfilled	2	2
Not fulfilled	--	1
Unknown	--	--

3.4.2 Review and commentary

Strategy 4.1.1: Appropriate standards for local use

The only standards for renewable energy that have been accepted by Government thus far are standards for bio-fuels. Those were accepted by Cabinet in 2011 and form the basis for bio-fuel blending and sale. This is a major and vital step toward the acceptance of bio-fuel for transport and power generation. However, there is no bio-fuel production at any significant level. Several proposals to establish both ethanol and biodiesel productions in Fiji have been discussed over the years, but no industrial scale bio-fuel projects have come to fruition.

For the renewable energy technologies that focus on generation for the grid, no standards have been developed by FEA as yet. This may be because only large-scale renewable energy projects are currently underway and, in these cases, the conditions of connection have been individually negotiated. However, not having standards in place is not realistic if the large increases in small-scale installations expected under the strategic plan take place. Also, any FEA standards would be related to grid-connected installations and would not be applicable to the large number of off-grid developments that are expected.

Strategy 4.1.2: Use of renewable energy for social and economic development

Achieving the policy goal of 50% renewables in the energy sector by 2015 implies that renewable energy will represent approaching 90% of electricity generation (given the small contribution from transport). This number has been set as FEA's goal and FEA developed a plan to reach this goal by 2020. However, achievement is handicapped by the difficulties facing private investors (see above), the lack of comprehensive energy development plans and limited data on resource potential.

In association with USP, DoE has a project to collect and file renewable energy data for most renewable ocean technologies. Resource assessment activities also include retrieving historical data and incorporating data from wind data collection systems around Fiji. The database has yet to be completed. It appears that very little data has been collected on biomass for local use in cooking and other activities and this needs to be considered since it remains an important resource for rural Fijians. Some work was done by the Department of Forestry, but requires updating. DoE's biofuel unit has done some assessments of coconut resources. However, a comprehensive inventory of all coconut stands including an assessment of age and productivity is missing.

Fiji is developing a substantial programme of bio-fuel development. Outer island production of coconut oil (CNO) for bio-fuel use is being promoted with government providing funding for bio-fuel installations on three islands (Koro, Rotuma and Cicia) with plans for up to 20 similar mills in islands around Fiji. There

are also significant incentives offered to the private sector for setting up of bio-fuel supply, such as tax holidays, duty free importation of equipment and reduction of duties on fuel used for blending. In addition, the development of bio-fuels is being encouraged through the issuing of standards and the requirement to blend 5% biodiesel with diesel fuel, 20% biodiesel with RDO and RFO and 10% alcohol with petrol (see also the discussion on transport, below).

The use of renewable energy in electrification is also being promoted. As well as the bio-fuel mills mentioned above, several different models of biogas digesters have been piloted and a programme for their implementation has been prepared. Different designs for solar home systems are being considered ranging from the full lighting kit provided to Vanua Levu 'RESCO' customers to small LED lights with integrated battery and controls.

The NEP singles out wind energy-based hybrid power systems as a priority for renewable energy development. The reasons for this are unclear. Such systems remain experimental with none being operational around the Pacific for electrification purposes.

On the other hand, solar-based hybrid systems are well-proven in the Pacific. Fiji has limited experience in hybrid systems and that which exists, notably the Nabouwalu wind/solar/diesel hybrid system, has been unsatisfactory. This hybrid system failed partly because of poor design (fast corrosion of the equipment) but also because there was no follow-up on training to the staff operating it. As a result it became a pure diesel system after a few years.[18]Although the project cannot be labelled a success with regard to economically sound use of renewable energies, the various stakeholders involved had an opportunity to gain valuable insights and experiences.

Incentives offered for renewable energy include:

- Duty free import of equipment needed to establish a bio-fuel manufacturing plant and the chemicals required for bio-fuel production.
- Duty free import of renewable energy equipment of all types.

[18] The system was operated and maintained by PWD. The people who were trained to operate the system were rotated to another location and the new people had no training in its operation plus the manuals that were prepared by the consultants were inadequate for the level of knowledge that the local engineers had. So after a number of years when there were technical problems (wind turbines breaking down due to corrosion and poor maintenance, connectors on the solar overheating and melting due to corrosion, etc.) the staff were ill equipped to manage the controls on the installation and to make repairs. The wind power ceased completely (most had failed for one reason or another anyway) but soon after the solar also stopped and it became a diesel only operation. The people PWD put on site were experienced electrical engineers (though experienced only with diesel systems) so the system failed partly because of poor design (corrosion ate up the equipment quite quickly) but also because there was no follow on training provided.

- ❑ A 10 year tax holiday for a new activity for converting local agricultural commodities to bio-fuels(ends 31 December 2014).
- ❑ Diesel that is imported for blending with biodiesel has a duty of FJD 0.05/litre instead of the usual FJD 0.18/litre.

Geothermal

The 2006 NEP was relatively silent on geothermal energy, which has a significant potential on the two main islands, Viti Levu and Vanua Levu. This may be due to the fact that geothermal energy is classified as a 'mineral' and therefore falls under the responsibility of the Department of Minerals. On the other hand DoE's NEP includes petroleum exploration as an action item, which clearly is a mineral and also falls under the Department of Minerals. The new energy policy should take a consistent approach to inclusion of geothermal and/or petroleum exploration.

Biomass and biogas

Outside DoE, there are also biomass-related activities undertaken by the Climate Change Unit (CCU) of the Ministry of Foreign Affairs and International Cooperation, which is the designated national authority (DNA) for Clean Development Mechanism (CDM) projects in Fiji. The DNA aims to promote mitigation projects which could also apply to register under the UNFCCC CDM. As such the CCU is promoting waste to energy projects (methane generation) at the Naboro landfill. The Kinoya sewerage treatment plant in Kinoya was registered as a CDM project in 2011 However, the Kinoya Sewerage Treatment Plant is not currently generating energy but insteadflares the methane gas it produces. This is considered to be more economic viable under the CDM project.

In October 2012, the ministry published an 'Investors Guide for CDM' and a catalogue of CDM opportunities in Fiji which contains the two projects above. In addition there is a suggestion to bundle small scale biogas projects (household plants) into a larger programme that could attract CDM investors. Up until now no project has been developed. A feasibility study is under way for landfill gas extraction at Naboro.

3.5 Transport

3.5.1 Status of implementation

The 2006 NEP included some provisions on the transport sector, however it did not feature highly and there was no specific strategy for the transport sector. In this report the assessment is focused on how this sector can reduce petroleum consumption through improvements in fuel efficiency and other methods. Petroleum imports and pricing are discussed separately in the following Section 3.6.

The key policy provisions and actions and the status of their implementation with respect to transport are summarised in the table overleaf.

Table 12Summary of status – transport

	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
Strategy 2.2.1	Increase efforts to create energy efficiency and conservation awareness and encourage energy-efficiency in all sectors.	No	Public awareness on power sector energy efficiency and security has been done, but nothing specific to transport.	Yes
	(a) public awareness and education programme on energy conservation / efficiency	No	Some activity under the Energy Efficiency Awareness Project. However, as far as the consultants are aware, no specific awareness in the transport sector.	Yes
	(b) Introducing incentives for importation and use of energy efficient equipment and appliances and efficient vehicles	Partly	Incentives to import energy efficient vehicles (age limit for second hand vehicles down to 5 years, reduced import duty for efficient busses). No incentives for efficient marine vehicles.	Yes
Strategy 2.3.4	Promote fuel diversification in all sectors. (2) Assess options including tax concessions for alternative fuels in the industrial, transport and other sectors	Partly	There are tax incentives for bio-fuels (10 years tax holidays, free import duties for equipment and chemicals).	Yes
Strategy 4.1.2	Ensure the use of renewable energy resources for social and economic development needs. (4) Provide incentives for the importation and use of renewable energy technologies.	Yes	Various tax incentives (see above), some of which are specific to the transport sector.	Possibly

SUMMARY

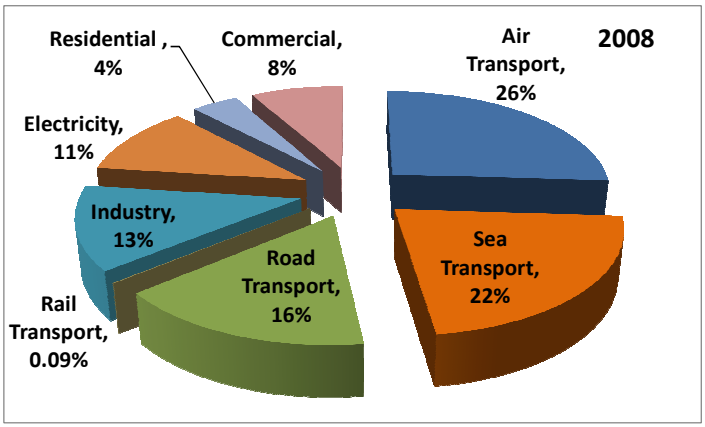
Status	Strategies	Actions
Fulfilled	1	--
Partially fulfilled	1	1
Not fulfilled	1	1
Unknown	--	--

3.5.2 Review and commentary

Land transport

The transport sector made up approximately 30% of final energy consumption from 1980 to 2004.The figure below shows the breakdown of petroleum product use by sector in 2008. In 2008, air transport accounted for 26% of total petroleum use, while road transport makes up for 16%, and sea transport accounted for 22%. In total, the transport sector accounted for over 60% of total petroleum consumption in Fiji (followed by the industrial sector at 13% and electricity generation at 11%).

Figure 7 Breakdown of petroleum consumption by sector in 2008

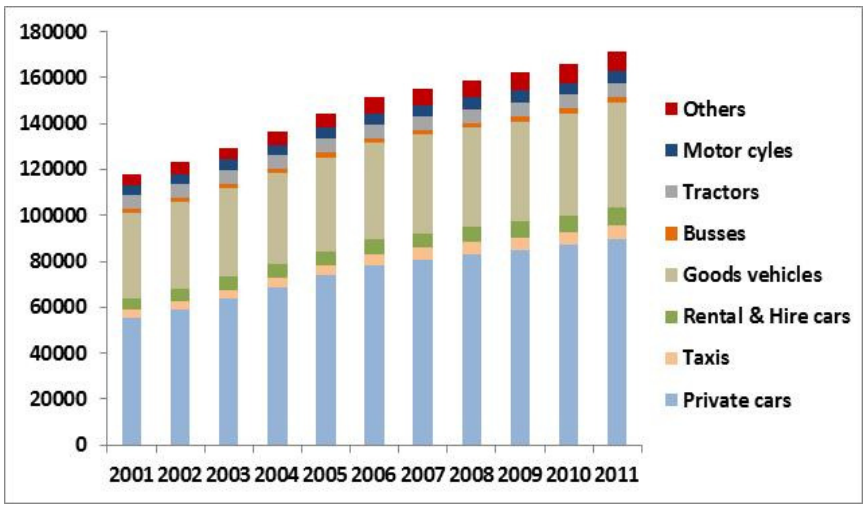


Source: Fiji Bureau of Statistics[19]

Growth in the number of registered land vehicles has been significant in the last decade, which contributes significantly to fuel consumption. The figure below shows the trend in the number of registered vehicles in the last 10 years.

[19] Cited in: Barry Whiteside, Governor of Reserve Bank of Fiji, Presentation at the National Energy Forum, April 2013

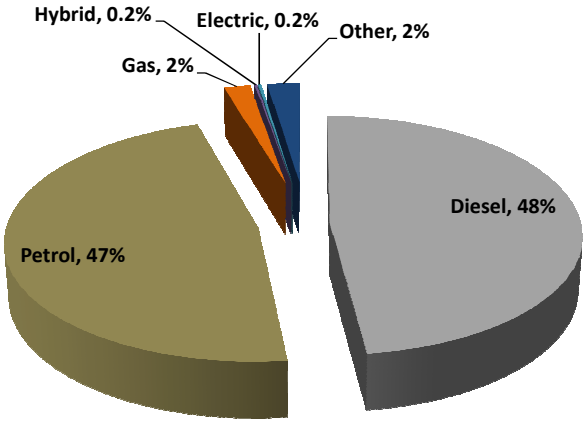
Figure 8 Registered land vehicles in 2001 - 2011



Source: Fiji Bureau of Statistics[20]

Based on information from Land Transport Authority (LTA)[21], as at December 2012 almost all registered land transport vehicles use either petrol (47%) or diesel (48%) as fuel, and only a small number of vehicles use LPG (2%). There are very small numbers of hybrid vehicles using gas and petrol (124 vehicles or 0.2%) and electric vehicles (0.2%), which are mostly golf carts and forklifts. This information is also shown graphically in the figure below.

Figure 9 Registered land vehicles by fuel type in 2012



Source: Land Transport Authority

[20] Available from: http://www.statsfiji.gov.fj/Key%20Stats/Transport/11.1_Distribution%20of%20vehicles%20registered%20annually.pdf

[21] Information provided by Faiyum Imraz Ali, LTA Manager Standard Compliance during interview on 10th April 2013.

There is also the possibility of increasing the share of renewable energy in transport through use of bio-fuels (biodiesel, ethanol) for land transport and this is an area which is being encouraged by the Fiji Government although large scale production of bio-fuels is yet to get underway.

Some policy initiatives with the land transport sector in relation to energy include:

- A target for vehicle emissions was established as part of the UN Declarations. This was adopted in DoT's annual corporate plan.
- Duty concessions are currently available for all buses with Euro4 and Euro3 engines and for LPG taxis.
- DoT has shown interest in providing more incentives for more importation of hybrid vehicles.
- The age restriction for second-hand imported vehicles has been reduced to no more than 5 years. Taxis are allowed to operate for 12 years, and busses for 25 years.

Incentives in the form of duty concessions include:

- The fiscal duty on new motor cars and other passenger vehicles with capacity not exceeding 1500cc was reduced from 32% to 15%
- The fiscal duty on new buses for the transport of 23 persons or more was reduced from 32% to 5%
- Fiscal duty on new trucks of gross vehicle weight not exceeding 3 tonnes was reduced from 32% to 5%
- The age restriction was extended on LPG, CNG and solar vehicles to 8 years.

The DoT is currently considering non-motorised transport options for Fiji in the form of bicycles. Close coordination with local councils is needed to pursue this initiative.

Air transport

Relatively little can be recommended within the Energy Policy with respect to air transport, given that energy use in the aviation industry is dominated by international flights, and that these are subject to international markets and regulation. The International Civil Aviation Organisation has published various resolutions, guidelines and standards with regards to aviation emissions. Fiji's aviation sector is currently following international standards.

Sea transport

As with aviation, international shipping falls largely under international maritime conventions. However, there is still scope to improve the efficiency of inter-island shipping. In particular, discussions with stakeholders at the Energy Forum showed that energy efficiency can be improved through:

- ❑ Improvement of ports, enabling ships to power down in ports
- ❑ Providing port facilities such that larger and more efficient vessels can be used
- ❑ Developing more efficient and economical routes
- ❑ Developing clear policy and regulation regarding marine vehicle standards.

There is also the possibility of increasing the share of renewable energy in transport through use of bio-fuels and solar energy for marine vehicles and sail-assisted shipping, particularly for domestic inter-island shipping. These avenues are at the early stages of consideration and investigation by the Department of Transport.

3.5.3 Future developments

There are no overarching policy documents that encompass the whole of the transport sector and provide its direction in the future including policies relevant to energy. However, the Department of Transport (DoT) is currently in the process of preparing a national transport policy and associated land and maritime transport plans. This policy document is expected to be released later this year. The Roadmap for Democracy and Sustainable Socio-Economic Development also has some policy directions as regards road transport as described in Box 3 below.

Box 3 Transport policy under the Roadmap for Democracy and Sustainable Socio-Economic Development 2009-2014

The Roadmap provides policy objectives, strategies and key performance indicators (KPIs) for the transport sector as a whole. Some specific strategies relate to energy efficiency and the use of alternative energy sources for the transport sector. For multi-modal transport, the strategy includes the promotion of the use of public transport and the use of fuel efficient vehicles. For land transport, similar strategy was stated namely the introduction of alternative fuel powered vehicles and the control of importation ages of second hand vehicles. However, no KPIs were applied to these strategies. For marine and aviation transport, no strategy was mentioned that was directly related to energy.

3.6 Petroleum

3.6.1 Status of implementation

This section focuses on petroleum prices and reducing Fiji's dependency on imported petroleum. The section above (3.5) addresses petroleum use in the transport sector, while the following section (3.7) addresses the development and use of bio-fuels.

There is no section or theme in the 2006 NEP and action plan that specifically refers to petroleum products. Petroleum products' related policy statements and related strategic actions are covered under energy planning (introduce legislation for bio-fuel use in industry and automobiles) and under energy security (assess potential petroleum and gas resources, maintain supply and storage arrangements for petroleum products that reduce the risk of supply disruptions at national level, develop a National Standard for petroleum products). However, for the purposes of this report a section on petroleum is included in order to assess this sector separately in tern of petroleum prices and dependency on imported petroleum, both high priority issues for the Fiji Government.

The implementation of actions relevant to petroleum is summarised in the table overleaf. Following this is our analysis of key areas relating to the implementation of petroleum actions.

Table 13 Summary of status – petroleum				
Reference	**2006 policy/action**	**Fulfilled?**	**Explanation**	**Relevant to future?**
Strategy 2.1.1	**Mobilise the private sector in the development of indigenous energy resources.**	**No**	**Despite 20 years of discussions, very little has been achieved. There are two SOE's generating electricity and supplying FEA on a seasonal basis, but no sole-purpose private sector IPP project has achieved financial closure despite a large number of proposals and expressions of interest. There is also no private sector activity in petroleum exploration. However, a local company has taken up a loan under the FDB Sustainable Energy Finance program to perform a drilling operation for geothermal resources in Vanua Levu. The status of this project is not known.**	**Yes**
2.1.1.4	Assess potential petroleum and gas resources	No	No activity since 1993 report by Mineral Resource Department. Overlap of mandate with Mineral Resources. This item indicates that a restructuring of administration should be considered. A new ministry of Minerals and Energy would be one solution.	No
Strategy 2.3.1	**Maintain supply and storage arrangements for petroleum products that reduce the risk of supply disruptions at national level**	**Partly**	**Outside the mandate and control of DoE as storage is maintained mostly by private sector oil companies. Legislation would need to be put in place that commits private sector suppliers to maintain certain storage levels (x number of days). Alternatively, the Government could invest in a national strategic fuel reserve owned and maintained by the Government. When Shell first tried to sell its Assets, a recommendation was made from DoE to Government to consider buying the assets but the Government had other priorities at that time.**	**Yes**
2.3.1.2	Assess and make appropriate recommendations on the current energy security situation	Yes	Energy security report commissioned and performed by SMECin 2011, however, no action on recommendations yet. Additional work in cooperation with SPC's energy security indicator project is envisaged and will involve the up-dating of the regional energy security database maintained by SPC's energy division.	Yes

Reference	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
2.3.1.2	Develop a National Standard for petroleum products	Yes	Fuel standards in place. Laboratory to test bio-fuels in the process of being established at USP.	No

SUMMARY

Status	Strategies	Actions
Fulfilled	--	2
Partially fulfilled	1	--
Not fulfilled	1	1
Unknown	--	--

3.6.2 Review and commentary

Petroleum imports

In 2011, Fiji imported a total of 707 million litres of petroleum products at a value of 1.17 billion FJD. 52% of this volume was retained (consumed and stored) in Fiji, the balance was re-exported to supply smaller Pacific island stated such as Kiribati and Tuvalu. Fuelling of international airlines also counts as re-exports.

Although the RBF has raised concerns with regards to the burden that retained fuel imports impose on the economy, the costs of local consumption have remained below its 2008 peak of FJD 770 million in subsequent years.

The table also shows both the sensitivity of consumption to world prices, with consumption of aviation turbine fuel and diesel declining very significantly in 2009, presumably, in response to the 2008 price rises, and the volatility of demand for both these fuels, with aviation turbine fuel use declining by 85% from 2010 to 2011. This may be due to changing decisions among aviation and shipping users as to where to refuel based on changing relative prices and routes.

What this does suggest is that Fiji's ability to control imports may be limited. Land transport, which may be most readily controllable by the government, only makes up a small part of total quantities and values of imported petroleum products. In 2011, motor spirits were around 20% of imported petroleum products by volume and 17% by value. As petrol cars represent around half of the total and diesel cars the remainder, this would imply about 40% of petroleum products imported were used in land transport.

Table 14 Fossil Fuel Supply (Retained Imports)

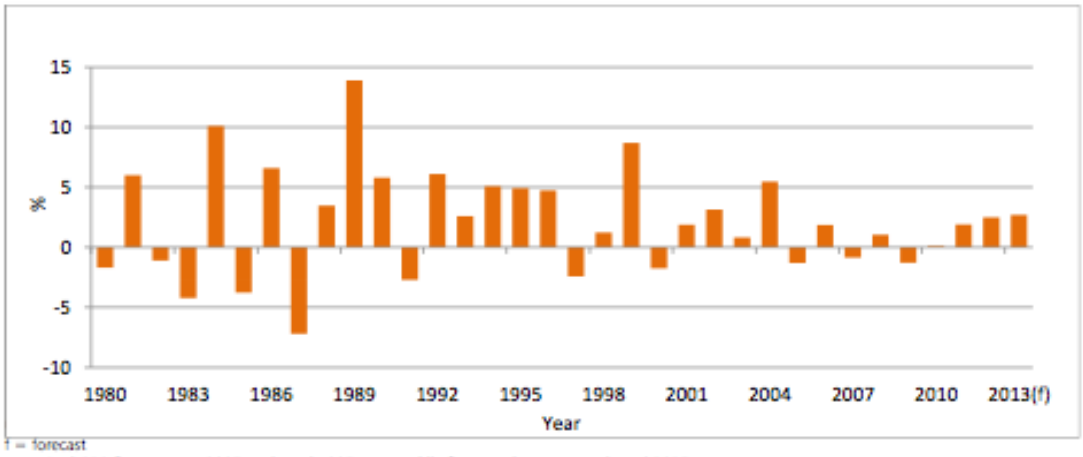
Year	Motor Spirit		Aviation Turbine		Diesel		TOTAL	
	Quantity (Million Litres)	Value (F$M)	Quantity (Million Litres)	Value (F$M)	Quantity (Million Litres)	Value (F$M)	Quantity (Million Litres)	Value (F$M)
2008	43	71	103	307	248	390	394	768
2009	45	58	82	126	189	218	316	403
2010	78	100	121	132	318	366	517	599
2011	70	99	17	74	276	410	364	583

Source: Fiji Bureau of Statistics/RBF

The contribution of fuel imports to Fiji's current account and trade balance deficits has reduced since 2008 as shown in Figure 11 below. This trend, however, can hardly be attributed to conservation measures or a higher share of renewable

energies in the supply mix. It is mostly a result of reduced economic activity and perhaps some price driven conservation efforts. Indeed, the cost of fuel imports has continued to rise (although this is driven by prices as much as volume increases).The overall pattern is more likely a reflection of economic stagnation and a shift towards services leading to declining trade balances from sources other than fuel imports alone. Figure 10 shows economic growth over the last 30 years.

Figure 10 GDP Growth Performance 1980 - 2013

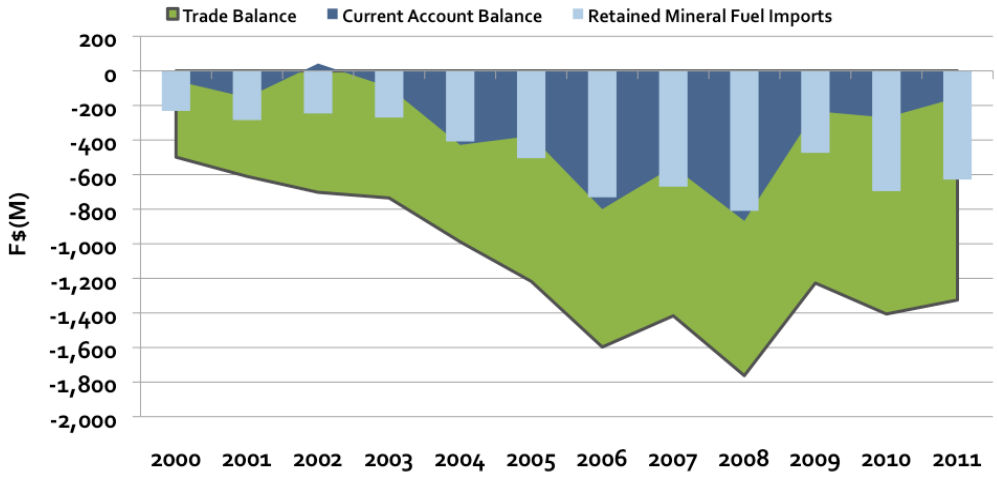


(% change in real GDP)

Source: Fiji 2012: Revitalizing the Economy, ADB 2012, p 3

However, the role of fuel imports is still important. In 2000, for example the trade deficit was FJD 500 million or which FJD 200 million or 40% was contributed by fuel imports. In 2008, the trade deficit was FJD 1,600 million, with fuel imports contributing FJD 800 million or a share of 50%. Although the absolute importance of fuel imports to the deficit has declined, they still make a very large contribution.

Figure 11 Retained fuel imports and current account



Source: Reserve Bank of Fiji

DoE's strategy to curb petroleum imports has been to mobilise private sector capital for the development of indigenous energy resources and replace fuel imports with locally produced energy. However, implementation of this strategy has shown very limited progress as discussed below and elsewhere in this report.

Petroleum exploration

Petroleum Exploration in Fiji is governed by the Petroleum (Exploration and Exploitation) Act, Rev. Edition 1985. This is a detailed piece of legislation that grants the Minister of Mineral Resources wide ranging rights to issue licences and monitor and oversee exploration and exploitation activities.

Preliminary petroleum exploration for crude oil and gas has been performed since the late 1960s. A major report was issued in 1993 by SOPAC detailing the results of previous efforts with exploration[22]. Fiji first gained attention as an area of petroleum potential in 1968 following the discovery of oil seeps in neighbouring Tonga. The first exploration license, covering Bligh Water Basin, was awarded to a partnership with Southern Pacific Petroleum as operator in 1969. In 1971 three licenses were awarded to Offshore Oil Exploration, Atlantic and Oceanic Resources, and Investment Corporation of Fiji; and a fourth to International Petroleum in 1972. These licenses covered the western Yasawa Platform, central Lau Ridge, Bau Waters Basin and Baravi Basin respectively. By 1977, all licenses had expired.

Encouraged by high world oil prices, a second period of exploration took place from 1977 to 1987. In 1977, Dakota Exploration was awarded a concession in the Bau Waters Basin and western Koro Sea. In 1978 three exploration licenses were

[22] Jonathan E. Rodd – The Petroleum Potential of Fiji, SOPAC 1993

awarded to Pacific Energy and Minerals covering Bligh Water Basin, the Yasawa Platform and Great Sea Reefs Platform. Exploration drilling followed in Bligh Waterin 1980 and during 1981 and 1982 in western Bligh Water Basin and Bau Waters Basin. Finally, a seventh well was drilled in 1982 in western Bligh Water Basin. None of the wells reached its target. By 1987, the second group of licenses had expired.

The 1993 SOPAC review was still positive as regards the potential. This may be what motivated DoE to include the action item 'Assess potential petroleum and gas resources' into its strategic action programme. It is, however, not surprising that no progress could be achieved: Firstly, the Minister in charge of energy does not hold any responsibility over petroleum. Secondly, DoE has no expertise (no geologist) in this area and thirdly, the DoE has never had the substantial budget necessary for petroleum exploration available, which would allow the department to embark upon exploration activities.

Level of petroleum storage

A similar picture emerges with regard to the action item 'Maintain supply and storage arrangements for petroleum products that reduce the risk of supply disruptions at national level'. Firstly, DoE has no legal mandate to regulate any fuel reserve levels in Fiji. So it is not clear how this strategy was intended to be implemented. Secondly it would also be necessary to assess the price impacts of increasing strategic reserves in the private sector. Petroleum product reserves absorb large amounts of capital that sit unproductively in tanks as an insurance against possible supply interruptions. While a policy statement on a desired level of fuel storage could be maintained in the new policy, listing action items that are out of reach of the mandate of the DoE will not be effective.

Petroleum product pricing

The regulation of petroleum pricing has been moved from the former Price and Income Board to the Commerce Commission (CC) which regulates all fuel prices (and FEA's electricity tariffs) in Fiji. The three oil companies operating in Fiji make submissions every three months to the CC which then determines maximum prices for six divisions across the country based on the cost of supply plus a return on investment for the oil companies. The table below shows the current price situation for the main island division.

Table 15 Maximum Retail Prices for Fuels April 2013

Product	FJD/litre	FJD/Ton	FJD/MJ	MJ/litre
LPG	2.14	3820	0.084	25.5
ULP	2.58	3510	0.076	34
Diesel	2.29	2726	0.059	38.6

Product	FJD/litre	FJD/Ton	FJD/MJ	MJ/litre
Kerosene	2.54	3215	0.069	36.6
Premix	1.86	2548	0.055	34

Source: Commerce Commission

The current prices are based on cost of supply alone and do not take account of any environmental impacts or wider policy objectives, such as reducing GHG emissions. This helps explain the higher unit cost for LPG as does the much smaller volumes imported relative to other products. LPG pricing should be reviewed in cooperation between DoE and Commerce Commission.

The table does not show the locational variations (schedules) the Commerce Commission allows. Household kerosene for instance has a maximum retail price (MRP) of FJD 1.86 in Suva but can cost up to FJD 1.93 in a schedule 6 region where the highest prices are allowed. For diesel the difference is 2.29 for schedule 1 and 2.32 for schedule 6. There is an obvious contrast between the pricing of petroleum products by region and the application of a uniform national electricity tariff for supply by FEA.

Natural gas

Elsewhere in the Pacific, Papua New Guinea is currently developing LNG terminals to export large gas reserves which were recently discovered. It is possible that a share of this may be reserved for the purposes of exporting to elsewhere in the Pacific, which could potentially provide a cheap source of imported energy for Fiji. However, Fiji's demand is unlikely to be sufficient to support a large LNG facility, implying a very high unit cost[23].

3.7 Bio-fuels

3.7.1 Status of implementation

The promotion of bio-fuels occupies a prominent position in the NEP and appears in both the energy security and the renewable energy themes. Bio-fuel investments also enjoy more tax concessions than other renewable energy sources.

The status of implementation of the 2006 NEP with respect to bio-fuels is summarised in the table overleaf. Following that, the key aspects of bio-fuel development and implementation are discussed in more detail.

[23]A small-scale LNG terminal would be one importing 1 Mtpa. This is approximately equivalent to enough natural gas to supply a 1,000 MW CCGT running to provide baseload supply.

Table 16 Summary of status – biofuels				
Reference	**2006 policy/action**	**Fulfilled?**	**Explanation**	**Relevant to future?**
Strategy 2.3.3	**Increase % use of renewable energy in the energy supply mix to 90% by year 2011**	**No**	**Ambitious target as transport sector dominates in the use of fossil fuels. Resource base not available in Fiji yet to transform land, maritime and air transport to renewable energy.**	**Yes**
2.3.3.1	Develop and implement a Strategic Master Plan for power generation using biomass and bio-fuel,	No	There is no masterplan for biomass/bio-fuels. A power sector development plan mentions biomass generation by IPP. Despite the attempt of various prospective IPP developers active in this area, no project has come to fruition.At the Energy Forum complaints were voiced by co-generator Tropik Wood that the negotiated FEA tariff (15 cents/kWh) was too low to maintain technology.	Yes
2.3.3.2	Implement a programme that ensures all electricity supply for the national grid are generated through renewable energy sources.	No	Outside the control of DoE which has neither regulator functions nor funds to direct towards RE investments. FEA has a target to generate 90% of power from RE by 2015. DoE director partly involved as member of the FEA board.	Yes
2.3.3.3	Implement the bio-fuel industry development programme	Yes	Three pilot CNO mills installed in outer islands, fourth CNO mill to be commissioned soon. Rural diesel grids are using CNO/Diesel blends at 20/80 % ratio. DoE to closely monitor the financial/economic performance of the operations and to assess food versus fuel issue. Comprehensive resource assessment of coconut stands only available for some areas (Rotuma performed by PIEPSAP/SOPAC). Resources available at SPC/SOPAC to assist DoE in further resource assessment work based on remote sensing data There were additional efforts to mainstream biofuels in Fiji and consideration was given to commit oil suppliers to mandatory blends(E10 and B5). However, despite considerable incentives for biofuel investors no investment in either a ethanol or an biodiesel (esterification) could be attracted.	Yes

Reference	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
Strategy 2.3.4	**Promote fuel diversification in all sectors**	**Partly**	**Focus on bio-fuels, no comprehensive analysis of land requirements, resource availability and food versus fuel issues**	**Yes**
2.3.4.1	Implement a widescale programme using organic wastes to produce gas for cooking/electricity purposes in domestic/commercial sectors	Yes	DoE has installed 20 biogas pilot operations in conjunction with animal husbandry (piggeries, dairy cattle). Gas used for cooking but not for power generation. Potential exists for methane extraction from Naboro landfill and Laucala Bay sewerage plant. Foreign Affairs Climate Unit to follow up on potential for CDM financing for industrial methane use to generate power.	Yes
2.3.4.2	Assess options including tax concessions for alternative fuels in the industrial, transport and other sectors	Yes	Biofuel legislation has been developed together with fuel standards for E10 and B5. Tax incentives in place for renewable energy investors. Best conditions for bio-fuel investors (10 years tax holiday, duty free import of equipment and of chemicals required to produce bio-fuels). 5 years tax holiday for other RE investments	Yes

SUMMARY

Status	Strategies	Actions
Fulfilled	--	3
Partially fulfilled	1	--
Not fulfilled	1	2
Unknown	--	--

3.7.2 Review and commentary

It is not clear, how bio-fuels and in particular CNO became such a high priority in the 2006 NEP. However, this is likely to reflect concerns, common across the Pacific, over the cost, volatility and risks to supply of imported petroleum and a view that domestic resources should be exploited first.

The DoE has developed a Draft Biofuel Policy[24] which appears to confirm this view. This policy document states:

> '*The economic viability of bio fuel necessarily depends on an evaluation of its cost when compared with the price of petroleum. At the present time, tax-free ethanol and gasoline prices even out when the price of an oil barrel fluctuates from US$ 50.00 to US$55.00. Since bio fuel technology has yet to attain maturity, it is estimated that parity will only be achieved when the oil barrel price is approximately US$ 60.00, as the case is in bio diesel. Today the price is well over US $120.00 per barrel. The economic conditions are right for the switch to fuel produced from agro- based businesses, whereby ethanol and bio diesel are the most important components, in addition to other types of bio fuels. Social (employment, income generation, migration flows) and environmental (climate changes, pollution) pressures reinforce and consolidate this position, as well as being able to bring the timetables forward.*"

This statement is the centrepiece of justifying the allocation of significant resources to the bio-fuel segment within DoE.

The 2006 NEP includes as an action item the development and implementation of a Strategic Master Plan for power generation using biomass and bio-fuels. Such a plan would have to address the whole range of costs and benefits of bio-fuels relative to petroleum products in more detail. As discussed below, currently is it not clear that bio-fuels are necessarily least-cost for Fiji. Unfortunately, the proposed Strategic Mast Plan for biomass and bio-fuels has yet to be prepared. This could be a follow-on step once the new NEP is finalised.

It is recommended to finalise the biofuel policy on the basis of the two biofuel feasibility studies commissioned by the World Bank in order to provide potential investors with a clear set of rules and incentives to invest in biofuel. The analysis should include an updated economic analysis of biofuel production and use including energy security considerations. It would be particularly useful to assess in detail the developments of the relevant world market commodity prices (sugar, ethanol, CNO) together with supply cost for these commodities to either the world market (in case of food commodities) or the supply cost of petroleum fuels to the six regulated fuel price divisions in Fiji.

[24] The document is not dated, presumably it has been compiled in 2008 as a precursor of the bio-fuel unit which has been established at DoE

Coconut oil

Considering the high priority given to bio-fuels in both the NEP and DoE's actual work programme and allocation of resources, it is noted that no explicit programme for collecting data on resources and competitiveness has been established. This is a missed opportunity as pilot projects now under way will generate a wealth of technical, operational and financial data and information.

A biodiesel study commissioned by the World Bank in 2009 found that there are a number of constraints that require careful consideration before any investment in biodiesel, with coconut oil as a feedstock, occurs in Fiji. The main constraints identified were:

- ❑ The relatively high value of coconut oil, as an export commodity in its own right, in comparison to diesel.
- ❑ Fijian coconut trees are ageing, with resultant lower yields of coconut oil.
- ❑ Volumes of biodiesel that could be produced from Fiji's domestic supply of coconut oil are low by industry standards and so the economies of scale are unfavourable.

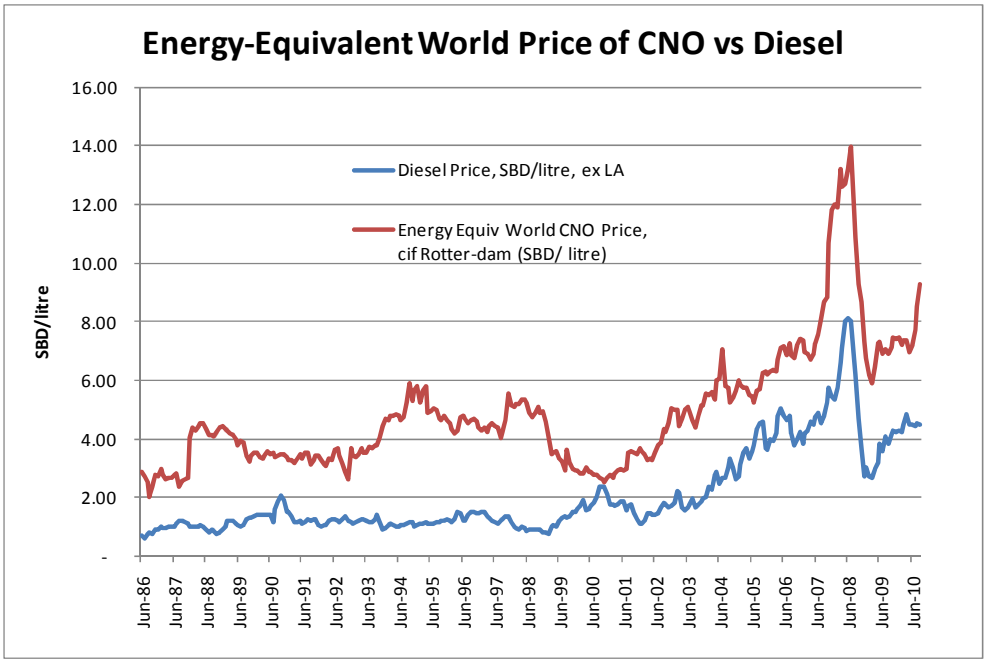
The report further states that coconut oil is a highly valued vegetable oil used in food, cosmetic and personal care applications. The prices that Fiji's coconut oil exports can command on the world market are significantly higher than the pre-tax price of wholesale diesel in Fiji and are typically higher than the duty-paid wholesale diesel price. This means that a potential biodiesel producer would face negative margins. Therefore, a Fijian commercial biodiesel industry, based on coconut oil, will require substantial and continuing support from government subsidies in order to be financially viable. In other words, the Government of Fiji needs to decide if an allocation of subsidies to biodiesel production is an efficient allocation of public funds.

Evidence from a recent bio-fuel pilot project in the Solomon Islands that uses CNO to replace diesel in one of the provincial power grids operated by the national power utility SIEA also suggests that CNO may well not be the least-cost option for Fiji[25]. The project concluded that in energy equivalent terms the world price per litre of CNO has at all times from 1986 to 2011 exceeded the world price of diesel fuel. After 2001, the price of CNO appears to have become correlated to that of diesel fuel, which probably reflects the increasing use of CNO as an alternative and, therefore, that demand for CNO and prices tends to move in line with diesel prices. Other vegetable oils that can be used as bio-fuels, such as palm oil and soybean oil,

[25] ADB/GHD – Coconut Oil As Substitute Fuel: Feasibility Study Auki, Malaita, 2012

also exhibit the same price pattern though the linkage appears to be most pronounced in CNO prices. This effect is exaggerated through the dual use of vegetable oils for biofuels and food products, which leads to food prices also rising with oil prices.

Table 17 CNO and Diesel on World Market



Source: ADB/GHD 2012

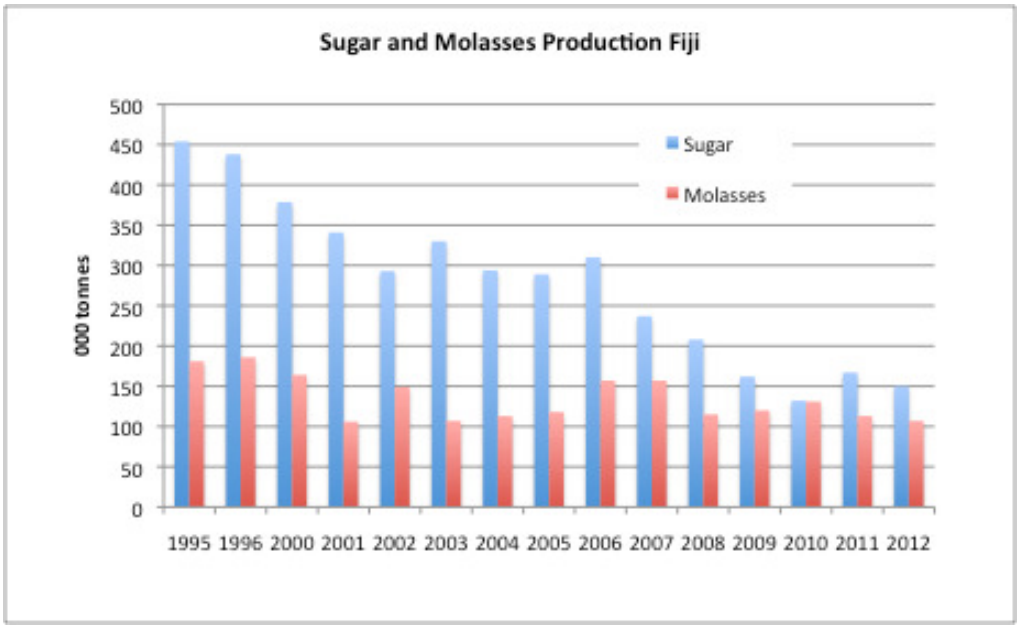
Notwithstanding the above economic and social considerations it must be noted that DoE succeeded in establishing three mini CNO mills on remote islands as a first step in its endeavour to establish a bio-fuel industry in Fiji. These mills are operated by the communities and sell a part of their outputs to community diesel systems which then blend 20% CNO into the diesel, effectively reducing diesel use by 18%. It is not clear what percentages of CNO are diverted into the food market, but the approach to add value in remote locations through local processing of agricultural products is commendable, irrespective of the use of the product. DoE has also embarked upon some applied research by introducing low level CNO/diesel blends as a fuel for Government vehicles. A comprehensive evaluation of these trials has not yet been performed and should be a high priority of DoE's revised work programme.

Ethanol

Ethanol production from molasses has been repeatedly suggested for Fiji and is included in DoE's bio-fuel promotion. While E10 has been included in the established fuel standards, no progress has been made towards ethanol production. It was expected that private investors would take up the opportunity to buy

molasses from FSC and convert it into ethanol. It appears, however, that the rapid decline of the sugar industry over the last 10 years is a deterrent for investors. The financial viability of ethanol production is highly sensitive to a consistent supply of feedstock and investors would scrutinize the feedstock resource and project availability into the future based on trends established in the past. These trends are clearly negative as shown in the figure below.

Figure 12 Sugar and Molasses Production in Fiji



Source: RBF, ADB

It should be noted that a feasibility study commissioned by the World Bank in 2008 found molasses based ethanol production a viable proposition, in particular if a 10% mandatory blend is targeted. Such blending for all retained unleaded petrol would require only 10 million litres of ethanol and an input of 42,000 tonnes of molasses. With some significant Fiji Government investments in its sugar industry in recent years, it is likely that the required feedstock would be available. However, at current oil price levels around US$ 100 per barrel, the government would have to wave the fuel tax on ethanol. The World Bank study suggests that the project would yield a financial return of 24%, possibly sufficient for an investor[26]. Without the fuel tax break, the return drops to 7 % and the project becomes marginal. It should be noted that according to an article in the Fiji Sun on May 26, the Fiji Sugar Corporation is currently undertaking another ethanol feasibility study. It would be desirable to obtain updated information on developments in order to reflect FSC's findings in the new NEP.

[26] Feasibility Study for Ethanol in Fiji, LNC World Bank 2008, p 37

3.8 Energy efficiency

3.8.1 Status of implementation

Improving energy efficiency is recognized as a highly cost-effective alternative to increasing energy availability. Supply side efficiency is not covered in this section as it is part of the power sector. What is covered in this section is demand side management in line with DoE's name change of its activities in energy efficiency to demand side management.

In the 2006 NEP the Government commits itself to facilitate greater energy efficiency in the industrial and other sectors. DoE has been committed to collaboration with other departments and public authorities to improve the management of these environmental impacts. The table overleaf summarises the results of energy efficiency activities, and is followed by a discussion of some of these energy efficiency activities in more detail.

Table 18 Summary of status – energy efficiency

Reference	2006 policy/action	Fulfilled?	Explanation	Relevant to future?
Strategy 2.2.1	**Increase efforts to create energy efficiency and conservation awareness and encourage energy-efficiency in all sectors**	**Partly**	**Focal area of DoE activity with some significant achievements. DoE sees need for specific policies and legislations and a need to have energy conservation and efficiency budgets for other ministries and departments to enable them to undertake these initiatives**	**Yes**
2.2.1.1	Develop and implement an energy efficiency and conservation programme with quantifiable targets covering all sectors. The Programme will include:	Partly	The energy efficiency activities of DoE have been re-labelled 'Demand Side Management' since 2011	Yes
a)	Public awareness and education programme on energy conservation/efficiency	Yes	Comprehensive training material produced and distributed to primary and secondary schools. DSM included in school curricula for 6, 7 and 8th form classes.	Yes
b)	Introducing incentives for importation and use of energy efficient equipment and appliances and efficient vehicles	Partly	Appliance labelling and standards decree promulgated for refrigerators and cooling systems to follow Australian Standards in 2007 (which became compulsory in 2012). Changes in import rules for second hand vehicles to limit age of second hand vehicles to 5 years or less. Reduced import duty on efficient busses.	Yes
c)	Implementing Minimum Energy Performance Standards (MEPS) and energy labelling programme for households and industrial appliances	Partly	2007 decree only covers refrigeration. Programme yet to be expanded to other appliances and industrial equipment	Yes
d)	Reviewing existing building codes to include energy efficiency concepts.	No	No activity in the past, but recruitment of specialised consultant currently under way with Permanent Secretary.	Yes
e)	Energy audits, energy efficiency research, introducing Energy Efficiency Service Companies	No	DoE lacks specific expertise in energy auditing. However two private companies offer energy auditing services.	Yes

SUMMARY

Status	Strategies	Actions
Fulfilled	0	1
Partially fulfilled	1	3
Not fulfilled	--	2
Unknown	--	--

3.8.2 Review and commentary

Measured against DoE's planning parameters the targets for energy efficiency and conservation have been partly fulfilled. DoE has in 2011 established a Demand Side Management unit consisting of 3 staff and has focussed its activities on appliance labelling for refrigeration technology and the development of training material for a programme on energy efficiency in schools. DoE's collaboration with the Ministry of Education has resulted in mainstreaming energy issues at all levels of primary and secondary education.

It is not entirely clear what 'environmental performance monitoring' means in the context of the action plan, but it appears that no such monitoring has been undertaken. The action item 'develop and implement an energy efficiency and conservation programme with quantifiable targets covering all sectors' has been partially executed but quantifiable targets for subsectors need to be developed.

The incentives programme mentioned under action item b) in the table has seen some success, notably in the transport sector (see Section 3.5). The review of building codes has not been executed, but has recently been initiated by DoE.

FEA also maintains a DSM unit, which is responsible for providing technical assistance and also for spreading awareness of energy efficiency. In 2008, the section completed two energy audits for the Holiday Inn and Tanoa Hotels[27].

DoE's current policy does not address the removal of common barriers to energy efficiency investments, as seen across the region. These typically include:

- ❑ High-risk perception of these investments among commercial banks.
- ❑ Relatively poor credibility of energy service providers.
- ❑ Insufficient capacity to audit, monitor and verify energy savings.

Experience in the region has shown that energy efficiency programs are best implemented by aligning their objectives with the strategies of financial intermediaries[28]. It is best to begin with the identification of local financial intermediaries interested in energy efficiency lending, followed by the design of energy efficiency interventions that conform to the specific business interests of financial intermediaries. If the programme is designed to include another partner organization, such as a utility company, its strategic objectives should also be aligned with that of the energy efficiency programme.

[27] FEA – Annual Report 2008

[28] ADB

4 Recommendations on mainstreaming

The analysis in the preceding sections highlights, in particular, the limited success in implementing the NEP and Strategic Action Plan. This report concludes that this limited success in implementation can be attributed to four main causes:

- The lack of capacity and resources within DoE, meaning that the vision of it becoming a central policy-making and planning entity cannot be readily realised. As such, the energy sector continues to lack a single coordinating entity that can oversee implementation of the NEP.
- The multiple entities involved in the energy sector, which means that mandates and responsibilities are not necessarily clear and responsibility for, as an example, renewable energy development is shared across multiple agents with different powers, remits and objectives.
- The restrictions imposed on sharing of energy-related information and the lack of efficient communication and cooperation between Government ministries, departments and SOE's.
- The lack of data and rigorous cost-benefit analysis to ensure that policy objectives are desirable and realistic. This can be seen, for example, in bio-fuels in particular where CNO based biodiesel is unlikely to be cost-competitive with diesel according to the biodiesel study commissioned by World Bank and where private sector interest in ethanol production could not be mobilised[29].

These factors are obviously interlinked. DoE's limited capacity means it has difficulties conducting the data collection and analysis needed to support such a wide-ranging policy. And the fragmentation of responsibilities means DoE cannot readily assert influence over other agencies to ensure delivery of the action plan.

Central, therefore, to any improvement in the mainstreaming of policy is the need to assess whether and how to strengthen DoE's institutional position and resources. This is the focus of the first part of our discussion in this section.

The second part of this section looks at specific points emerging from the reviews of the implementation of individual areas of the NEP. These are not necessarily related to mainstreaming directly but that will need to be addressed in the review policy.

[29] Although the World Bank feasibility study calculated a financial rate of return of 24% for a 10 million litre unit at an oil price level of US$ 100 per litre.

4.1 Coordination of policy, planning and implementation

4.1.1 The issues

The review makes clear the limited ability of DoE to influence policy and implementation in areas not explicitly under its current remit, despite being the custodian of the NEP. In practice, DoE's direct ability to influence policy appears to be largely limited to the promotion of energy efficiency measures. The review also highlights the number of elements of the policy, which appear to not be backed by rigorous analysis or planning. Examples include the rural electrification programme and the future role of bio-fuels.

It appears that energy sector planning has been one of the weakest areas in the past, which is due to limited financial and human resources as well as the lack of a legal mandate for such a planning authority. Several studies have clearly identified the need for a planning and regulatory authority that would develop national plans and would also have the capability to scrutinise, for example, FEA's own power sector expansion planning.

This will become particularly important if the significant reforms of FEA under consideration (the details of which were not made available for the energy policy review) proceed. These include the partial sale of the Government's stake in the business. In that case, the interests of FEA will be likely to increasingly diverge from those of government, and it will be necessary for government to have access to its own sources of expertise in the planning of the electricity industry.

4.1.2 A possible role for DoE

DoE appears to be the most relevant entity to develop a planning and coordination role with respect to national energy policy. To do so, it would need to develop a clear focus on knowledge management, planning, regulation and monitoring for the energy sector as a whole. This would require adequate resourcing for these activities and, possibly, new legislation in the form of an Energy Act or similar to clearly define DoE's remit in this regard.

If DoE does undertake such a function, it would be appropriate to improve its focus by reallocating those functions that do not fit with such a policy and planning remit. In particular, DoE should not be expected to combine a high-level policy and planning remit with responsibility for matters such as delivering operational subsidies, installation of equipment etc. These are very different functions. The latter might be better placed with a dedicated rural electrification and/or renewable energy agency with a remit for developing technologies and supporting electrification efforts. Some initial suggestions on how such a model might fit with

FEA and in the current electricity industry structure are provided later in this section. However, it might be necessary to retain functions of contract management and supervision within DoE, at least for a transitional period. With further expansion of the FEA grid into rural areas, the role of mini grids and stand-alone systems for electrification will reduce over time.

DoE should not become responsible for the implementation of economic regulation (pricing and competition regulation), which requires a different set of skills again and which should, ideally, be separated where practicable from planning and policy-making. This responsibility should rest with the Commerce Commission.

Even if DoE's remit is adjusted in this way, there would still be a need to ensure effective cooperation with other departments and agencies engaged in the energy sector. In particular, close coordination is needed between the Department of Energy and the Department of Transport to ensure that the National Transport Policy and the new National Energy Policy are mainstreamed.

Close coordination will probably require some form of overarching inter-departmental body which has responsibility for approving the NEP and for co-ordinating its implementation. DoE could then act as the secretariat to such a body. To ensure its decisions have sufficient influence, it would need to be chaired by a very senior figure such as the Prime Minister. The advisory committee established as part of this review could form a starting point for such a body.

4.1.3 Alternatives

There are two obvious, but very different, alternatives to the possible strengthening of DoE as a planning body described above.

The first is to remove all planning and policy responsibilities from DoE and leave it as a technical agency alone. The planning functions would be transferred to the Ministry of Planning. However, this review does not recommend this course of action given that it does not solve the basic problem of a lack of capacity in energy planning and loses the sector focus that DoE can provide.

At the National Energy Forum in April 2013, there were several participants who suggested upgrading DoE to a fully-fledged ministry as an alternative, possibly in the form of a Ministry of Minerals and Energy incorporating the Department of Minerals as well. This is the model followed by many countries. It would remove some of the current overlaps and gaps and greatly enhance DoE's position as well as making clear its policy-making role, as opposed to its role as a technical agency. However, this would represent a major institutional upheaval with revisions to the entire allocation of portfolios in Government. It would also still not solve the basic problem of how to coordinate with other entities such as those involved in transport. The same applies to the option of merging functions of the Department of

Environment, the Climate Change Unit at the Ministry of Foreign Affairs and International Cooperation.

In general there are a number of options to streamline current Government functions in energy and related sectors. It goes beyond the terms of refernce for this review to recommend on a restructuring of Government portfolios across the board. The fact that there is considerable fragmentation and overlap in the energy administration of Fiji remains and this should be addressed by Government. The upgrading of DoE to ministerial status would certainly signal that government gives a high priority to energy issues.

4.2 Specific implementation issues

4.2.1 Energy planning

This is covered in Section 4.1, above.

4.2.2 Power supply – grid based

Maximise the use of cost-effective renewables

Renewables should be encouraged where these are the least-cost means of supply. This requires a comprehensive assessment of the different technologies using up-to-date costs and then measures to overcome barriers. For example, FEA could offer a standard contract for renewable generators priced at the avoided cost to encourage economic investments. A premium could be added for more secure (i.e. domestic) supplies.

Strengthen the regulatory framework ahead of FEA's privatisation

FEA is largely self-regulating at present and the proposals for regulating FEA post-privatisation are currently unknown. In the meantime, the conclusion of this review is that an independent power sector regulator would be cumbersome and expensive for a small country like Fiji, but a formal regulatory contract which is published, includes investment plans, and is supervised by the Commerce Commission could be a step in the right direction. The contract would be prepared with the help of independent consultants and subject to public consultation to improve its quality, transparency and acceptability.

Complete the electrification programme

This requires a national electrification plan showing how each un-electrified area should be served (FEA grid extension, diesel based mini-grid, solar home systems etc.). FEA's own power development plan should then be integrated with this plan.

The plan may need to be accompanied by an explicit electrification obligation on FEA to prevent it trying to avoid further electrification post-privatisation (if privatisation goes ahead). As discussed in Section 4.2.3, grid extension is one of the key delivery models for electrification, but it needs to be conditional on the economic viability of electrification and accompanied by clear rules on subsidies so that FEA is not left financially disadvantaged by electrification activities. It would also be desirable to separately identify the costs and revenues of FEA's electrification activities so that assessments of its commercial position, required tariffs etc., all take account of its public service obligation.

The potential for increasing FEA's role in electrifying remote areas is discussed further in the following section on rural electrification.

Define the role of the private sector

The main obvious role for the private sector in the energy sector in Fiji is as IPPs to provide electricity to the main grids, in order to relieve the investment needs of FEA and to introduce competition into project selection (which may help reduce costs). Some thought is needed here as to whether FEA should be tendering specific projects or more general requirements (for example, a certain megawatts of capacity able to operate reliably throughout the year, not specific on technology type and site location). There also needs to be clarity on how acceptable IPP power purchase agreement (PPA) prices are established, given the potential for IPP policy to be misused in the form of over-priced PPAs that benefit local well-connected investors.

In principle, the private sector might also be involved in electrification. However, as discussed in the following section on rural electrification, overseas experience is that private investors are rarely willing to undertake large-scale electrification schemes in remote areas. The more realistic potential for private sector involvement in electrification might be for FEA or DoE to establish isolated systems and then to contract the operation and maintenance of these to the private sector on a management contract or lease basis (so no up-front capital investment required from the private side).

Other specific recommendations

Our other recommendations that are more specific to operation and expansion of the power system include putting in place:

- A requirement for a Power Development Plan (PDP) that is updated on an annual or biannual basis and is publicly available, building on the present PDP developed by FEA. If FEA judges that commercially sensitive information is in the PDP, then an Executive Summary could still be made publicly available with the sensitive information removed.

- ❑ A grid asset management plan detailing the operation and maintenance programme and costs for managing the grid and associated generation. This will ensure that on one hand the grid is not being run down and on the other there is no over investment ("gold plating"). An asset management plan that clearly defines the operations and maintenance costs for the existing grid and generation will also assist in fixing the tariff on a factual basis.

- ❑ A clearly defined framework including technical details for connecting small-scale renewables and embedded generation to the grid. This would encourage rooftop solar and other forms of small-scale renewable generation.

4.2.3 Power supply – rural electrification

At present, approximately 20% of the rural population does not yet have any access to some modern form of energy.[30] The ongoing efforts of DoE and FEA under the Government funded rural electrification programme will probably continue to make progress towards full coverage, however the sustainability of provision in rural areas appears to be at risk.

The existing policies in Fiji reflect an approach to rural electrification that was popular throughout Asia-Pacific during the previous decade and is characterised by a move towards small off-grid providers (some of which would in theory be private, others community operated). However, experience overseas has shown that in most cases the costs of operating small systems (including solar home systems, which are relatively easy to install and subsidise up-front) are higher than the tariffs that rural communities are willing/able to afford, and as a result private providers do not enter the market without Governments providing operational subsidies.

The situation in Fiji seems to mirror this experience – community operated models often lead to deteriorated and inoperable diesel or micro-hydro systems, while the maintenance of solar home systems is heavily subsidised on an ad-hoc basis by the Government. While these models have had some success, they do not appear to be sustainable, long-term solutions for most of rural Fiji.

Many countries, including Philippines and Cambodia, are now putting more emphasis on grid-based electrification, with subsidies directed at this rather than other delivery models. Where grid-based electrification is not currently (or is unlikely to ever be) feasible (for remote areas or in areas with low population density), solar home systems are used.

[30] This figure dates back to the 2007/08 census. Since then DoE estimates around 1,500 households per year have been electrified (primarily through the installation of solar home systems), although these gains will likely have been offset by population growth and the deterioration of existing systems.

This report recommends that a similar approach be explored for Fiji – giving FEA more of a leading role in electrifying new areas (rather than relying on community applications and stringent viability tests as in the current Rural Electrification Policy), with Government subsidies used in some cases (for example for non-economic expansion of the grid, or for the initial installation of off-grid systems) to ensure that FEA still recovers its costs. It is particularly important that FEA's role in rural electrification be clarified with respect to the main islands and urban centres of Fiji in light of the reforms that are currently being considered.

The number of remote islands in Fiji poses additional challenges for electrification (previous estimates suggest less than 10% of the rural population not electrified are within economic reach of FEA's grid, although this assessment should be updated). In theory, FEA could expand into remote islands by establishing off-grid systems and solar home systems on a subsidised basis, and then operating/maintaining them through village associations or similar delivery models. It would be well positioned to lead in this regard (given that its staff are qualified and experienced, has the capability to purchase fuel through bulk procurement arrangements), however it is noted that this is unlikely to happen in short to medium term. FEA's focus is set squarely on the three main islands and it would be a clear departure from current policy and practice to change this. Regardless, it is particularly important that FEA's role in rural electrification be clarified given the reforms that are currently being considered.

The District Works Department is another possible candidate for taking on the implementation of rural electrification in remote areas, but in recent years it has had its number of staff reduced significantly and no longer has the technical expertise located in the remote islands that it used to. It therefore seems likely that DoE will continue to take on the role of managing the implementation of remote systems, although it should focus predominately on procurement and monitoring (for example procuring private contractors) rather than hands-on implementation. If DoE is given the mandate of energy planning and regulation, its role in implementation should be gradually moved to other Government departments and private sector bodies.

Regardless of the institutional arrangements, the delivery models and available technologies for rural electrification need to be reviewed, and a defined framework for providing operational subsidies (where necessary) developed. This could take the form of an Electrification Fund, which removes the burden of operational subsidies from DoE's budget and provides FEA with a clear mechanism for recovering the cost of non-commercial grid extensions.

Specific gaps in existing policies relating to rural electrification include:

- ❑ New electrification targets need to be developed.
- ❑ An electrification master plan still needs to be developed.

- ❑ The role and obligations of FEA relating to rural electrification needs to be clarified.
- ❑ The existence of an energy regulator and its future role with respect to rural electrification should be clarified.
- ❑ A framework for providing on-going operational subsidies needs to be defined and adequate funding secured that of new applications for rural electrification can be satisfied. This could take the form of a national electrification fund or similar to cover the difference between allowed tariffs and actual costs. The need for any such fund is linked to FEA's future role.
- ❑ Where 'RESCO' and community-operated systems are continued, their design and use of different technologies should be updated. This includes consideration and research of new technological options now available in Fiji (including diesel-solar hybrids). On-going research into new, proven technologies needs to be improved.
- ❑ Reporting, monitoring, and training by DoE's Rural Electrification Unit still need to be improved, as evidenced by the difficulties that many schemes have faced and the lack of information available on their performance.

4.2.4 Renewable energy

Arguably one of the areas where energy policy in Fiji can have the greatest impact is in encouraging the research and development of renewable energy resources, in particular the development of large-scale hydro, wind, and potentially geothermal sites for the use of grid-based power generation. The process of quantifying the renewable energy resources in Fiji is incomplete and needs to be continued so all technologies and resources are addressed. This should be an on-going process. The 2006 Energy Policy appears to consider this a one-time effort but in the face of climate change and changing technologies, it will be important to continue collection and filing renewable energy data for all technologies.

There is also an urgent need to make all resource data widely available to prospective investors. Lack of access to resource data has been an impediment to private sector project development in the past and a provision should be made in the new policy, which requires publishing resource data (access to DoE database on resources) in order to attract reputable project developers.

The potential of renewable energy technologies in rural areas, in particular solar, is already well proven in Fiji and the key in this regard is to apply implementation models that are effective and sustainable.

A considerable data gap also exists in the area of traditional cooking fuels and therefore it is recommended to start collecting data for biomass used for cooking and other traditional purposes.

DoE should not aim to develop new technical standards for renewable energy in Fiji, but rather continue to promote appropriate existing standards. Standards and guidelines for on-grid and off-grid solar should be based on the work by SEIAPI (Sustainable Energy Industries Association of the Pacific Islands) including covering design and installation aspects, while standards for other renewable energy should be based on Australian Standards. SEIAPI recommended standards for its members are based on international practices and best practices in the Pacific Islands and are in the last stage of development. These can be the basis for Fiji standards and guidelines for future grid-connected and off-grid solar installations. Similar standards for small wind systems also need to be adopted. Standards for bio-fuels are already in place.

At the project level, it is recommended to improve the feedback and actively learn from experiences made in Fiji and elsewhere. This means to:

- ❑ Critically evaluate the performance of projects and technologies such as the Butoni wind farm in order to avoid replicating investments in low performing technologies.
- ❑ Avoid replication of trial projects until at least five years of success have been observed.
- ❑ Not repeat technical concepts that have been tried earlier in Fiji or elsewhere in the Pacific and have not been successful.

It is also recommended to integrate all separate project plans into a master energy plan that leads to new policy goals to be formulated.

Such a plan also needs to be backed up by the introduction of additional incentives for grid-connected wind and solar (net-metering, feed-in tariffs, special financing conditions, etc.). There is also a very strong link with what will happen with FEA and regulation and who sets feed-in tariffs for grid-connected renewables.

4.2.5 Transport

The transport sector is the main user of imported fuel. Some policies have already been put in place in the land transport sector to improve energy efficiency and to encourage the use of more energy efficient vehicles. The new National Energy Policy should incorporate in more detail policies and strategies directed at improving fuel efficiency in the transport sector.

The biggest opportunity in fuel savings and energy conservation is in land transport. Improving vehicle standards, providing incentives to import fuel-efficient vehicles, improving road conditions, and improving congestion management have been identified by stakeholders in the Energy Forum as some of the ways to improve energy efficiency in the land transport sector.

Fiji could reduce its land transport petroleum use considerably through the introduction of electrical vehicles. The technology of electric busses, cars and scooters is mature and electric/hybrid vehicles would be a financially attractive alternative at today's electricity tariffs. However the possibility of electric vehicles enabling a serious reduction in imported fuels is still some way away – fully electric vehicles are still not a cost effective alternatives to standard vehicles. Also, whether this offers benefits is dependent on the source of electricity—simply switching from importing petroleum products for land transport to importing for electricity generation to power electric vehicles is of little benefit (it would need to be accompanied by grid-based renewable energy expansion)

The air and marine transport industries are also major users but the potential for Fiji, acting alone, to increase efficiency in these is much more limited. There appear to be opportunities to improve fuel efficiency by imposing stricter vessel standards for inter-island travel, as well as potential to adopt energy efficient modern designs such as sail assisted ships or to introduce the use of bio-fuels and solar power for marine vessels. The costs and benefits of such proposals need to be evaluated.

4.2.6 Petroleum

While there is general agreement on the desirability of reducing the volume and cost of imported petroleum products, the potential to do so is limited. There are two main strategies that Fiji can employ: bulk procurement of fuel supplies and a review of the pricing mechanisms for imported fuel:

- **Bulk procurement** – Reducing the cost of imported petroleum through changes in the procurement modality has been discussed in both Fiji and the wider Pacific region for two decades. Despite several attempts of the Forum Secretariat to convince Pacific leaders to subscribe to a bulk procurement system for the entire region this project never took off, as it would have regionalised a very critical part of sovereign decision making of the national governments involved. In Fiji the option of changing to the so-called Samoa model has also been discussed. It is an established fact that Samoa consistently achieves to supply the country at cost below supply cost for petroleum products than Fiji. This is mainly due to historic government ownership of bulk storage, which allowed the government of Samoa to regularly tender their supply and procure at competitive cost. As Samoa is supplied from Fiji the supply cost to Samoa should be higher than to Fiji due to additional transport and handling. When Shell started to sell its assets in Fiji, a purchase of Shell's bulk storage by Government and a change to the Samoan petroleum procurement model was discussed, but Government did not take the opportunity. As all storage is now owned by the suppliers, a change to the Samoan model would require a buyout of existing capacity or investment in new bulk storage. This is not currently a

realistic option for Fiji and this report does not recommend that it be pursued further.

- **Review of petroleum pricing** –To date, fuel price regulation in Fiji has been determined, almost exclusively, on submissions by the dominant suppliers. In addition, current fuel price regulations seem to allow too generous a Return on Capital Employed (ROCE) as the agreed profit component. The ROCE seems to be applied to the price regulated volume, thus resulting in a relatively high 'cents per litre ROCE allowance' which is also recovered from the price regulated market. A study[31] commissioned by the Cook Island government which regulates fuel prices in essentially the same way Fiji does found in 2005 that fuel price reductions available through direct negotiation with oil companies and a thorough review of pricing templates are in the region of FJD 15-36 cents per litre. Even if Fiji is at the lower end of this savings scale, its volume of approximately 200 million litres per annum means that thereappears to be potential savings of more than FJD 30 million per annum.

It is also recommended that consideration be given to reviewing current pricing arrangements against different energy security and environmental objectives. In particular, it would perhaps desirable to shift taxes and/or levies away from LPG to encourage an increase in its use in the transport sector. LPG is currently the most expensive fuel by energy content, but also the cleanest and most convenient fuel for cooking. But any move to do so needs to be carefully analysed—experience elsewhere is that this can rapidly turn into an extended and ultimately unaffordable subsidy programme. The price review should analyse the submissions made by the suppliers, assess if the ROCE rates and other pricing parameters are appropriate and analyse if LPG can be priced more competitively.

Petroleum exploration is not an area that should fall under the mandate of DoE (it currently falls with the Department of Minerals). However, it perhaps should be addressed at a high level in the National Energy Policy.

4.2.7 Bio-fuels

The economics of bio-fuel production and use needs to be carefully analysed. While superficially attractive, experience suggests that many of the claims made for it are unrealistic. It needs to be demonstrated that costs for imported fuels are indeed high enough to justify the diversion of a valuable export commodity (CNO) from its regular application as food and chemical feedstock into the fuel market.

[31] Ouro Preto, Cook Islands Review of Fuel Distribution and Pricing System, Prepared for Cook Islands Government, October 2005

Fiji's outer islands may still represent a niche market situation where an under-utilised resource (coconuts and land) could be used to replace a critical and costly imported commodity (diesel fuel) while generating local employment and revenue. Local social impacts would be positive and the rehabilitation of coconut plantations could actually increase food security by a) providing additional cash income for local communities and b) allowing the reintroduction of mixed cropping patterns typical for well-maintained coconut stands.

Due to the fuel-versus-food problematic, many countries have initiated research in biofuel feedstocks that do not compete with land and water use for crop production. Materials include cellulose contained in agricultural and forestry wastes as well as organic municipal wastes. It is recommended to investigate such sources in Fiji.

4.2.8 Energy efficiency

Despite considerable potential, efforts to improve end-use energy efficiency have consistently fallen short of expectations. Progress is hindered by a lack of rigorous monitoring and evaluation.

Particular emphasis should be placed on energy efficiency in the public sector, which has been the trigger for the development of energy efficiency projects and energy performance contracting in many countries overseas, given that the size and complexity of providing energy services for public buildings and facilities makes projects/contracts attractive. Governments can use the public sector as a platform for encouraging and demonstrating the potential of large-scale energy efficiency initiatives. To do this, it is recommended that the key barriers to energy efficiency projects be investigated in Fiji, either by DoE or through a specific study on the topic.

Other steps that the Government can take to mainstreaming energy efficiency across all its departments and other end user segments include:

- ❑ Public education and awareness campaigns on ways to reduce household and industry energy consumption
- ❑ Tracking technological developments (such as the emerging LED lighting technology) and keeping the public aware of such developments and their costs on DoE's website
- ❑ Prioritising interventions with high impact (such as refurbishment of street lighting with low energy LED technology)
- ❑ Instituting information systems so that a verifiable data trail is created and energy savings can be reasonably verified
- ❑ Reviewing relevant codes and standards for building industry and industrial operations and adaptation of these to accommodate energy efficiency.

ANNEXES

A1 Minutes of cross-sectoral meeting

Fiji Government Cross-Sectoral Meeting for Input into the Review of the 2006 National Energy Policy and Strategic Action Plan

Date: Friday 19th April 2013

Venue: Ministry of Strategic Planning, National Development and Statistics

Minutes

The meeting was attended by representatives from the following Fiji Government ministries and departments:

- ❑ Ministry of Youth & Sports
- ❑ Ministry of Local Government, Urban Development and Housing
- ❑ Republic of Fiji Military Forces (RFMF)
- ❑ Ministry of Health
- ❑ Fiji Corrections Service
- ❑ Maritime Safety Authority of Fiji (MSAF)
- ❑ Ministry of Sugar
- ❑ Water Authority of Fiji (WAF)
- ❑ Ministry of Industry & Trade
- ❑ Ministry of ITaukei Affairs
- ❑ Mineral Resources department
- ❑ Department of Government shipping Services
- ❑ Biosecurity Authority of Fiji

In addition representatives from the Department of Energy, Ministry of Strategic Planning, National Development and Statistics, GIZ and UNDP attended the meeting.

Each Government representative gave a briefing to the meeting covering the following three areas, which was then followed by a Q&A session:

Recently endorsed sectoral policy and action plan or documents under development;

Key links between the respective sectoral policy and action plan and the energy sector; and,

Main items from the sector to be reflected in the revised/new energy policy and action plan which are regarded as being key to supporting the Ministries/Departments sectors' development.

The information collected is presented in the following table.

Table 19 Information collected at cross-sectoral meeting

Ministry/ Department/ Authority	Recently endorsed policy / policy or plans under preparation	Key links between the respective sectoral policy and action plan and the energy sector	Main items from the sector to be reflected in the revised/new energy policy and action plan	Other comments
Sugar Ministry	3 focus areas of the policy & action plan: Increase national cane production Efficient harvesting & transportation of cane to mill Improving mill efficiency & mill operation	Clean and efficient cultivators, harvesters, machineries – energy is needed to operate these Rails and lorries for transport Potential to showcase railway as tourism attraction in off-season. Sustained mills performance and operations	Modern cane production technology requires energy Efficient sugar mill hardware Value-adding by-products of sugar cane (sugar refinery/co-gen/ethanol) Option of producing ethanol (from molasses) endorsed by PM and feasibility study underway Ongoing discussions between FSC & FEA on bagasse fed 40MW generation at FSC Ba and 10MW at FSC Labasa are planned to run 365days/yr	Key industry in Fiji

Ministry/ Department/ Authority	Recently endorsed policy / policy or plans under preparation	Key links between the respective sectoral policy and action plan and the energy sector	Main items from the sector to be reflected in the revised/new energy policy and action plan	Other comments
Maritime Safety Authority of Fiji (MSAF)	No specific sector policies or plans on energy – focus is on ship safety	However fuel is needed for the maritime sector – main source of energy In context of maritime safety lighting up jetties & wharfs (Suva, Labasa, Savusavu, Levuka) is a priority Concerning GSS fuel costs are subsidized by Government Power/lights for navigations aids (Gau, Kadavu, Koro, etc.) Rising cost of fuel for GSS and private operators is a major concern Links to Transport Planning Unit with fuel subsidy from Government	Navigation aids – currently using solar but there are not enough of them Rising cost of fuel for GSS and private operators Lighting jetties and wharfs using renewable energy and efficient lighting technologies Getting enough energy for the needs of the maritime sector as mentioned above Policy in transport sector lacking on how to get more appropriate boats/ferries (e.g. similar to LTA concerning buses), subsidies and fuel types	MSAF is concerned with ship safety & maritime safety, qualifications and training and it plays a regulatory role. Other key Government agencies in maritime transport are the Transport Planning Unit (TPU) and the Government Shipping Services (GSS). GSSand MSAF can discuss about using alternative to fossil fuel based maritime transport including sails, solar PV and hybridsto carry cargo and passengers No policy on fuel cost, just increasing complaints from the private sector. Fuel consumption is verified for ships. MSAF is only a regulator but not operator of ships and boats
Ministry of Health	No specific sector policies or plans on energy. However some nursing stations in rural and outer islands powered by solar and a few by wind (eg. Nabouwalu)	One of the biggest service providers in Fiji Govt Would like to seeuse of renewable energy sources further encouraged in all sectors and activities including Health Uses a lot of energy – it is a major cost for Ministry	Wind energy for rural stations Plans for CWM /Lautoka –decentralization efforts underway to reduce waiting list and cost including for electricity. Contracting out (e.g. laundry) underway also in an effort to reduce cost including for electricity. Encourage use of renewable energyat all levels of Government	Very cautious about the pollution side of energy Achieving Millennium Development goals (MDG's) including health related targets depends on availability of energy

Ministry/ Department/ Authority	Recently endorsed policy / policy or plans under preparation	Key links between the respective sectoral policy and action plan and the energy sector	Main items from the sector to be reflected in the revised/new energy policy and action plan	Other comments
Ministry of Youth & Sports	There is a National Youth Policy & National Sports Policy. These do not include specific policies or plans on energy however the Youth Policy has 8 thematic areas and one of these is environment and sustainability.	Working with Sigatoka town council on waste management within the municipality and plans to expand the scheme into generation of electricity Have to assist many school leavers every year Installation of solar power system at Kadavu Youth Center	Managing of equipment and RE technology disposal (e.g. disposal of used solar panels, etc.)	Frequency of energy policy review - 5 years is too long because energy sector is dynamic. So it is recommended to shorten review period Plan to have solar system for other Youth Centers
Department of Housing	Administers the Housing Act. Social Housing Policy (renewable energy is captured here to be used for new housing) Social housing policy emphasizes: Accessibility Affordability sustainability	Social housing needs / low-income earners Sustainable housing Squatter re-settlement and relocation Building new housing Access to services, especially electricity	Needs of low-income earners in urban and rural areas Providing access to electricity to new housing developments Consumer produced power (e.g. via net-metering) Consumers to have control of their power (to help in case of disasters / emergencies) More options on the market for sustainable housing Renewable energy technologies for housing and mapping methods accompanied by training and capacity building Continuous provision of power to rural areas	It was mentioned that electrical connection of new households on housing developments has been hindered by FEA and WAF

Ministry/ Department/ Authority	Recently endorsed policy / policy or plans under preparation	Key links between the respective sectoral policy and action plan and the energy sector	Main items from the sector to be reflected in the revised/new energy policy and action plan	Other comments
Department of Environment	Environmental Management Act and many relevant other acts, policies and plans including Resource-based plan, Solid waste management strategy, National biodiversity strategy action plan, climate change policy, etc.	Coordination/consultation National resource inventory (as part of the legislated State of Environment reporting) Set-up regional landfill for power generation (1 each in the West and North)	Require new power stations to support new infrastructure developments Encourage power generation from industrial sector	
Department of Local Government	Currently reviewing Local Government Act.	Industrial technologies to process waste	Coordination / consultation at the sector level is an issue Energy sector needs to receive more recognition as all sectors need energy	
Department of Mineral Resources	Currently reviewing the Mining Act. In 2012 a Rural Water and Sanitation Policy was prepared.	Geothermal resources are currently classified as a mineral under the current Mineral Resources Act - Department responsible for issuing licenses for land based exploration. Use of water for the production of energy and electricity.	Provision of energy for mineral activities/development. Have some advance mineral exploration projects in place: Geothermal resource exploration – two licensescurrently under consideration Via JBIC funding made available for a geothermalpre-feasibility study	Feasibility study indicates FEA will not be able to meet the demand during the implementation of the projects. 4 licenses issued forexplorationofgeothermal resources (production/exploration). Hydro thermal exploration also underway
Fiji Corrections Services	No sector policy or action plan including energy			Initiatives are in place to reduce the energy consumption in terms of limiting appliances used and energy saving tips.

Ministry/ Department/ Authority	Recently endorsed policy / policy or plans under preparation	Key links between the respective sectoral policy and action plan and the energy sector	Main items from the sector to be reflected in the revised/new energy policy and action plan	Other comments
Government Shipping Services (GSS)	No sector policy or action plan on energy but GSS is in compliance and abided by the Marine Act and Marine Regulation	Initiatives are in place to reduce fuel consumption by reducing of shipping movement. Provisions of shore power installations for vessels while at berth	Rising fuel costs. Contemplating on acquiring vessels that are economically viable.	Only have in-house initiatives' for energy saving programs Considering on using Bio-fuel or alternatives to fossil based products including Solar Power, Sail, Natural Gas and Electro Hybrid
Water Authority of Fiji (WAF)	No explicit formal policy relating to energy	Implement cost cutting measures/energy efficiency in terms of power factor improvement. E.g. in 2012 the (electricity bill was reduced by FJ$0.5 million based on an investment of FJ$145,000. Contemplating on improving equipment efficiencies. WAF is in partnership with FEA in terms of power generation (eg. Vaturu 2MW mini hydro) Also viewing developments of good gravity sites for installing additional mini hydro power plants along with their water catchment sites.	50% unaccounted water due to theft and leaks (in particular in Rewa area). In addition some large consumers don't pay their bill (including Government entities). Request for FEA to provide WAF with a special tariff rate. In general FEA should reduce tariffs further.	$25mill per year in electricity bill out of an allocated total budget of $40million. 9 major pump stations for WAF Power generation is not WAF's core business Have to work in partnership with companies or FEA in terms of power generation. Wastage in water usage really put a lot of burden to WAF. (eg. Leaving tap water running, water theft) Waste water (storm water) intrusion overload the system (Liaising with Local Government on this)

Ministry/ Department/ Authority	Recently endorsed policy / policy or plans under preparation	Key links between the respective sectoral policy and action plan and the energy sector	Main items from the sector to be reflected in the revised/new energy policy and action plan	Other comments
Biosecurity Authority of Fiji	Deal with quarantine issues such as pests and diseases	Encourage clean energy, renewable energy and waste management Utilization of of Bio-energy such as issuing import permits including screening importation of possible raw materials (e.g. new plant and seeds) for bio-fuel energy generation purposes. Such screening can take between 3 months to 2-years		Keen on the introduction of Bio-energy
Ministry of Industry & Trade	National Export Strategy (NES)			Doing in house energy savings programme
Ministry of iTaukei Affairs	3 Acts in place: iTaukei Affairs Act iTaukei Lands Act iTaukei Lands Trust Act No sectoral policy for energy but have policy that are used in consultation with other ministries who has the legislation for it	Establishment of the National iTaukei Resources committee to oversee the implementation of new projects on iTaukei lands to assist managing possibleland disputes and delay in project implementation	Prior consultation should be carried out with iTaukei Affairs in regards to any energy projects being planned/implemented because many projects sit on iTaukei land (about 90% is iTaukei land) This to reduce the delay in project implementation	Feasibility studies have found out that about 100 villages/settlements are relocated due to the effects of climate change and new developments

A2 References

The following documents have been reviewed and used to compile the mainstreaming report.

No.	Title	Author	Year
	General background		
1	The sustainable development of Fiji's energy infrastructure: a status report	Anirudh Singh	2009
2	SMEC, National Energy Security Situation Report	SMEC	2009
3	DoE Internal Energy Policy Review	DoE	2012
4	SREP Pacific Regional Energy Assessment	PIREP	2004
5	Presentation on Fiji National Energy Security	UNESCAP	2012
6	Renewable Energy Developments in the Pacific – present status and future prospects	Anirudh Singh	2011
7	Presentation - Practical Steps to ReduceFiji's Petroleum Fuel Imports	Peter Johnston	2010
8	FEASP Fiji Country Energy Security Indicator Profile	SPC	2009
9	Fiji Policy Database	REEEP	2010
10	Fiji National Workshop on Energy Planning and Policy	DoE	2011
11	Renewable Technologies and Risk Mitigation in Small Island Developing States (SIDS): Fiji's Electricity Sector	Dornan and Jotzo	2012
12	Presentation - Promoting Renewable Energy Policies in Fiji	DoE	2011
13	Fiji energy situation and carbon financing possibilities	Tricorona	2010
14	Doing Business in Fiji	IFC	2011
15	Renewable Energy Report	APCTT	2009

No.	Title	Author	Year
16	Pacific Islands Energy Strategic Acton Plan (PIESAP)	SPC	2007
17	Framework for Action on Energy Security in the Pacific (FAESAP)	SPC	2011
18	A Review on Gender Mainstreaming and Action Plans of the SIDS IUCN ORO Energy Projects	SPC	2010
19	DOE Annual Report 2011	DoE	2011
20	DOE Annual Corporate Plan 2013	DoE	2013
21	Country Energy Profile_ Fiji - Clean Energy Information Portal - reegle	REEGLE website	2011
22	DoE submission on results of past symposiums		
23	A Framework for Sustainable Electricity Development in Fiji	Greenpeace	2000
24	Presentationson mainstreaming in Fiji	David Smith	Various
25	Mainstreaming Poverty-Environment Linkages into Development Planning: A Handbook for Practitioners	UNDP	
26	Cook Islands Energy Act	Cook Islands	2012
27	Cook Islands Power Utilities Act	Cook Islands	2012
28	Samoa Electricity Act	Samoa	2010
29	Fiji Private Sector Assessment	ADB	2011
30	Fiji 2012: Revitalizing the Economy	ADB	2012
	Laws, regulations, policies		
31	National Climate Change Policy	DoE	2012
32	National Energy Policy Framework Strategic Action Plan	DoE	2006
33	National Energy Policy Document	DoE	2006
34	Rural Electrification Policy	Cabinet	1993

No.	Title	Author	Year
35	Environment Management Act	Cabinet	2005
36	Supplement to the 2012 Budget Address	Ministry of Finance	2011
37	CDM Policy Guidelines - Draft	Dep of Environment	2009
38	Electricity Act	Cabinet	
39	Draft Biofuels Policy	DoE	
40	Strategic Development Plan, 2007 - 2011	NES	2006
41	Roadmap for Democracy and Sustainable Socio-Economic Development for 2009 – 2014	Ministry of National Planning	2009
42	Public Enterprise Act	Cabinet	1996
43	Petroleum (Exploration and Exploitation) Act	Cabinet	1978
44	Commerce Act 1998	Cabinet	1998
45	Emergency Power Act 1998	Cabinet	1998
46	People's Charter for Change, Peace, and Progress	Cabinet	2011
47	Customs Act 1986	Cabinet	1986
48	Final determination on FEA	Commerce Commission	2013
49	Final determination on Petroleum	Commerce Commission	2013
50	Final determination on LPG	Commerce Commission	2013
	Donor projects		
51	Presentation on WB Sustainable Energy Financing Project (SEFP)	WB	?
52	Final Evaluation Report - Promoting Sustainability of Renewable Energy Technologies and Renewable Energy Service Companies in the Fiji Islands	UNDP	2010

No.	Title	Author	Year
53	Fiji Renewable Energy Power Project, Project Indentification Form	GEF	2009
54	SEFP Executive Operations Manual	WB	2010
55	SEFP grant agreement	WB	2010
56	SEFP Project Appraisal Document	WB	2010
57	FREP work plans, 2012 & 2013	WB	2012
58	FREP final inception report	WB	2012
	FEA		
59	Renewable Energy Developments in Fiji – Fiji Electricity Authority	FEA	2009
60	Presentation - Symposium on Renewable Energy Technologies	FEA	2010
61	Annual report 2011	FEA	2011
62	Annual report 2010	FEA	2010
63	Determination on hcarging customers for capital costs	FEA	2011
64	Quantification of the Power System Energy Losses in South Pacific Utilities	KEMA	2012
65	FEA Regulatory Review	Maunsell	2010
66	Presentation - Future Renewable Energy Investments	FEA	2010
67	Presentation - FEA	FEA	2012
68	FEA Power Development Plan 2011-2020	FEA	2011
69	Consumer Extensions Policy	FEA	
70	FEA grid code	FEA	2011
71	PPA benchmarking report	PPA	2011

No.	Title	Author	Year
	Transport and petroleum		
72	SOPAC Development Of An Energy Efficiency Project for Land Transportation	SOPAC	2008
73	Promotion Of Environmentally Sustainable Transportation In The Pacific Islands	SOPAC	2005
74	Presentation - Balancing Our Fuel Demand	MSPNDS	2012
75	Framework for Action on Transport Services 2011	SPC	2011
76	The Petroleum Potential of Fiji	SOPAC	1993
77	Study on Procurement Policies and Practices in FICs and Recommendations on theinclusion of Government Procurement in thePacific Island Countries Trade Agreement	Pacific Islands Development Agency	2011
78	Small Island States Bulk Procurement of Petroleum Products: Feasibility Study	ADB	?
79	Trade Standard (Fuel Standard) Order 2007	Cabinet	2007
	Biofuels, agriculture, and forestry		
80	Fiji National Agriculture Census	DoA	2009
81	Facilitating Financing for Sustainable Forest Management in Small Islands Developing States and Low Forest Cover Countries	Indufor / UNDP	2010
82	Potential for Liquid Biofuels in Fiji	SOPAC	2009
83	Presentation - Biofuel Developments in Fiji	DoE	2010
84	Biofuel from Coconut Resources in Rotuma	PIEPSAP	2007
85	An Evaluation Of The Biofuel Projects In Taveuni And Vanua Balavu, Fiji Islands	SOPAC	2006
86	Economic Feasibility Of The Sopac-Catd Biofuel Project, Nadave, Tailevu, Fiji Islands	SOPAC	2010
87	Agriculture Strategic Development Plan, 2010-2012	DoA	2009
88	Forests of the Pacific islands	SPC	2011

No.	Title	Author	Year
89	Biofuels and Fiji's roadmap to energy self-sufficiency	Anirudh Singh	?
90	Feasibility Study for Ethanol in Fiji	LMC/World Bank	2008
91	Developing a Biofuels Industry in Fiji	Al Binger, Raghavan & Ronneberg	2005
92	Trade Standard (Order 2011) National Biodiesel Ethanol Standard	Cabinet	2011
93	Feasibility Study on Biodiesel	LMC/World Bank	2008
	Rural electrification		
94	Charter for Renewable Energy Based Rural Electrification with Participation of Private Enterprises	DoE	2003
95	Case Study of the Fiji Rural Electrification Programme	UNDP	2012
96	Report of Rural Electrification (RE)Survey	DoE	2006
97	ADB Rural Electrification Project Summary	ADB	2005
	Energy efficiency		
98	The costs and benefits of introducing standards and labels for electrical appliances in Pacific Island countries	SPC	2011
99	Feasibility of Appliance Labelling in Samoa, Tonga, and Vanuatu	SPC	2010
100	Energy Efficiency for the Domestic Householder	SOPAC	2001
101	Energy Efficiency for Commercial Buildings in the South Pacific	SOPAC	2002
102	Presentation - Cost-benefit Analysis of Investment in Renewable Energy andEnergy Efficiency in the Pacific	ESCAP	2012

No.	Title	Author	Year
103	Guidelines For Strengthening Energy Efficiency Planning And Management In Asia And The Pacific	ESCAP	2011
104	Promoting Energy Efficiency in the Pacific	ADB	2008
105	The Costs and Benefits of Energy Labelling and Minimum Energy Performance Standards for Refrigerators and Freezers in Fiji	George Wilkenfeld and Associates Pty Ltd	2007
106	Customs Act - Trade Standards - Household Electric Refrigerating Appliances Order 2007	Cabinet	2007
	Technology specific info		
107	Strengthening the Fiji Biogas Programme	Agama	2006
108	Presentation - AGrid-connected PV System forUSP	USP	2010
109	Annual-Report-2010	Fiji Sugar Corporation	2010
110	Ocean Based Renewable Energy Technologies	SOPAC	2009
111	Nadarivatu and Vaturu Wainikasou Hydropower CDM Projects	FEA	2011
112	Presentation - Prospective Hydro Schemes: Namosi, And Serua	Hydro Developments	2011
113	South Pacific Islands - Geothermal energy for electricity production	Isor	2008
114	Geothermal Resources In The Pacific Islands: The Potential Of Power Generation To Benefit Indigenous Communities	McCoy-West	2011
115	Presentation - Sustainable Solar-Based Rural Electrification in the Fiji Islands - The Renewable Energy Service Company Model	ANU	2011
116	Pre-feasibility study of a potential Wind farm in Benau, Savusavu, Fiji	FNU	2011
117	Presentation - Status of wind power in Fiji	USP	2010

No.	Title	Author	Year
118	Exploring The Potential Of Waste As A Renewable Source Of Energy In The Pacific Islands	SPC	2007
119	Hybrid Power Systems and Their Potential in the Pacific Islands	SOPAC	2002
120	The solar home PV program in Fiji - A successful RESCO approach?	Urmee & Harries	2012
121	Fiji Insolation Database	Luis Vega	2003
122	RECIPES Pacific Islands-Part D - 060209 - Fiji SHS case study included	Developing renewables	2005
123	JBIC Report Hydro Survey	JBIC	2009
124	JBIC Report Geothermal	Nittetsu Mining Consultants	2009
	Statistics		
125	Fuel imports & re-exports 2007-2009	DoE	2009
126	Pacific shipping energy use data	DoE	2008
127	Fiji Energy Indicators	DoE	2009
128	Fiji Energy Balance	DoE	2008
129	Timber Production Imports and Exports	FBS	2011
130	Production and Sales of Electricity	FBS	2011
131	Fiji Facts and Figures	FBS	2011
132	Consumption per Head	FBS	2011
133	Household Income and Expenditure Survey, 2008-09	FBS	2009

A3 Mini Hydro and Geothermal Resources Fiji

NO.	SITE (RIVER)	LOCATION	CAPACITY (kW)
Vanua Levu			
1.	Nadamanu	Lekutu, Bua	1,000
2.	Saquru	Labasa, Macuata	1,000
3.	Nuku	Navakasali, Bua	1,100
Viti Levu			
4.	Wailoa Downstream	Naboubuco, Naitasiri	10,300
5.	Wainavau	Sigatoka, Navosa	1,400
6.	Nasa	Sigatoka, Navosa	1,500
7.	Sigatoka 1	Sigatoka, Navosa	3,100
8.	Sigatoka 2	Sigatoka, Navosa	3,900
9.	Solikana	Sigatoka, Navosa	1,300
10.	Nabiaurua	Tavua	1,600
11.	Ba	Ba	2,600
12.	Nakara	Ba	1,100
13.	Loqa	Rakiraki, Ra	1,300
14.	Tawa	Rakiraki, Ra	3,100
15.	Savu	Saivou, Ra	1,600
16.	Nasoqo	Wainimala, Naitasiri	4,100
17.	Naboubuco	Wainimala, Naitasiri	3,700
18.	Waqaitabua	Matailomaibau	1,500
19.	Waikonavona	Matailomaibau	2,100
20.	Waiduvu	Matailomaibau	1,200
21.	Wainivodi	Wainimala, Naitasiri	2,000
22.	Wainisavulevu 1	Wainimala	3,000
23.	Wainisavulevu 2	Wainimala	4,100
24.	Wainimala	Wainimala	2,300
25.	Wainimakutu	Namosi	3,000
26.	Nakavika	Namosi	8,800
27.	Sovi	Namosi	4,700
28.	Wainivadu	Namosi	5,400
29.	Wainamoli	Wailoa, Naitasiri	4,600

Source: Pilot Study for Comprehensive Renewable Energy Power Development, Tokyo Electric Power Company for Japan Bank for International Cooperation (JBIC).

Area	Estimate Temperature (°C)	Suitability	Temperature and Volume of Reservoir	Capacity
Viti Levu				
Sabeto	120°C	No problem for PS construction No problem for grid-connected system	Reservoir Temp. - 120°C Area – 1km x 2km Thickness – 200m	0.5MW
Ba	120°C	Mangrove Too far to grid-connected system	Reservoir Temp. – 120°C Area – 1km x 2km Thickness – 200m	0.5MW
Tavua (Waikatakata)	Boiling before: 150°C	No problem for PS construction No problem for grid-connected system	Reservoir Temp. – 160°C Area – 2.5km x 1km Thickness – 400m	6MW
Rabulu	110°C	No problem for PS construction No problem for grid-connected system	Reservoir Temp. – 110°C Area – 1km x 1.5km Thickness – 200m	0.2MW
Nakavika	140°C	In steep mountains Impossible for grid-connected system	Reservoir Temp. – 140°C Area – 1km x 2km Thickness – 200m	1.5MW
Naseuvou	130°C	Flatland No bridge near this point Impossible for grid-connected system	Reservoir Temp. – 130°C Area – 1km x 2km Thickness – 200m	1MW
Wainawaqa	Discharge temp: 28°C	Flatland Impossible for grid-connected system	Reservoir Temp. – 100°C Area – 1km x 1.5km Thickness – 200m	0MW
Busa	180°C	Necessary to confirm access road	Reservoir Temp. – 180°C Area – 1km x 1.5km Thickness – 200m	4MW
Waibasaga	150°C	No bridge near this point Impossible for grid-connected system No access road	Reservoir Temp. – 150°C Area – 1km x 1.5km Thickness – 200m	1.5MW
Viti Levu Total15MW				
Vanua Levu				

Area	Estimate Temperature (°C)	Suitability	Temperature and Volume of Reservoir	Capacity
Savusavu	170°C	No problem for PS construction No problem for grid-connected system	Reservoir Temp. - 170°C Area – 2.5km x 1km Thickness – 400m	8MW
Rava Beach	185°C	No problem for PS construction No problem for grid-connected system	Reservoir Temp. – 185°C Area – 1km x 1km Thickness – 200m	2MW
Tabia	150°C Boiling spring	No problem for PS construction No problem for grid-connected system	Reservoir Temp. – 150°C Area – 1km x 1km Thickness – 400m	2MW
Waiqele	150°C Boiling spring	No problem for PS construction No problem for grid-connected system	Reservoir Temp. – 150°C Area – 2.5km x 1.5km Thickness – 400m	8MW
Vunimoli	130°C	No problem for PS construction No problem for grid-connected system	Reservoir Temp. – 130°C Area – 1km x 2km Thickness – 200m	1MW
Vanua Levu Total>23MW				

Source: Department of Energy: Project Dossier on Renewable Energies 2010/JBIC

A4 Summary Discussions National Energy Forum

SESSION 1: TRANSPORT

- Transport-links to the energy sector, supply & demand issues, alternatives:
  - **Key Actions:**
  - Develop policy on minimum vehicle standards and on phasing out old energy inefficient vehicles
  - Develop policies to provide incentives for use of energy efficient vehicles
  - Improve infrastructure to support better vehicles
  - Investigate feasibility of having railway system for mass transport in Lami-Nausori and Singatoga-Ba corridors
  - Improve availability of transport data and knowledge management on transport efficiency
  - Investigate more technology options for energy efficient vehicles, such as electric cars etc
  - Enabling environment for private sector to contribute to energy efficient transport

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SESSION 1: ENERGY ACCESS

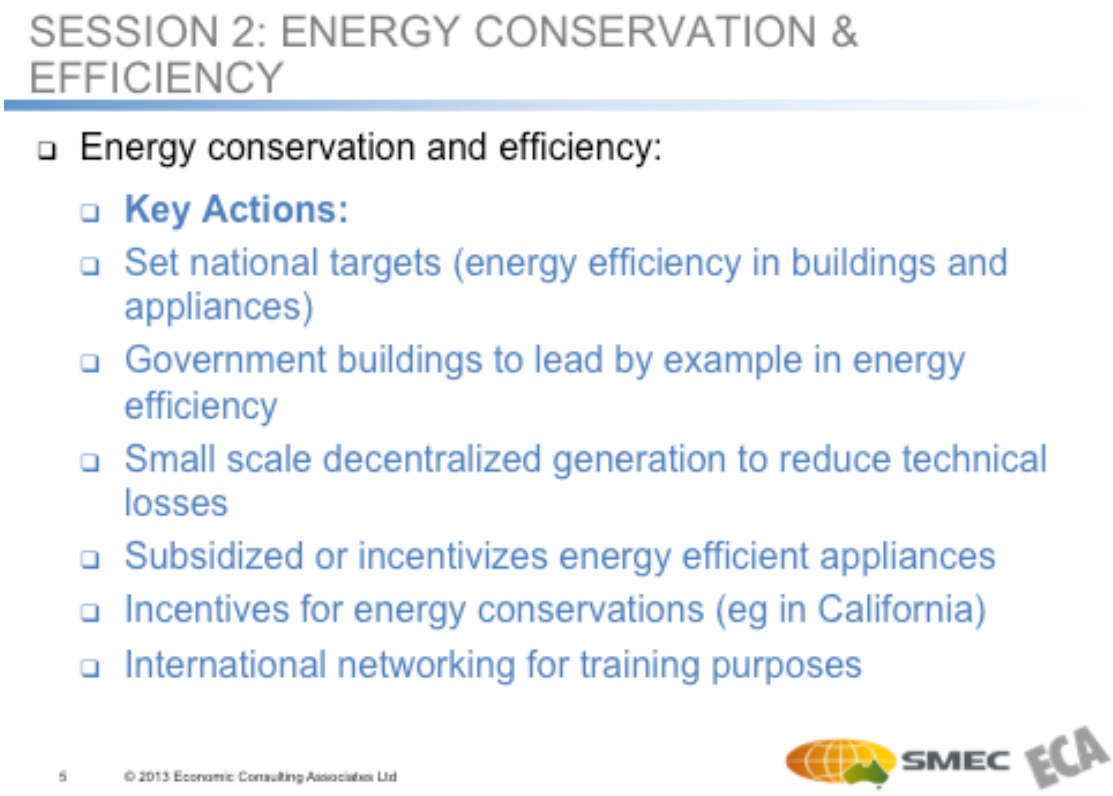
- Energy access, alternatives:
  - **Key Actions:**
  - Access to finance/fund for sustainable energy to increase energy access
  - Commitment of Government to international targets and improve performance monitoring
  - Uplift status of energy sector by introducing a separate Ministry of Energy
  - Resource assessment of potential renewable energy sources, determine least cost supply
  - Clarify regulatory framework for RESCOs and other private service providers
  - Scale up successful pilot project in renewable energy

3

SESSION 2: ENERGY RESEARCH, EDUCATION, TRAINING

- Energy research, education and training:
  - **Key Actions:**
  - Training for communities to operate and maintain generation assets
  - Raise awareness of end-users on energy efficiency and renewable energy through different mass media
  - Include awareness education in school curricula
  - Provide training by international expert to local industry and institutions
  - Joint committee between education institutions and DOE to align energy education and training

4


SESSION 2: ENERGY CONSERVATION & EFFICIENCY
Energy conservation and efficiency:
Key Actions:
Set national targets (energy efficiency in buildings and appliances)
Government buildings to lead by example in energy efficiency
Small scale decentralized generation to reduce technical losses
Subsidized or incentivizes energy efficient appliances
Incentives for energy conservations (eg in California)
International networking for training purposes
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SESSION 3: INVESTMENT & FINANCING

- Key Actions:
  - Improve communication and coordination
  - Project development guidelines
  - Inventory of showcase projects
  - Monitoring system
  - Streamline processes, one stop shop
  - Improve access to personal financing
  - Media program to advertise financing opportunities
  - Establish steering advisory committee
  - Government to continue on course with electoral cycle

SESSION 3: CONDUCIVE ENERGY INVESTMENT ENVIRONMENT

- Key Actions:
  - Actively pursue local/foreign investors
  - Stream line processes/one stop shop
  - Establish accreditation scheme for RE installers
  - Educate bank staff on RE investments
  - Develop industry specific solutions, eg hotels
  - Refine energy loan portfolio requirements to include smaller loans
  - Promote innovative business models
  - Government to approach donors to provide guarantee funds
  - Centralized information on available international facilities promoting RE investments
  - Develop RE expertise at provincial level
  - TLTB to provide special lease condition for energy project
  - Learn from successful international experiences
  - Better marketing of RE loan products


SESSION 4: LEGISLATION, REGULATORY, & INSTITUTIONAL FRAMEWORK
Key Actions:
Establish Ministry of Energy and formalized Energy Act
Clear guidelines for investors
Attract the right expertise for regulatory authority
Establish national energy advisory committee and task force groups with representatives from key stakeholders including TLTB
Set PPA conditions to break even in ten years
Remove regulatory role from FEA
Increase competition in the market
Knowledge management and monitoring
Develop action plan with timelines and allocation of responsibilities
4
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