

UPDATED VANUATU NATIONAL ENERGY ROAD MAP

2016-2030



JUNE 2016

**Updated Vanuatu National
Energy Road Map
2016-2030**

June 2016

Acronyms and Abbreviations

ADB	Asian Development Bank
BAU	Business as usual
CCDRRS	Vanuatu Climate Change and Disaster Risk Reduction Strategy
CSOs	Civil Society Organisations
DoA	Department of Agriculture
DoE	Department of Energy
DoT	Department of Transport
EE	Energy Efficiency
EU	European Union
GGGI	Global Green Growth Institute
GHG	Greenhouse gases
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoV	Government of Vanuatu
GPOBA	Global Partnership for Output Based Aid
HH	Households
INDC	Intended Nationally-Determined Contribution under the UNFCCC
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
IUCN	International Union for Conservation of Nature
kWh	Kilowatt-hours
LPG	Liquefied Petroleum Gas
MEPS	Minimum Energy Performance Standards
MoF	Ministry of Finance
MOPS	Mean of Platts Singapore
MW	Megawatts
NAMA	Nationally-Appropriate Mitigation Action
NERM	National Energy Road Map
NGEF	National Green Energy Fund
NGOs	Non-government organisations
NSDP	National Sustainable Development Plan
NZMFAT	New Zealand Ministry of Foreign Affairs and Trade
PEEP	Promoting Energy Efficiency in the Pacific
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PV	(Solar) Photovoltaics
RE	Renewable Energy

RESCO	Renewable Energy Service Company
SMART	Specific, Measurable, Achievable, Relevant, and Time-bound
SPC	Secretariat of the Pacific Community
SREP	Scaling Up Renewable Energy in Low Income Countries Programme
TBD	To be determined
UNDP	United Nations Development Programme
UNELCO	Union Electrique du Vanuatu Limited
UNFCCC	United Nations Framework Convention on Climate Change
URA	Utilities Regulatory Authority
US\$	United States Dollars
VAT	Value-added Tax
VISIP	Vanuatu Infrastructure Strategic Investment Plan
VREP	Vanuatu Rural Electrification Project
VUI	Vanuatu Utilities & Infrastructure

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Foreword

The endorsement of Vanuatu's first National Energy Road Map (NERM) in 2013 was a landmark occasion in the development of the country's energy sector. Since then, valuable progress has been made towards the NERM's objectives and targets. More households now have access to electricity in and near concession areas, and the Vanuatu Rural Electrification Project has been launched to extend access to off-grid areas. Several renewable electricity generation projects have been implemented, including the United Arab Emirates-funded solar photovoltaic project, and biofuel projects in Saratamata and Sola. This progress reflects the combined impact of initiatives led by the Government of Vanuatu, energy companies, development partners, and many other sector stakeholders. The NERM also triggered an upgrade of the Energy Unit, which has significantly enhanced the Government's capacity to develop, implement, and monitor initiatives that can deliver additional results.

At the same time, developments outside the energy sector have shaped how energy sector policies and priorities are conceived. Cyclone Pam in early-2015 highlighted the importance of resilient and reliable energy infrastructure. The Vanuatu Infrastructure Strategic Investment Plan, Vanuatu's Intended Nationally-Determined Contribution under the United Nations Framework Convention on Climate Change (UNFCCC), the Vanuatu Climate Change and Disaster Risk Reduction Strategy 2016-2030, and the forthcoming National Sustainable Development Plan, among other government strategic documents, include objectives and actions likely to contribute to the NERM's priorities.

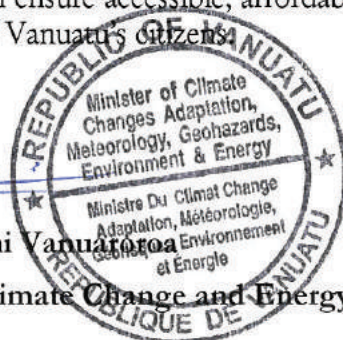
With these developments in mind, in July 2015 the Government called for an update of the NERM. As a 'living document', the NERM has been updated to reflect on recent developments (and adjust the NERM's targets and implementation plan accordingly), while retaining the vision and direction of the NERM endorsed in 2013. The updated NERM also better emphasises Vanuatu's vision for sustainable energy and sustainable development. In particular, it expands on the potential role of renewable energy and energy efficiency, by introducing new energy efficiency targets and a new priority area—green growth—that explicitly links Vanuatu's economic growth with opportunities in the energy sector.

The updated NERM was developed through a collaborative process, and reflects the contributions of a range of energy sector stakeholders. I would especially like to express my appreciation for the technical assistance and funding provided by the World Bank Group and Global Green Growth Institute that have made this update possible.

This updated NERM reiterates the Government's commitment to achieving the NERM's objectives. We look forward to the support of development partners, energy companies, energy consumers, and broader ni-Vanuatu in this endeavour. I have no doubt that, together, we can ensure accessible, affordable, secure and reliable, and sustainable energy supply for all of Vanuatu's citizens.


Hon. Ham Lini
Minister for Climate Change and Energy

July 2016



Executive Summary

Vanuatu's National Energy Road Map (NERM) was considered and endorsed by the Council of Ministers in 2013. The NERM is the policy framework for developing the energy sector in Vanuatu.

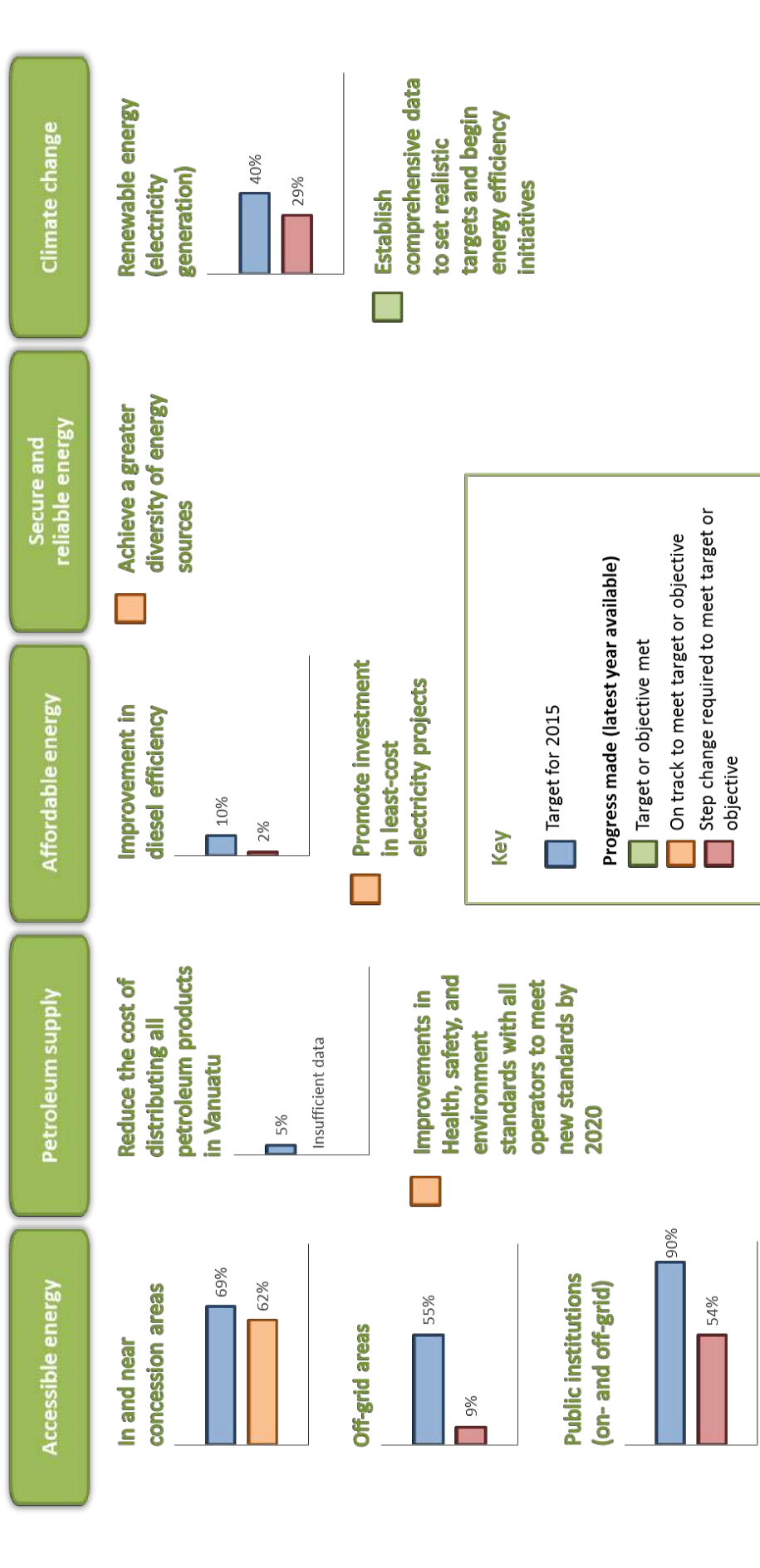
The 2013 NERM's overall vision is to energise Vanuatu's growth and development through the provision of secure, affordable, widely accessible, high quality, clean energy services for an educated, healthy, and wealthy nation.

The NERM identified five priorities for the energy sector: access, petroleum supply, affordability, energy security, and climate change. It set out objectives, targets and actions to achieve these priorities and contribute to the NERM's overall vision.

Figure 0.1 provides an overview of the progress made up to the end of 2015.¹ The progress review indicates that the NERM 2013 targets have not yet been reached in several areas, and that additional effort will be needed to achieve the NERM's long-term targets.

¹ In some cases, data for 2015 are not available and progress is measured based on the latest available data.

Figure 0.1: Summary of Progress Against NERM Targets and Objectives



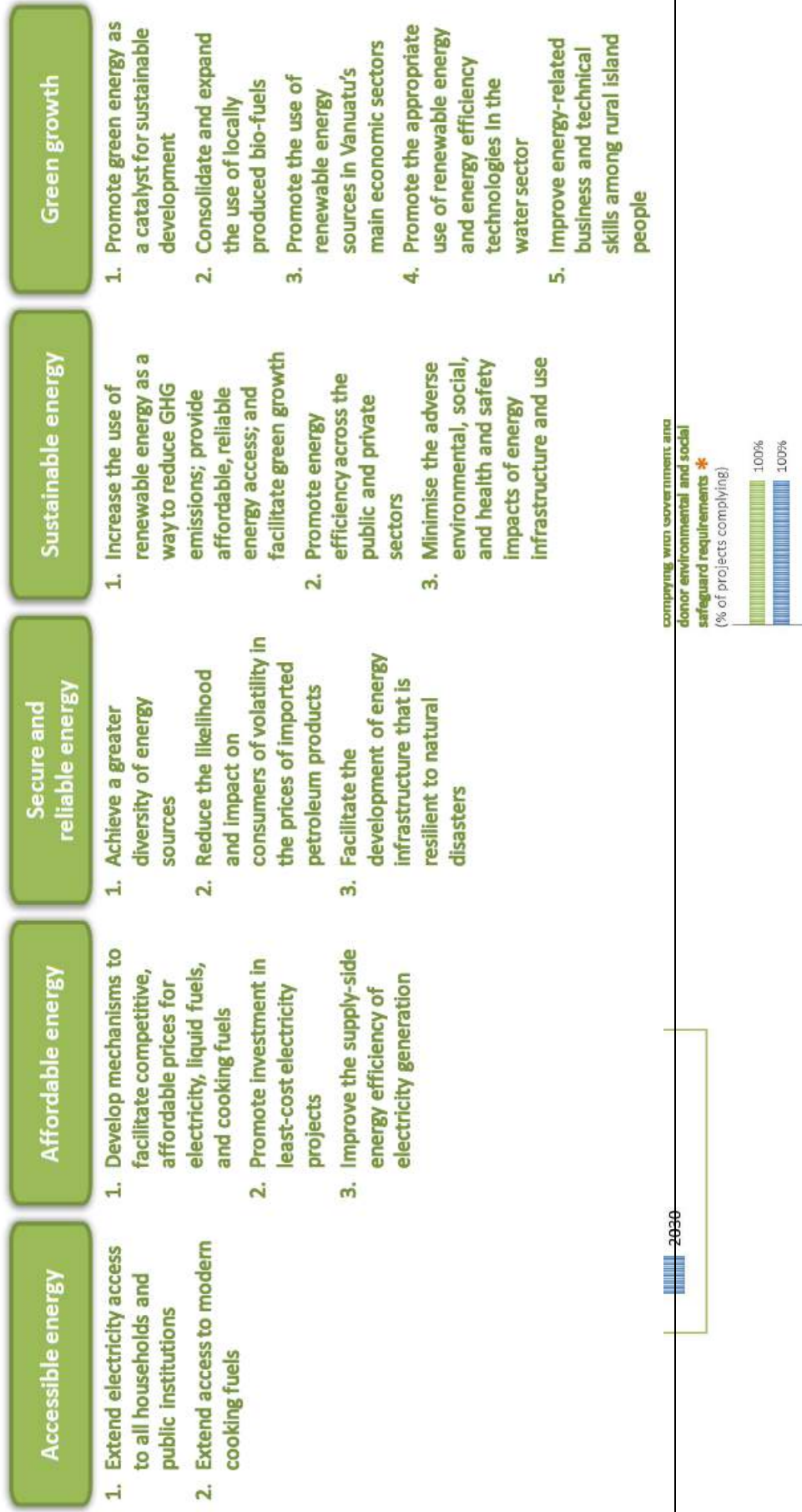
Since the NERM was launched, Vanuatu's economy and energy sector have continued to develop. External events, such as Cyclone Pam in early-2015, have also shaped how energy sector policies and priorities are conceived.

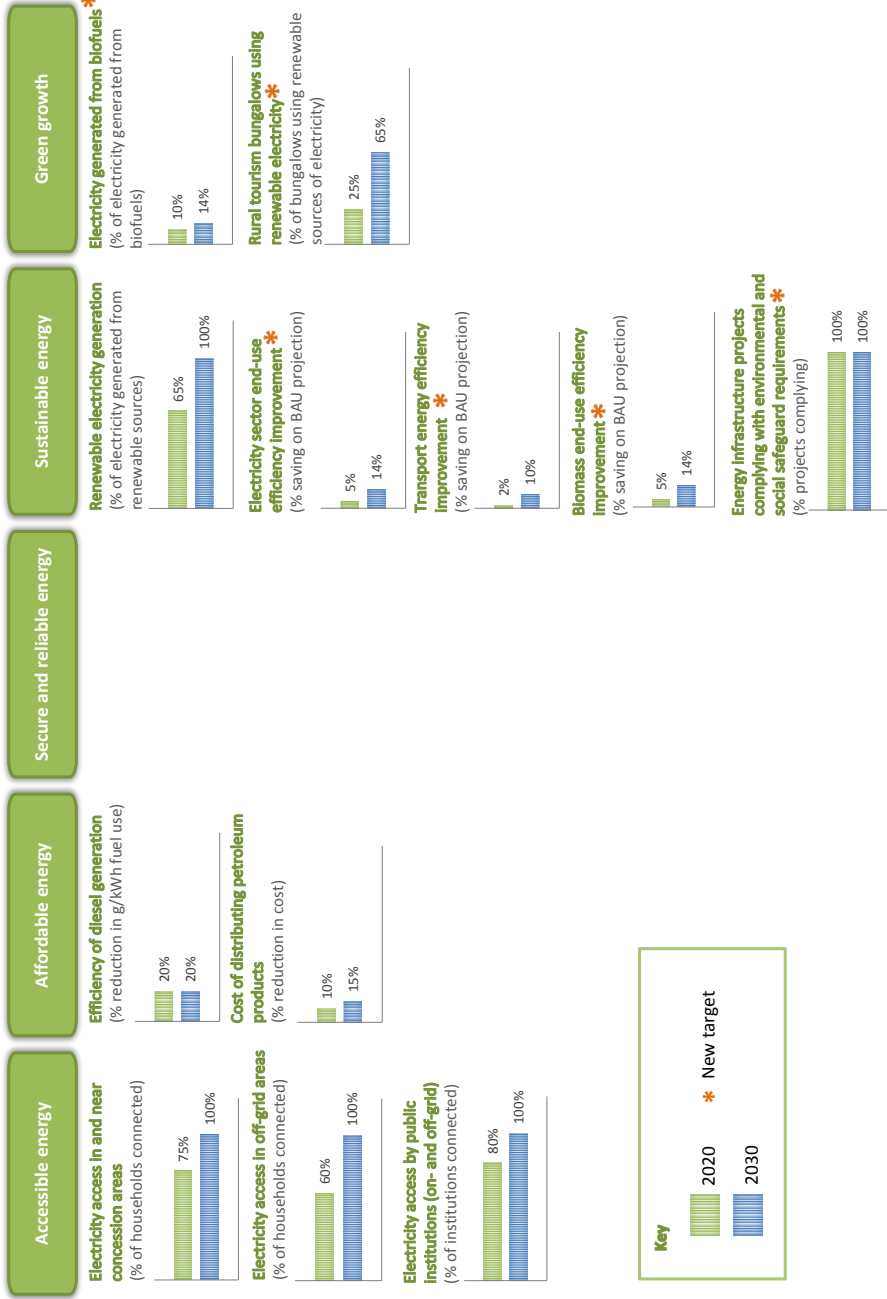
The purpose of this document is to update the NERM to reflect recent developments. This updated NERM has the same vision as the 2013 version of the NERM, and its objectives, targets, and actions are intended to be consistent. In updating the NERM, the Government is, however, taking the opportunity to provide more detail on particular areas (especially energy efficiency and green growth), and improve consistency of the priorities and objectives.

To achieve the NERM's vision, this updated NERM focuses on five priorities: accessible energy, affordable energy, secure and reliable energy, sustainable energy, and green growth. These five priorities are used to categorise the key objectives of the NERM (although several objectives work to achieve multiple priorities). Figure 0.2 summarises the priorities and objectives in the updated NERM. These objectives will be pursued only where the technologies are proven and the benefits exceed the costs.

Future progress towards the objectives will be measured against various quantitative targets (Figure 0.3). The Government remains committed to achieving the NERM's original targets, and all quantitative targets from the 2013 version of the NERM are being retained in the update. Some additional targets have been added, to emphasise particular priorities such as energy efficiency and green growth. It is envisaged that additional targets, under secure and reliable energy, and green growth, will be added in the future as more data become available.

Figure 0.3: Revisited Strategic Objectives of NERM-related NERM





This updated NERM proposes 68 actions to achieve the NERM's objectives. Many of these actions are the same as in the first NERM Implementation Plan. Some actions and investments envisaged when the NERM was published in 2013 are not included in this updated Implementation Plan, because they have already been completed or are now—due to changes in circumstances—considered less of a priority. Several other investments and actions have been added to the Plan, especially to reflect the updated NERM's emphasis on green growth, and the improved information base on energy efficiency.

Nineteen of the 68 actions included in the updated Implementation Plan are already in progress, and so are considered to be immediate priorities (actions highlighted in blue in Table 0.1). A further 22 are the highest priority actions on which work should commence in 2016 (actions highlighted in green in Table 0.1). The Implementation Plan in Appendix B includes an additional 27 actions that should also be undertaken, but are considered 'high' or 'medium' priorities. The timelines for implementing these less urgent actions will depend on the availability of financial resources, and of government staff time.

Overall, it is estimated that it will cost at least US\$250 million between 2016 and 2030 to implement all the actions in the Implementation Plan. These costs will be funded through a mix of Government, donor, private sector, and other funding.

Table 0.1: Ongoing and Highest Priority Actions

Investment/action	Main outcome(s) it contributes to	Energy subsector(s)	Priority	Status	Funding source
Investments and Donor Programmes					
Undine Bay Solar PV System (510kW)	Access, sustainability, green growth	Electricity	Immediate	Construction completed; ready to launch	UNELCO
GPOBA Grid Based Electricity Project	Access	Electricity	Immediate	In progress	World Bank
Efate Ring Project (grid extension)	Access	Electricity	Immediate	In progress	UNELCO
Lighting of Luganville Town Streets	Access	Electricity	Immediate	In progress	VUI
Demonstration Rural Biofuel Project (Ambae, Vanua Lava)	Access, sustainability, green growth	Electricity	Immediate	In progress	EU/GoV
North East Malekula Rural Electrification Project	Access	Electricity	Immediate	In progress	EU (Energy Facility 1), GoV, UNELCO
Vanuatu Rural Electricity Project (VREP) Phase 1 (Off-grid households and public facilities)	Access, sustainability, green growth	Electricity	Immediate	In progress	NZMFAT (via World Bank)
Kawene 1.5MW grid-connected solar facility, Efate	Sustainability	Electricity	Immediate	In progress	EU (Energy Facility 2)
Loltong Hydro Project, North Pentecost	Access, sustainability, green growth	Electricity	Immediate	In progress	Governments of New Zealand, Australia, and Vanuatu
Talise Hydro Project, Maewo (Phase 2—installing distribution lines)	Access, sustainability, green growth	Electricity	Immediate	In progress	IUCN, Governments of Austria, Italy, and Vanuatu
Solar Light Industrial Centres and Agro-processing Power Stations	Access, green growth	Electricity	Immediate	In progress	Village Infrastructure Angels
Prepare a detailed design for, and establish, a National Green Energy Fund to support investments in RE-based electricity access and energy efficiency, especially in rural areas	Access, sustainability, green growth	Electricity, liquid fuels, cooking fuels	Immediate	In progress	GGGI, GoV

Investment / action	Main outcome(s) it contributes to	Energy subsector(s)	Priority	Status	Funding source
Whitesands Solar PV Micro-grid, Tanna	Access, sustainability, green growth	Electricity	Highest	Proposed	
Efate Grid Connected Solar PV Project (1MW)	Sustainability	Electricity	Highest	Proposed	
Vanuatu Rural Electricity Project (VREP) Phase 2	Access, sustainability, green growth	Electricity	Highest	Proposed	
Invest in a barge to improve the efficiency and reliability of fuel distribution within Vanuatu by shifting away from deliveries of fuel in drums towards the use of regular bulk deliveries to outer islands	Security and reliability, affordability	Liquid fuels	Highest	Proposed	
Grid Extension, East Cost Santo (Matelevu to Shark Bay, Port Olry, Stone Hill and Palekula)	Access	Electricity	Highest	Proposed	
Sarakata Hydro Power Extension Project (600KW), Santo	Access, sustainability, green growth	Electricity	Highest	Proposed	
Brenwe Hydro Power Project (< 1.2MW), Malekula	Access, sustainability, green growth	Electricity	Highest	Proposed	
Policies, laws and regulations					
Introduce mandatory standards and labelling system (MEPS) for refrigerators, freezers, air conditioning, and lighting through Parliamentary approval of the Energy Efficiency of Electrical Appliances, Equipment and Lighting Products Bill	Sustainability, affordability	Electricity	Immediate	In progress	SPC/ Australian Government
Incorporate MEPS into Government procurement policies for appliances and vehicles	Sustainability, affordability	Electricity, liquid fuels	Immediate	In progress	GoV

Investment / action	Main outcome(s) it contributes to	Energy subsector(s)	Priority	Status	Funding source
<p>Review and draft changes to the Geothermal Energy Act, Petroleum Act, Electricity Supply Act, URA Act, Government Tenders and Contracts Act, and other relevant legislation and regulations. To include:</p> <ul style="list-style-type: none"> ▪ Enabling the URA to monitor and report on petroleum prices, and conduct “light-handed” regulation of LPG prices ▪ Developing environmental, health and safety requirements for petroleum storage and supply ▪ Developing an instrument to facilitate requirement for and the development and adoption of fuel (petroleum) quality standards 	All	Electricity, liquid fuels, cooking fuels	Immediate	In progress	World Bank
Retender the Luganville concession agreement	Affordability, security and reliability	Electricity	Immediate	In progress	GoV/World Bank
Develop a national energy efficiency strategy and action plan	Sustainability, green growth	Electricity, liquid fuels, cooking fuels	Immediate	In progress	GGGI
Develop an effective policy and risk-sharing framework for PPP transactions in order to accelerate major investments (to include legislation and regulations to facilitate IPPs and PPAs)	Access, affordability, security and reliability, sustainability	Electricity	Highest	Proposed	
<p>Reform import duties, tariffs and VAT to encourage imports of energy efficient and renewable energy equipment:</p> <ul style="list-style-type: none"> ▪ Energy efficient products for use in buildings—in particular, efficient electrical appliances and lights ▪ Spare parts for vehicles and marine vessels ▪ Energy efficient vehicles ▪ Improved cook stoves and crop dryers ▪ Renewable energy systems (solar PV, wind, biomass) and spare parts 	Sustainability, green growth	Electricity, liquid fuels, cooking fuels	Highest	Proposed	

Investment / action	Main outcome(s) it contributes to	Energy subsector(s)	Priority	Status	Funding source
Work with Department of Tourism to develop energy efficiency guidelines for bungalows and hotels	Green growth, sustainability	Electricity, liquid fuels, cooking fuels	Highest	Proposed	
Support Ministry of Internal Affairs and Ministry of Infrastructure and Public Utilities to review the draft National Building Code to incorporate energy efficiency measures as a requirement for all building constructions and renovations	Sustainability, affordability	Electricity	Highest	Proposed	
Analysis and Studies					
Improve the collection, analysis, monitoring, and collation (within a central system) of data on energy end-use by sector (electricity, liquid fuels, biomass) and use (cooking, transport, etc.). To include training of DoE officials as needed	All	Electricity, liquid fuels, cooking fuels	Immediate	In progress	GoV
Develop an electrification plan for renewable energy in remote islands	Access, sustainability, green growth	Electricity	Immediate	In progress	GIZ
Commission a national study on biomass resource and use in Vanuatu, and develop a national biomass strategy (with the Departments of Forestry and Agriculture)	Green growth, sustainability	Electricity, liquid fuels, cooking fuels	Highest	Proposed	
Investigate the costs of urban and rural biomass cooking and the extent to which forest resources may be affected by deforestation related to population growth, cooking, and drying	Green growth, sustainability, affordability	Cooking fuels	Highest	Proposed	
Explore options for promoting energy efficiency in the transport sector (including in tourism uses) and develop an action plan for cost-effective implementation	Green growth, sustainability, security and reliability, affordability	Liquid fuels	Highest	Proposed	
Establish an energy audit programme for all government buildings, and implement cost-effective energy efficiency actions identified by the audits	Sustainability, affordability	Electricity	Highest	Proposed	

Investment / action	Main outcome(s) it contributes to	Energy subsector(s)	Priority	Status	Funding source
Explore the use of mini-grid renewable energy systems in communities that have the potential to develop businesses in the agriculture, fisheries, and/or tourism sectors	Green growth, access, sustainability	Electricity	Highest	Proposed	
Capacity Building and Institutional Development					
Develop and implement a campaign to promote efficient cook stoves, efficient dryers for agriculture products, and solar water heaters in tourism accommodation	Green growth, sustainability, access	Electricity, cooking fuels	Highest	Proposed	
Set up a body to identify and coordinate the implementation of energy-related green growth actions between the energy sector and other sectors, with participation from key government agencies	Green growth	Electricity, liquid fuels, cooking fuels	Highest	Proposed	
Carry out joint planning sessions between different ministries to identify key energy sector activities that can contribute to objectives in other sectors	Green growth	Electricity, liquid fuels, cooking fuels	Highest	Proposed	
Support relevant government departments and training institutions to provide technical, management and financial trainings to local entrepreneurs on how to manage their businesses in areas where new renewable energy community projects would be implemented	Green growth	Electricity, liquid fuels, cooking fuels	Highest	Proposed	
Other					
Encourage the systematic implementation of standalone renewable energy systems within communities with strong governance, a track record of maintaining infrastructure, and community plans that are well-established and linked to provincial and national plans, while not prioritising the implementation of standalone renewable energy projects in communities that are likely to have problems maintaining systems in the future	Green growth, access	Electricity, liquid fuels, cooking fuels	Highest	Proposed	
Develop petroleum energy and security policy and work with industry to optimise petroleum storage capacity and shipping schedules to ensure national energy security is maintained	Security and reliability	Liquid fuels	Highest	Proposed	

1 Introduction and Context for the Updated NERM

The overall vision of the 2013 version of the National Energy Road Map (NERM) is to energise Vanuatu's growth and development through the provision of secure, affordable, widely accessible, high quality, clean energy services for an educated, healthy, and wealthy nation. Vanuatu's NERM was first endorsed by the Council of Ministers in 2013. At that time, the NERM identified five priorities for the energy sector: access, petroleum supply, affordability, energy security, and climate change. It sets out objectives, targets and actions to achieve these priorities and contribute to the NERM's overall vision.

Since the NERM was launched, Vanuatu's economy and energy sector have continued to develop. The NERM has been updated in 2016 to reflect these developments.

This updated document retains the vision and direction of the 2013 version of the NERM, and incorporates its critical elements

The updated version is intended to be the single key source of current information on Vanuatu's energy sector policies, plans, and priorities in the future.

The NERM was always intended to be a "living document" that would be reviewed and revised to reflect new circumstances and information. The Government of Vanuatu, led by the Department of Energy (DoE), has reviewed and updated the NERM to reflect the above developments, and the recent progress made against the NERM's original targets.

As a result, this updated NERM refreshes and revises the following aspects of the NERM:

- **Priorities and objectives:** Re-frames the NERM priorities to reflect desired outcomes for Vanuatu's energy sector and to incorporate new areas of emphasis
- **Progress:** Provides an update on how well Vanuatu is meeting the targets (and what progress might look like by 2020 and 2030)
- **Targets:** Sets 2030 targets for targets that previously only had targets for 2015 and 2020, and adds new targets to help catalyse faster progress in particular areas
- **Implementation Plan:** Refines and adds actions needed to achieve the updated targets and objectives.

A range of other energy sector stakeholders (including utilities, equipment and fuel suppliers, other government ministries and departments, the Utilities Regulatory Authority (URA), and other development partners) contributed to this update. A workshop was held in Port Vila in March 2016, attended by a range of stakeholders from across the energy sector. The outcomes of the workshop were incorporated into this updated NERM.

These changes to the NERM reflect several relevant developments

Progress has been made towards the NERM objectives in several areas. Recent initiatives include the Global Partnership for Output Based Aid (GPOBA) programme to subsidise electricity grid connection fees, and the launch in September 2015 of a new Vanuatu Rural Electrification Programme to subsidise the initial cost of solar photovoltaic (PV) systems for households and public facilities in off-grid areas.

Various other government policy documents and strategic plans have been published, which include objectives and actions likely to contribute to the NERM's priorities:

- **The Vanuatu Infrastructure Strategic Investment Plan (VISIP, 2015)** highlights six priority actions in the energy sector (to extend the electricity grid and increase renewable electricity generation capacity)

- Vanuatu’s **Intended Nationally-Determined Contribution** (INDC, 2015) under the UNFCCC reiterates the Government’s commitment to reducing energy sector greenhouse gas (GHG) emissions—in particular, by increasing the share of electricity generation from renewable sources—and sets some targets for emissions reductions, renewable energy, and energy efficiency
- The Government has prepared major proposals—**Nationally-Appropriate Mitigation Action on Rural Electrification in Vanuatu** (NAMA, 2015) and **Scaling Up Renewable Energy in Low Income Countries Program Investment Plan** (SREP, 2014)—to seek funding for electricity access and renewable energy initiatives
- The **National Sustainable Development Plan (NSDP)** (currently being drafted) will set out the Government’s objectives for social, environmental, and economic development over the next 15 years and how they will be achieved. It will include objectives related to sustainable infrastructure (including access to reliable and affordable energy that increasingly comes from renewable sources), environmentally-responsible economic growth, and sustainable natural resource management
- The strategic goal of the **Vanuatu Climate Change and Disaster Risk Reduction Strategy 2016-2030 (CCDRRS)** is ‘resilient development’ in the face of external events like climate change and natural disasters (such as Cyclone Pam). The strategy recognises the important role the updated NERM can play in achieving this goal—in particular by facilitating low-carbon development based on renewable energy and more efficient energy use
- The **Vanuatu Renewables Readiness Assessment** (Government of Vanuatu and International Renewable Energy Agency (IRENA), 2015) assesses the opportunities for greater use of RE, and recommends strategies and actions to facilitate this.

The structure of this Updated NERM

The Government remains committed to the vision, priorities, objectives, targets, and actions of the 2013 version of the NERM. This updated NERM reinforces these by:

- Reiterating and clarifying the original priorities and objectives, and elaborating on these to emphasise the Government’s commitment to green growth and energy efficiency (Section 2)
- Reviewing recent progress in implementing the NERM, and identifying implications for the future (Section 3 and Appendix A)
- Adding to and refining the quantitative targets in the NERM to reflect new priorities and to extend the timeline of the NERM to 2030 (Section 4)
- Highlighting new options for government-led, donor-led, private-sector led, and community-led approaches to implementing the NERM (Section 5)
- Adding to and refining the Implementation Plan to reflect recent progress, areas needing particular attention, and new or revised priorities (Appendix B)
- Setting out a monitoring, verification, and evaluation plan that will guide Government in tracking progress, identifying key implementation gaps early on, and using this information to improve performance (Appendix C).

2 The NERM's Priorities and Objectives

The priorities listed in the 2013 version of the NERM are access to energy, petroleum supply, affordability, energy security, and climate change. The Government remains committed to making progress in each of these areas. It is also keen to provide more clarity on these sector objectives and priorities, and to place added emphasis on how climate change and green growth are influencing energy policy and strategy in Vanuatu.

With this in mind, this updated NERM has the following (slightly revised) priorities:

- Accessible energy
- Affordable energy
- Secure and reliable energy
- Sustainable energy
- Green growth.

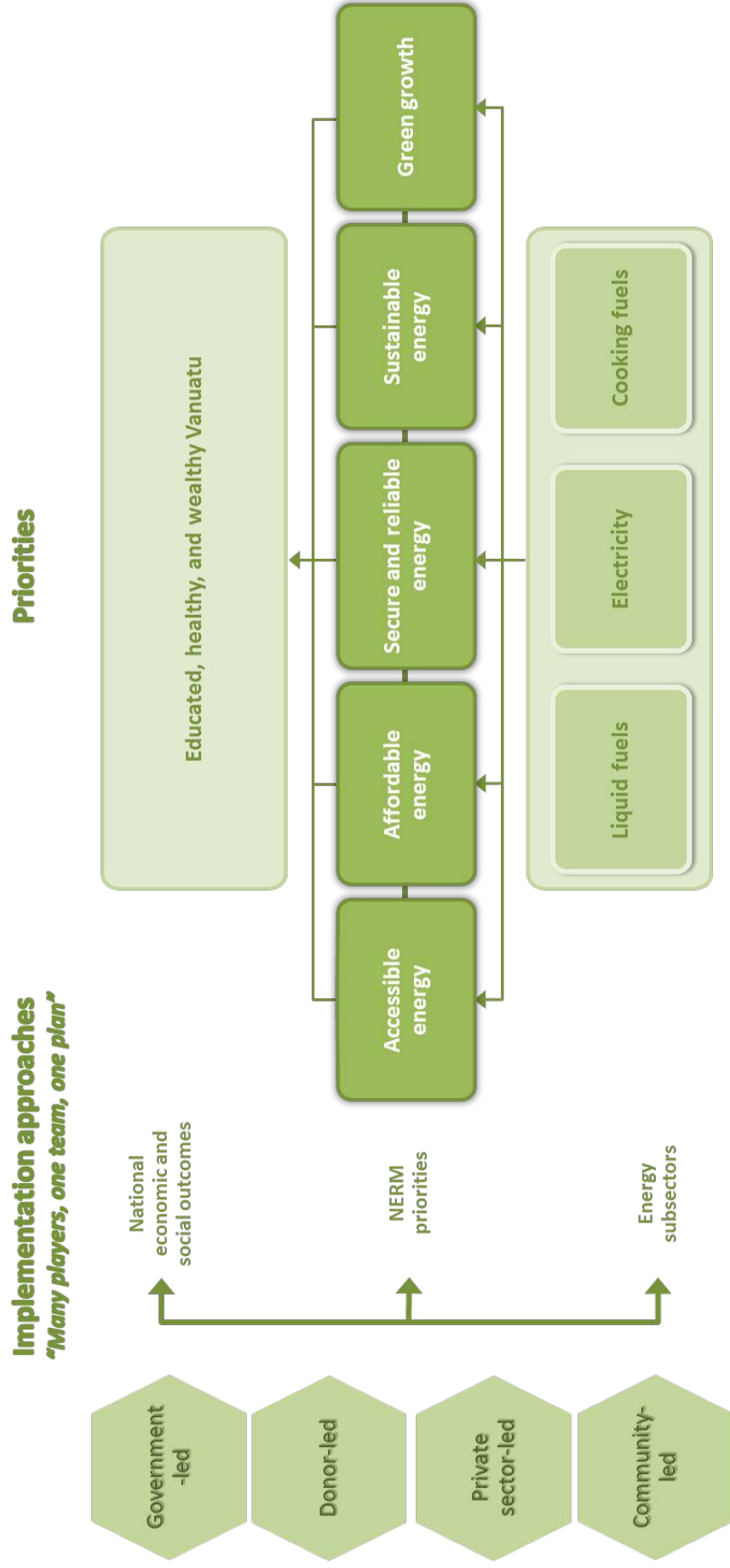
These priorities reflect the high-level outcomes the Government ultimately seeks to achieve in the energy sector. They encompass all of the NERM's original priorities and objectives. Figure 2.1 shows these priorities; how they relate to higher-level economic and social objectives, and energy subsectors; and the main approaches to achieving them.

The priorities apply to all three energy sub-sectors (petroleum and other liquid fuels, electricity, and cooking fuels). The 2013 version of the NERM focused primarily on the electricity and petroleum sub-sectors, with less explicit consideration of household cooking fuels. Through the updated NERM, the Government wants to reinforce that cooking fuels are an important form of energy use in Vanuatu, and an area where improvements can be made. Therefore, the updated NERM includes cooking fuels as one of the energy sub-sectors that support the achievement of the NERM priorities (in particular, accessible energy, and sustainable energy).

Petroleum products will continue to play a key role in meeting Vanuatu's energy needs in the near- to medium-term. With this in mind, improving the efficiency, reliability, and cost of petroleum supply remains a priority for the Government and the NERM. This updated NERM recognises that petroleum is one of the energy subsectors in which the NERM priorities could be achieved, rather than being a priority or high-level outcome itself. In addition, it broadens the definition to include other liquid fuels—reflecting the possibility that alternatives to petroleum may become more prominent in the future (for example, biofuels used in transport).

Addressing climate change also remains a key objective of the NERM. The updated NERM treats this as part of a broader outcome of 'sustainable energy'—which also captures wider environmental and social aspects of energy, such as local air pollution, deforestation, and health and safety. Renewable energy and energy efficiency can improve the sustainability of energy supply and use by helping to reduce adverse environmental impacts of energy use, and mitigate climate change. As such, they are discussed under 'sustainable energy'. However, this is not to say that they cannot make a valuable contribution to the other NERM priorities of accessible energy, affordable energy, secure and reliable energy, and green growth.

Figure 2.1: Overview of Revised NERM Priorities and Implementation Approaches



The following subsections explain the importance of each priority outcome, and highlight the NERM's main objectives in each area. The Implementation Plan in Appendix B identifies a range of actions to help achieve each objective.

2.1 Accessible Energy

Widespread access to energy underpins sustainable development. At a basic level, modern energy is used for the provision of clean water and sanitation, and for effective delivery of health care as well as educational and knowledge services. Widespread and affordable energy access can help provide reliable and efficient lighting, heating, cooking, mechanical power, and transport and telecommunication services.² There is a strong correlation between low access to electricity and cooking fuels, and high poverty levels and low human development (and vice versa).

Relative to other countries (including in the Pacific Region), electricity access levels in Vanuatu are unusually low, and stand out in relation to the country's levels of poverty. For instance, countries like Tonga and Samoa (which have a comparable poverty prevalence to Vanuatu) have achieved far higher national access rates for electricity. There is also limited access to modern cooking fuels (electricity, liquefied petroleum gas (LPG), kerosene, and propane), which are used by less than 20 percent of the population.

Differences in energy access match the differing levels of development in urban and rural areas. This is reflected in electricity access, with about 83 percent of rural households lacking access, compared to 20 percent of urban households. Rural households are also less likely to have access to modern cooking fuels, with about 95 percent of the rural population still cooking with biomass. In urban areas, about 87 percent of Port Vila households and 76 percent of Luganville households report using wood. Only 60 percent of Port Vila households, and 71 percent of Luganville households, report using wood over half the time.³

The lack of significant progress achieved to date undermines Vanuatu's economic competitiveness and impedes progress on human development across the entire nation.

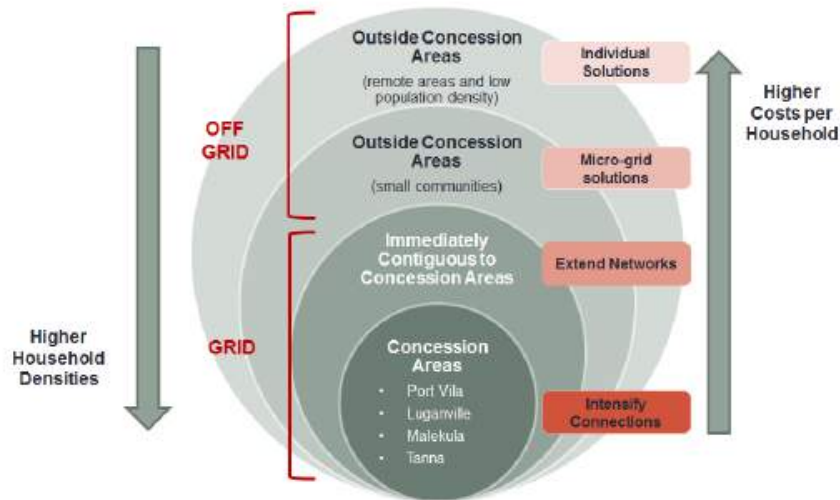
The NERM's vision of electricity 'access' encompasses pico solar lighting products, solar home systems, micro-and mini-grid connections, and grid connections. The Government wants to see households and businesses having access to a higher quality electricity service than solar lanterns—and so does not consider that solar lanterns provide sufficient 'access' to meet the NERM's targets. However, small pico solar systems (even from 5 watts-peak upwards) can provide a valuable and improved service in rural Vanuatu, where many households currently rely on solar lanterns or kerosene. Such systems are assumed to constitute electricity 'access' under the NERM, as they provide the minimum functions of lighting, mobile phone charging, and a radio.

To support sustainable development nationwide, the 2013 NERM identified approaches to providing electricity access that are specific to geographic locations. These are illustrated in Figure 2.2. The NERM also had a specific target for public institutions, to recognise the role that energy has in driving development through improving education and health facilities.

² See www.worldenergyoutlook.org/resources/energydevelopment/modernenergyforallwhyitmatters/.

³ ADB, UNDP, IIEC & GIZ, "Urban Household Appliance & Energy Use Survey: "Port Vila & Luganville, Vanuatu (2013); Volume 1: Main Report (Final Report, 20 March 2014).

Figure 2.2: Strategic Framework for Scaling up Electricity Access Nationwide by 2030



Source: Vanuatu National Energy Road Map, 2013.

When first developed in 2013, the NERM placed less explicit emphasis on household cooking fuels, and did not include quantitative targets related to cooking fuels. Through the updated NERM, the Government wants to reinforce that cooking fuels are an important form of energy use in Vanuatu, and an area where improvements can likely be made.

There remains significant potential to improve access to modern cooking fuels. This is discussed in more detail in Section 2.4, and the updated Implementation Plan in Appendix B includes several actions that will help Vanuatu realise this potential.

There are two main objectives for accessible energy in Vanuatu. These objectives also relate to energy affordability (for example, encouraging a switch from kerosene to pico solar systems is likely, over time, to provide households with cheaper lighting). Objective 2 also relates to green growth objectives.

Objective 1: Extend electricity access to all households and public institutions

- Connect all households within grid concession areas
- Extend electricity grids to connect more consumers living near concession areas
- Provide individual or community level solutions to extend electricity access to rural, off-grid areas where grid extension is not cost-effective
- Connect all public institutions (health and education) through either grid-based or off-grid solutions

Objective 2: Extend access to modern cooking fuels and cooking technologies

- Promote the use of efficient cook stoves, and modern cooking fuels (such as LPG or biogas)

2.2 Affordable Energy

If the expected social and economic benefits from modern energy services are to materialise, energy must not only be accessible, but also affordable. To ensure broad-based and sustainable benefits from energy, Vanuatu requires well designed and targeted policies aimed at bridging the “affordability gap”, especially for the poorer segments of the population.

When electricity connection charges and usage charges (unit prices and monthly bills) are perceived to be unaffordable, many households choose not to—or otherwise cannot afford to—connect despite being in an area that already has access to electricity. At the same time, many of those with grid connections overly limit their usage. Almost without exception, international experience in countries that have achieved near-universal access indicates that capital subsidies for grid extensions into new areas and for connections by the poor within reach of an existing grid are needed to achieve significant results in extending electricity access.

However, there are also sector-wide developments that can help drive down the price of energy, or reduce the nation’s exposure to volatile and high fuel prices (which, in turn, largely determine electricity prices). In particular, increasing the share of renewable energy in electricity generation, particularly to substitute the use of diesel for base load generation, may provide an opportunity to reduce electricity generation costs. International experience indicates that if the development of renewable energy potential is accomplished in a transparent and cost-effective way, it can go a long way towards substituting expensive diesel fuel and reducing generation costs.

Even where diesel continues to be used for electricity generation, there are ways to reduce the cost. These include using diesel more efficiently (as the NERM seeks to encourage), or reducing losses on the network (not a priority action under the NERM as Vanuatu has lower network losses than its Pacific counterparts).⁴

The following objectives focus on improving energy affordability in Vanuatu. There are several overlaps with other priority areas. For example, energy efficiency objectives are included under the ‘sustainable energy’ outcome area below, but are also relevant to affordability as they provide a way to reduce consumers’ energy costs.

Objective 1: Develop mechanisms to facilitate competitive, affordable prices for electricity, liquid fuels, and cooking fuels

Objective 2: Promote investment in least-cost electricity projects

Objective 3: Improve the supply-side energy efficiency of electricity generation

⁴ Pacific Power Association. 2015. “Pacific Power Utilities Benchmarking Report: 2012 Fiscal Year”. Network delivery losses and distribution losses for UNELCO were each about 5 percent in 2012, compared to regional averages of about 14 percent. This report does not provide data for VUT’s network.

2.3 Secure and Reliable Energy

Ensuring that the supply of energy is secure and reliable is a high priority for Vanuatu. Vanuatu is highly dependent on fuel imports. This exposes consumers to two types of risk: oil price variability and price shocks; and interruptions in the delivery of fuel caused by natural phenomena or by international or domestic political turmoil.

Vanuatu ranks among the nations with the very highest petroleum energy intensity (when comparing petroleum intensity to GDP per capita). At the same time, Vanuatu consistently has a higher petroleum price than comparable Pacific countries such as Tonga and Fiji. The cost of petroleum in Vanuatu is impacted by a lack of scale—the same supply infrastructure is required (albeit less than for higher volume countries), but market demand volumes are of a lower order of magnitude, leading to higher per litre costs.

Fuel prices are determined by the international supply chain, although the price volatility and supply shocks are exacerbated by the inefficiencies in the domestic supply chain. Managing aspects of the supply chain that are within Vanuatu’s control can help to make fuel supply more reliable and efficient, and, as a result, more affordable.

A key way to manage Vanuatu’s exposure to fuel price volatility and supply disruptions is to diversify the energy supply. In Vanuatu there are resources to support hydro-, wind-, solar-, and geothermal-based electricity generation, which could reduce the reliance on imported diesel. In addition to improving energy security, this would contribute to a more sustainable energy supply.

The risks to energy supply do not only revolve around markets and prices. The effects of Cyclone Pam reiterated Vanuatu’s vulnerability to natural hazards and the effects of climate change, and the importance of developing resilient infrastructure and energy supply chains that can continue to support communities post-disaster. For example, the design of power lines and wind turbines should reflect the risk of extreme weather events, the design of new hydro generation and solar facilities should take into account the possibility of changes in rainfall patterns and cloud cover, and biomass energy should be developed based on climate-resilient crops.

The following objectives focus on improving the security and reliability of Vanuatu’s energy supply.

Objective 1: Achieve a greater diversity of energy sources

Objective 2: Reduce the likelihood, and impact on consumers, of volatility in the prices of imported petroleum products

Objective 3: Facilitate the development of energy infrastructure and energy supply chains that are resilient to natural disasters

2.4 Sustainable Energy

The concept of sustainable energy, as used in this NERM update, encompasses the key dimensions of how energy can have positive or negative impacts on the environment and society.

2.4.1 Renewable energy, energy efficiency, and climate change

Mitigating climate change through renewable energy and energy efficiency remains a key objective of the NERM. The 2013 version of the NERM identified this as one of five priorities. The Government's focus in this area has been reinforced by the more recent Intended Nationally-Determined Contribution (INDC), which highlighted the important contribution the NERM can make to achieving national climate change mitigation goals.

Renewable energy and energy efficiency are discussed here under the 'sustainable energy' priority due to their potential to reduce GHG emissions and local pollution. Nevertheless, they can also contribute to all of the other NERM priorities. Rather than seeking to promote renewable energy solely or primarily for climate change objectives, the NERM recognises that increasing the share of renewable energy substantially in Vanuatu—on-grid and off-grid—may be the most cost-effective way to develop the sector. The NERM pursues renewable energy for its economic, energy security, energy access, and environmental benefits.

The updated NERM recognises that renewable energy and energy efficiency are equally important ways to achieve the NERM's vision

As with the 2013 version of the NERM, this updated NERM considers promoting the increased use of renewable energy—in the electricity and other sectors—as a key means of achieving the NERM's priorities. At the same time, the updated NERM places additional emphasis on the equally important role of energy efficiency.

Internationally, energy efficiency policy has tended to receive less focus than renewable energy policy. However, there is increasing recognition that both are equally important. In fact, energy efficiency investments can in many cases be more cost-effective than investing in new renewable generation capacity. There are also significant synergies between renewable energy and energy efficiency.⁵ For example, in the case of micro- or mini-grids, exploiting opportunities for demand-side energy efficiency can reduce the size (and, hence, the cost) of the system required by a community.

The Government is committed to achieving a balance between the level of attention (and resources) given to energy efficiency and renewable energy. This updated NERM reflects this aim. Taking advantage of new information on energy use in Vanuatu and on energy efficiency potential (that was not available when the 2013 NERM was developed), it sets out new energy efficiency targets and specific actions to promote energy efficiency.

Energy efficiency can be a cost-effective way to meet energy demand while reducing the environmental and social impacts, and cost, of energy infrastructure and use

Improving energy efficiency implies delivering better or more services for the same energy input, or delivering the same services for less energy input. It can be achieved through better performance, the use of more energy-efficient equipment, or a change in consumer behaviour. The objective is to save energy without reducing the overall comfort and well-

⁵ IRENA. August 2015. "Synergies Between Renewable Energy and Energy Efficiency: A Working Paper Based on REMAP 2030", www.irena.org/DocumentDownloads/Publications/IRENA_C2E2_Synergies_RE_EE_paper_2015.pdf.

being of the end-user, providing the same (or even better) energy services using less energy inputs, and often at less cost.

Under a business-as-usual (BAU) energy demand scenario, Vanuatu's consumption of imported petroleum products is expected to grow by 50 percent by 2030.⁶ Petroleum consumption by land transport, and households' electricity consumption, will also increase significantly. If this growth is not checked, it may reduce Vanuatu's energy security, worsen its balance of payments position, expose consumers to high and volatile energy costs, and increase GHG emissions and other pollution. The projected continued reliance on biomass for cooking (and drying) will also have several negative impacts—in particular: deforestation, poor health from smoke inhalation, and time that could have been used for more productive purposes wasted collecting firewood. These impacts are likely to affect women—who do most of the cooking—disproportionately.

The greatest immediate potential for energy efficiency improvements is in cooking and drying, transport, and electricity use in buildings

The sub-sectors and end uses with the greatest potential for feasible and cost-effective energy efficiency improvements are:

- Cooking and drying
- Land, air, and marine transport
- Electricity use in buildings.

Cooking and drying account for almost all biomass consumption in Vanuatu. Rural (and many urban) households still rely heavily on biomass for cooking and for drying crops. Demand for firewood, charcoal, and biomass residues is rising due to population growth. Representing about half of the national energy demand (but much less in terms of monetary costs), with most cooking using very inefficient techniques, the potential for energy savings is significant. The replacement of traditional biomass with more efficient fuels, or shifting from open fires to improved cook stoves, could have potential health benefits by reducing women's and children's exposure to smoke. Improved cook stoves can also help reduce GHG emissions, with advanced cook stoves able to limit emissions by 90 percent and improve fuel efficiency by more than 50 percent.

Land vehicles, aeroplanes, and marine vessels are the largest users of petroleum fuel in Vanuatu, already accounting for two-thirds of consumption. This share is expected to increase further by 2030. A shift towards more efficient engines and consumer behaviours could generate savings for consumers, and help manage the country's balance of payments.

Land transport represents the majority of petroleum fuel consumption—50 percent by volume in 2011⁷. Therefore, an initial area of focus under the updated NERM is improving the efficiency of energy use in land transport. As engines typically last a decade or more, efforts to reduce fuel use with new efficient vehicles will not have a large impact on fuel imports for some years. It is, therefore, important to introduce energy efficiency measures in transport as soon as practical. There are also opportunities for considerable reduction in vehicle fuel use through improved maintenance. Changes in drivers' behaviour could also help to achieve some results at a reduced cost, based on better education around energy consumption in the sector and practical tips for effective savings at the household

⁶ GGGI estimates.

⁷ David Butcher and Associates, "FINAL REPORT: Options for Increasing the Efficiency of Vanuatu's Oil and Gas Supply Chain," April 24, 2013, 1–159.

level. The public sector can also lead by example in examining the composition of its vehicle fleet, its maintenance practices, and how it uses its vehicles.

Most electricity consumption in Vanuatu is related to electrical appliances in buildings, to provide services such as lighting, cooling, entertainment, and communications. Energy savings through improved energy efficiency of buildings and appliances (including lighting) are often a cost-effective first option before installing new electricity generation capacity, whether diesel- or renewables-based. Thus, energy efficiency can contribute to reducing the overall cost of supplying Vanuatu with electricity in the long-term, while also reducing costs for businesses and households.

Vanuatu's buildings are, in general, not energy-efficient. Comfort and built-in energy demand such as space cooling and lighting are intrinsically related to building design and are best addressed during design and construction. If realistic and achievable minimum energy performance standards were enforced for commercial buildings, electrical energy use for new buildings could drop by 25 percent.

Within buildings, Vanuatu's energy consumers often use inefficient appliances. Electricity consumption in the residential sector (which currently represents 30 percent of total electricity consumption, and is projected to reach 50 percent by 2030) is dominated by refrigeration, lighting, and electric fans.⁸ Increasing the use of energy efficient appliances is an opportunity to reduce electricity demand (and, hence, consumers' energy bills and emissions) without compromising quality of service.

Significant energy efficiency improvements will be difficult to achieve without Government support

Energy efficient appliances and behaviours are not yet common in Vanuatu. As a result, the potential identified above is unlikely to be achieved without Government support. Integrating energy efficiency targets and actions into the NERM is, therefore, an important step to realising the potential.

Despite the potential savings, consumers often fail (without government support) to make energy efficiency improvements for a variety of reasons. Especially in countries like Vanuatu, there is a lack of awareness of the benefits of energy efficiency—and of investments and behavioural changes that could make energy use more efficient. In many cases, cultural traditions, social norms, and habits limit consumers' willingness to change their behaviour. Investing in energy efficient equipment generally involves upfront costs for consumers that may face financial constraints. In Vanuatu, there are also a range of technical, geographical and logistical, financial, and legal barriers that pose challenges to the uptake of energy efficient equipment and behaviours.

The updated NERM identifies specific energy efficiency targets and actions to achieve them

Integrating specific energy efficiency targets and actions into the updated NERM is expected to facilitate faster uptake of energy efficient behaviours and equipment by removing some of the main barriers. It is intended to demonstrate the Government's strong commitment to improving energy efficiency across the country, and raise the visibility of energy efficiency as an important tool to increase energy security, reduce dependence on fossil fuels, improve energy affordability, and mitigate climate change.

Energy efficiency initiatives can be minimal, moderate or aggressive, with differing benefits and costs. The NERM advocates a moderate policy scenario to support the adoption of

⁸ PEEP2's 2013 urban household energy survey.

suitable measures that demonstrate the Government’s commitment and encourage stakeholders to adopt energy efficiency measures and behaviours.

Under this moderate policy scenario, the NERM targets a reduction of at least 10 percent in total energy demand (in tonnes of oil equivalent) between 2015 and 2030, compared to the BAU scenario. In other words, if this objective is achieved, Vanuatu’s energy demand will be 10 percent or more below what demand is expected to be if there is no national policy and programme for energy efficiency.

It is estimated that moderate energy efficiency policies and actions—such as those included in the updated NERM Implementation Plan—could reduce electricity consumption by 13.5 percent, petroleum imports by 10 percent, and biomass use by 15 percent in the next 15 years.⁹ Such savings can be roughly valued at US\$335 million.¹⁰

2.4.2 Other elements of sustainable energy

To be sustainable, and to achieve the overall NERM vision, Vanuatu’s energy supply and energy infrastructure must be safe for humans and the environment. They must also promote Vanuatu’s broader social and environmental objectives as set out in the NSDP.

Energy—if accessible, affordable, and secure and reliable—can make a significant contribution to social development. At the same time, developing energy resources, supply chains, and infrastructure presents some risks to Vanuatu’s citizens and broader society. Therefore, the design and siting of major energy infrastructure needs to reflect social safeguards such as land tenure and cultural values. Similarly, if not well-managed, Vanuatu’s population may be at risk of adverse impacts from the energy sector—such as from water and air pollution from petroleum facilities, and smoke from inefficient cook stoves.

The natural environment, too, is susceptible to damage from inappropriate energy uses or badly-managed energy projects. Adverse environmental impacts may result, for example, from the use of biomass as a major energy source (local air pollution and deforestation) and inappropriate disposal of used batteries from solar home systems.

The investments and activities proposed in this NERM Implementation Plan are expected to provide net environmental and social benefits. For example, investing in renewable energy is expected to reduce local noise and air pollution near existing diesel plants, and reduce Vanuatu’s GHG emissions. Improving the petroleum supply chain between islands should reduce the risk of small oil spills. Increasing rural households’ and public institutions’ access to electricity and modern cooking fuels is intended to yield positive health and educational impacts. In deciding which actions and investments to include in the NERM Implementation Plan, the likely impact on society and the environment, and ways to mitigate adverse impacts, have been considered.

Objective 1: Increase the use of renewable energy as a way to reduce GHG emissions; provide affordable, reliable energy access; and facilitate green growth

⁹ This is the cumulative potential saving in the period of 2015-2030, based on GGGI estimates.

¹⁰ GGGI estimates. In the case of petroleum, the saving is about US\$139 million assuming an oil price of US\$50 per barrel.

Objective 2: Promote energy efficiency across the public and private sectors, especially in biomass for cooking, transport, and electricity use in buildings

- Establish an appropriate legal, regulatory, and institutional framework to support energy efficiency in Vanuatu (including Minimum Energy Performance Standards)
- Raise awareness of the benefits of energy efficiency, the Government's commitment to increased energy efficiency through the NERM, and the actions that individuals and organisations can take
- Build capacity to develop energy efficiency programmes, undertake energy audits, and maintain energy efficient equipment
- Provide financial support and fiscal incentives to incentivise investments in energy efficient equipment

Objective 3: Minimise the adverse environmental, social, and health and safety impacts of energy infrastructure and use

2.5 Energy for Green Growth

Green growth aims to overcome the often perceived contradiction between economic growth and environmental sustainability. While related, green growth and sustainable energy are separate priorities in the NERM. The concept of sustainable energy used in this document focuses on the environmental and social impacts of energy production and use. Green growth is a broader concept, reflecting how energy can catalyse broader social and economic development.

2.5.1 Why include green growth in the NERM?

The concept of green growth for Vanuatu's energy sector is founded on the principles that renewable energy and energy efficiency will improve energy security and affordability, and contribute to achieving climate change adaptation, resilience and mitigation as a co-benefit. Improved energy security and affordability in Vanuatu can and should also enable economic development.

The DoE does not have oversight of energy use in other economic and social sectors. For example, DoE is involved in small-scale energy projects in rural areas, but has limited involvement in many projects that currently use (or are planning to use) solar PV in the fisheries, agriculture, and other sectors. Nevertheless, DoE could play an important role in such cases—providing technical assistance, facilitating communication and information dissemination, helping develop improved regulatory and financial mechanisms, and coordinating energy planning and implementation to maximise the economic benefits of increased and more reliable access to energy.

Consequently, one of the objectives of this updated NERM is to link national energy objectives and strategies to the policies, strategies and work programmes of other relevant government departments and agencies, with the aim of facilitating green growth through a collective effort. In particular, there is an opportunity to link the NERM's objectives on green growth to the NSDP (which is expected to place stronger emphasis on environmental, as well as social and economic objectives), and the CCDRRS. The CCDRRS includes low-carbon development as a priority, with a particular focus on renewable energy and energy efficiency.

A first step in this process is to include in the NERM green growth policies that promote more productive, socially-inclusive, and environmentally-sustainable use of energy. This will put Vanuatu in a position to become a leader in the Pacific region on green energy and green growth implementation.

Renewable energy can serve as an enabler of economic and social development

Vanuatu currently relies on high-cost, imported fossil fuels for transport and most electricity. In many cases, renewable energy resources can be a lower-cost substitute for fossil fuels, and, therefore, can improve affordability for households and businesses.

The location of renewable energy resources can also enable access to electricity. Renewable energy resources, such as solar PV, can provide an opportunity to extend electricity access in remote areas where extending networks is not cost-effective.

Improving energy access through renewable energy can raise productivity and product quality in key sectors, including agriculture and tourism, which can result in improved income opportunities and a better life for rural island people.

The joint objectives of improving access to energy, while encouraging sustainable development, are particularly relevant for Vanuatu's rural areas. A solar mini-grid in a community can provide electricity access to a cooperative or to small-scale enterprises (for example, fisheries cooperatives, tourist bungalows, and agricultural processors) in addition to households and public buildings (such as schools and health centres). Investing in energy infrastructure that provides electricity to businesses, such as through a mini-grid, could enable rural job creation and increased economic development in rural Vanuatu.

Investments in renewable energy can act as a direct source of economic and social development

Depending on the type of energy, and broader economic conditions, renewable energy can also create direct opportunities for employment and income. For example, the promotion of coconut oil-based fuel (where cost-effective and available) as a substitute for imported diesel fuel could foster employment and income generation opportunities for coconut-producing regions of the country, while reducing the need to import diesel. Distributing and maintaining solar systems can provide employment opportunities in rural communities.

2.5.2 Proposed green growth objectives

In including green growth as one of its five priorities, the updated NERM advocates the effective and efficient use of natural resources like energy, water, forests, land, and fisheries to facilitate economic growth and social development without depleting natural capital for future generations. In particular, it seeks to set out a path by which renewable energy and energy efficiency can contribute to improving productivity and growth in Vanuatu's key economic sectors.

The updated NERM includes five green growth objectives. The Implementation Plan highlights specific actions to achieve these objectives.

Objective 1: Promote green energy as a catalyst for sustainable development

Objective 2: Consolidate and expand the use of locally produced bio-fuels as an alternative to fossil fuels for electricity generation and transport

Objective 3: Promote the use of renewable energy in Vanuatu's main economic sectors, including agriculture, fisheries and tourism

- Promote the use of renewable energy and application of energy efficiency in rural bungalows and tourism resorts
- Promote the use of renewable energy to enhance income generation for small-scale fishing programmes and projects
- Promote the use of renewable energy to raise productivity in the agriculture sector
- Apply a coordinated, inclusive, cross-sectoral approach

Objective 4: Promote the appropriate use of renewable energy and energy efficiency technologies in the water sector

- Where cost-effective, improve access to and the quality and reliability of water services through the use of renewable energy and energy efficiency technologies, especially for agricultural and tourism uses
- Promote more efficient use of water as a way to save energy in urban areas

Objective 5: Improve energy-related business and technical skills among rural island people

- Enable rural people to maximise the benefits they can gain from new or improved access to energy
- Create skills in relation to energy use, and management, operation and maintenance of renewable energy systems, while preserving the natural environment and local culture through clean and efficient energy use

3 Current Performance and Expected Progress

To develop an action plan for achieving the NERM's objectives by 2030, information is needed on where Vanuatu's energy sector is now, and where it is heading. This requires analysing performance to date against the NERM targets, and assessing the ability to achieve the targets identified for 2020 and 2030.

This section summarises the progress so far against the quantitative NERM targets established in 2013. It highlights major ongoing initiatives and major new, proposed, or planned programmes or initiatives that could help achieve these targets. It also highlights if further resources, policy changes, new or different funding approaches, or assignment of new responsibilities will be required.

Appendix A describes in more detail the progress made against the targets between 2013 and the end of 2015 (or the most recent year with available data). It also provides an update on progress against the qualitative NERM targets—for which the NERM did not establish any quantitative targets.

While valuable progress has been made, significant additional action will be needed to meet the NERM's 2020 and 2030 targets

Table 3.1 provides an overview of recent and projected progress against the targets for 2015, 2020, and 2030. For each target, the first row states the target set in the NERM, and the second row shows the actual or projected progress made in the corresponding year. Green shading indicates that Vanuatu has met or is likely to meet the target; orange shading indicates that it has partially met or is broadly on track to meet the target; and red shading indicates that a step change (a substantial increase in the rate of progress) is needed if the target is to be met.

The projected progress represents what appears to be the most likely future path if no additional action (beyond the confirmed programmes) is taken. Projected progress by 2020 and 2030 is based on either:

- Trends in progress made so far, where incremental progress is likely to be made over time without substantial input from government, donor, or private initiatives, or
- Expected progress where resources have already been committed to achieving particular outcomes.

Table 3.1: Current and Expected Progress Against Original NERM Targets

Section	Target	NERM baseline ¹	Actual	Projected	
			2015 ²	2020	2030
3.1	Increasing electricity access in and near concession areas ³	59% (2012)	69%	90%	100%
			62%	71%	56%
3.2	Increasing electricity access in off-grid areas ⁴	<10% (2012)	55% ⁵	100%	100%
			9%	61%	55%
3.3	Increasing electricity access by public institutions (on- and off-grid)	48% (2011)	90%	100%	100%
			54%	63%	74%
3.4	Improving diesel generation efficiency	0% (2010)	10%	20%	No target
			2%	5%	
3.5	Reducing the cost of distributing petroleum	Baseline distribution cost unavailable	5% reduction	10% reduction	No target
			Insufficient data	Insufficient data	
3.6	Generating electricity from renewable energy sources	19% (2012)	40%	65%	No target
			29%	40%	

Key

	Target met
	On track to meet target
	Step change required to meet target
	Insufficient data available to make assessment

¹ Baselines were calculated with data available at the time of the 2013 NERM (date marked in brackets).

² Progress documented in this column is based on the most recent data available, which are not always data from 2015. ³ The separate NERM targets for in and near concession areas are combined. This is because connection data are not categorised by these areas. ⁴ ‘Off-grid’ areas are considered to be those for which grid extension is not expected to be cost-effective in the foreseeable future (although micro- or mini-grids may be a possibility). ⁵ No specific target was set for 2015; the target provided is based on linear growth between the baseline and the 2020 target.

Source: Targets from Vanuatu National Energy Roadmap 2013-2020. Sources used to assess current (2015, or most recent year available) and projected progress are provided in Section 5 and Appendix A.

3.1 Progress on Energy Access in and Near Concession Areas

The NERM set targets for electricity access by households in, near, and outside concession areas (off-grid areas), as well as for public institutions (on- and off-grid).

There has been progress in extending electricity access in and near Vanuatu’s concession areas, with 62 percent of households having access in 2015 (the combined target for 2015 was 69 percent). While the number of households with access is rising, this assessment

assumes that the total number of households in and near concession areas will also increase, by 3 percent annually.¹¹

There are two types of initiatives that could increase the rate of new connections between 2015 and 2020. The first type includes grid extensions. For instance, Union Electrique du Vanuatu Limited's (UNELCO) plans to extend grids in Tanna, Efate, and Malekula would further increase the number of households connected. There are also financial initiatives that increase connections by providing financial support for consumers to connect. These include the GPOBA, Article 6 Fund,¹² and Santo Fund¹³ initiatives. This financial support will help customers connect to the grid extensions that UNELCO and Vanuatu Utilities & Infrastructure (VUI) are undertaking. To avoid double-counting when projecting Vanuatu's progress, this assessment based the estimates only on the number of connections for which funding support is available through the financial initiatives (listed in Table 3.2). Actual progress towards the target may be greater than these estimates because a few customers might also pay to connect to the grid or extended grids on their own.

Table 3.2: Planned Initiatives to Provide Access in and Near Concession Areas

Initiative/ Development	Location	Households to be connected	
		Total	2015-2020
GPOBA programme	Grid concession areas	4,375	4,218 ¹
Article 6 Fund ²	Areas within the Port Vila concession	953	320 ³
Santo Fund ²	Rural and outlying areas of Santo	568	190 ³
Total households connected in funded projects		5,896	4,728

¹ Total households to be connected minus progress made in 2015. GPOBA reported providing access to 755 people by November 2015, which is approximately 157 households (assuming 4.8 people per household).¹⁴

² Expected to continue until 2030.

³ Calculated as the amount credited to the Fund per year (estimated for the Article 6 Fund) divided by the cost of a grid connection (US\$1,180),¹⁵ and then multiplied by five.

If the financial initiatives achieve their expected new household connections, Vanuatu would have 71 percent of households within and close to the concession areas connected by 2020. This is below the 2020 target of 90 percent of households.

¹¹ Household growth is based on projecting the baseline figures using the compound annual growth rate for urban households (3 percent) between 2013 and 2030 (in GGGI's Vanuatu Energy Demand Business as Usual Scenario report).

¹² The Article 6 Fund is an investment support fund, with the aim of extending electricity access to communities within the Port Vila concession area that would otherwise not be serviced. The Fund sits in UNELCO's accounts and is maintained through revenues generated from electricity consumers. The Government of Vanuatu owns the money in the Fund and the Minister of Energy chooses how the money is spent.

¹³ The Santo Fund was created in 2013 to promote electricity access in rural and outlying areas of Santo. Money for the Fund is collected from all Santo electricity consumers through a per kWh charge in their monthly bills.

¹⁴ Vanuatu National Statistics Office, 2009 National Population and Housing Census. Available at www.vnsso.gov.vu/index.php/census-and-surveys/censuses.

¹⁵ GPOBA: World Bank. October 2014. "Rural Electrification Project."

The only planned initiatives between 2020 and 2030 include the ongoing efforts by the Article 6 Fund and the Santo Fund. These efforts will mean that about 56 percent of households will have access by 2030 (compared to a target of 100 percent). This reduction in the percentage of households with access is a result of the number of households increasing, and comparatively few connections between 2020 and 2030.

However, some growth could be expected from households choosing, over time, to connect themselves. Such growth has not been incorporated, but it could improve the performance against the 2020 and 2030 targets (although this growth is unlikely to be sufficient to achieve the targets).

3.2 Progress on Energy Access in Off-Grid Areas

Vanuatu is unlikely to meet the future targets for access for off-grid households unless major new action is taken.

Limited progress seems to have been made in connecting off-grid households between the baseline and today. However, robust data are difficult to find and progress may in fact have been made by households purchasing their own household systems (such as solar plug and play systems). Due to growth in the number of households in off-grid areas, the proportion of off-grid households with access has decreased to 9 percent in 2015.¹⁶

Progress beyond 2015 is expected to be driven by the implementation of multiple micro-grid projects (providing access to 2,020 off-grid households), and the VREP programme achieving its targets. Table 3.3 lists the planned and funded initiatives between 2015 and 2020 that will help connect off-grid households.

In addition to the funded initiatives listed in the table, the NAMA also identified and proposed four priority sites for pilot micro-grids, which could support further progress against the off-grid electricity access target.¹⁷ If investments proposed in the NAMA were implemented, they would connect a further 298 households in Tanna, Malekula, Pentecost, and Aniwa.

¹⁶ Household growth is based on projecting the baseline figures using the compound annual growth rate for rural households (2 percent) between 2013 and 2030 (in GGGI's Vanuatu Energy Demand Business as Usual Scenario report).

¹⁷ UNDP. "Rural Electrification in Vanuatu" ("NAMA Report").

Table 3.3: Current and Planned Initiatives to Provide Off-Grid Access

Name	Type of access	Status	Finish date	Households affected
VREP	Solar plug and play systems	Active	31 December 2019	17,500
Solar Light Industrial Centres	Solar power for lighting and productive uses	Active	31 March 2017	1,000
Talise Hydro Project	Micro-hydro	Phase 1 of 2 complete ¹⁸	2016/2017	300
Biofuel Rural Electrification Project	Biofuel-based electricity generation facilities	Active	2016	<ul style="list-style-type: none"> ▪ 350 in Penama ▪ 300 in Torba
Loltong Hydro Project	Micro-hydro	Active	2016	70
Total households provided with access				19,520

Source: GGGI, 2016, “Vanuatu Energy Demand Projections, Business as Usual Scenario.”, World Bank, 2014. “Project Paper for a Small RETF Grant in the Amount of US\$4.7 million Equivalent to the Republic of Vanuatu for a Rural Electrification Project”.

The 2020 target (100 percent access for off-grid households) will still not be met after the above initiatives are completed. If all currently funded projects (as of May 2016) are implemented, around 61 percent of off-grid households would have access to electricity by 2020.

To date there are no projects planned (and funded) between 2020 and 2030. There may be some progress with households buying their own systems in this period. It is assumed that this progress could provide another 2,000 off-grid households with access. While very limited progress has been made between the baseline and today, it is assumed that progress is more likely to be made between 2020 and 2030 (given that it is a longer timeframe, and technology may be comparatively cheaper). As a result, around 55 percent of households in off-grid areas may have access by 2030 (compared to a target of 100 percent). This is lower than the proportion with access in 2020 (61 percent) due to the projected increase in households. This estimate of progress may improve if additional initiatives are implemented.

3.3 Progress on Energy Access for Public Institutions

There has been progress in providing public institutions (education and health) with access, with 54 percent of institutions (on- and off-grid) now having access. However, this rate of progress will need to accelerate in order to meet the targets set for 2020 and 2030.

¹⁸ See http://dailypost.vu/news/training-in-munda-for-maewo-hydro-technical-operators/article_0e89b690-dd22-5bf5-95dd-2b224a3d9428.html.

There are projects planned to help connect more public institutions by 2020. It is assumed that these are to connect existing institutions, rather than new or planned institutions. These projects include:

- VREP, which aims to provide plug and play solar systems to 230 aid posts¹⁹
- The Biofuel Rural Electrification Project, which will connect two hospitals, four dispensaries, and 10 schools in Penama and Torba provinces
- The Talise Hydro Project, which aims to increase electricity services in Maewo, including one health centre and three schools.

Factoring in these planned initiatives only, about 57 percent of public institutions will have access by 2020. However, public institutions may also get access by connecting to the grid, or purchasing plug and play systems themselves (as some institutions have done to date). The planned initiatives and the observed progress rate (between the baseline and 2015) are combined to find the expected progress by 2020. Combining these progress measures yields a figure of 63 percent of public institutions having access by 2020 (compared to a target of 100 percent).

No initiatives are planned between 2020 and 2030. During this period, the same average annual rate of progress made between the baseline and today is assumed. If this level of progress is achieved, then 74 percent of public institutions would have access by 2030. This may understate the progress made between 2020 and 2030, as technology may be cheaper, so more public institutions may be willing and able to connect themselves.

3.4 Progress on Improving Diesel Generation Efficiency

The NERM identified an improvement in the efficiency of diesel generating units (that is, a decrease in the amount of diesel used to produce each unit of electricity) as a priority objective.

There has been some improvement (2 percent) in the average efficiency of diesel generating units compared with the baseline (which was based on data from 2006-2010). However, this improvement has not been at the level aspired to in the NERM (10 percent by 2015).

Opportunities for further improvements in diesel generation efficiency seem to be limited. Future efforts are likely to produce minimal improvements as operators are using recently purchased or refurbished equipment, and are increasingly using coconut oil as a substitute for diesel. The potential for increasing efficiency through improved maintenance also appears to be limited.

Slow growth in demand²⁰ and new renewable energy-based generating capacity that is being built are likely to reduce the cost-effectiveness of investments in new diesel engines. Therefore, there may be a trade-off between making progress on the diesel efficiency target, and energy affordability.

Similarly, there is a possible trade-off between achieving the diesel efficiency target, and increasing the use of renewables for electricity generation. Greater use of hydro and solar resources on a network can reduce diesel efficiency where smaller diesel units are required, or where larger units are run at low loads (which is inefficient in fuel use). There may also

¹⁹ In accordance with the original NERM calculations, aid posts are not included in the calculation of overall public institutions with access.

²⁰ UNELCO, Vanuatu Electricity Road Map, October 2015 Update. Vanuatu's electricity demand fell by about 3 percent between 2012 and 2015 (estimates were used for 2015).

be a decrease in efficiency if there is a push for greater use of coconut oil. Coconut oil has a lower energy content than diesel fuel, so more fuel (in litres) is required to produce the same amount of electricity. While using more coconut oil increases the proportion of electricity generated from renewable energy sources (a sustainability target), this could decrease the efficiency of liquid fuel-based electricity generation.

3.5 Progress on Reducing the Costs of Distributing Petroleum

Reducing the costs of distributing petroleum products can improve energy affordability, and some of the actions to achieve this (such as bulk deliveries) can also help support secure and reliable energy. The NERM set a target for a 5 percent reduction in petroleum distribution costs by 2015 and a 10 percent reduction by 2020.

However, the NERM did not have a baseline for this target in 2013 as data on distribution costs were unavailable. As no direct monitoring of distribution costs has been introduced since the NERM, it is not possible to measure the change in distribution costs directly. Future monitoring is required to measure progress in this area.

Despite a lack of available data, other information suggests that some distribution cost savings may have been achieved. A comparison of the prices for petrol and automotive diesel shows that the difference between the Vanuatu price and Singapore-based price benchmarks narrowed between 2014 and 2015. Distribution cost savings could be responsible for narrowing the difference in prices (although this might alternatively be due to a reduction in either wholesale or retail margins, or both).

Stakeholders have identified several ways to reduce distribution costs, suggesting progress can be made against this goal. For example, Pacific Petroleum claims its acquisition of multiple service stations helped to reduce margins. If so, replicating this model could further reduce margins.

Moving to bulk deliveries could also help reduce the cost of shipping to outer islands. If the cost savings are passed on to consumers, this could also improve affordability. Two key developments could potentially reduce distribution costs to outer islands by 10-15 percent by 2020,²¹ which would meet or surpass the NERM target:

- **Using a barge to supply outer islands**—Pacific Petroleum is currently seeking funding for this initiative, which would make freight costs less volatile and could reduce distribution costs by 5-10 percent.²²
- **Wharf developments**—Building a new wharf in Port Vila, and possible new wharves in outer islands. These developments could help to attract more, and larger, ships to Port Vila and the outer islands.

3.6 Progress on Generating Electricity from Renewable Energy Sources

There has been progress in renewable electricity, although further efforts are needed to reach future targets.

Between 2012 and 2015, the proportion of electricity generated from renewable sources increased from 19 percent to 29 percent²³. This is due to the development of alternatives

²¹ Communication with Pacific Petroleum.

²² Communication with Pacific Petroleum.

²³ UNELCO and VUI data, URA, December 2015.

such as the installation of 0.1 megawatt (MW) of grid-connected solar PV capacity, and the existing on-grid generators increasing their use of coconut oil.²⁴ This improvement is encouraging, but has not been sufficient to achieve the 2015 target of 40 percent renewable electricity. If the rate of progress between 2015 and 2020 is the same as that between 2012 and 2015, Vanuatu will have 40 percent renewable electricity by 2020 (the target set in the NERM is 65 percent by 2020).

The Government's INDC assumes that progress against renewable energy targets will be achieved through greater use of solar and geothermal resources. However, as existing electricity demand can be met without new generating capacity, there is limited scope for large amounts of new renewable capacity (at least not without grant funding) unless demand increases significantly. Indeed, this is one of the reasons (as well as a funding shortage) the proposed geothermal plant on Efate has been stalled—although this may be countered by increases in demand from extending grids and achieving access targets.

Greater use of coconut oil could help achieve the renewable electricity generation target. As it involves substituting for existing fuels, it does not rely on increased demand or require new generation infrastructure for grid-based systems (although may require investment in coconut trees and processing capacity). However, achieving this target could come at the cost of other targets and priorities such as diesel generation efficiency (coconut oil has a lower energy content than diesel, so more has to be used to produce electricity). Furthermore, there are barriers to ensuring a consistent supply of coconut oil in sufficient quantities. In a recent report, IRENA noted that the quality and quantity of coconut oil supply can vary.²⁵ The report also noted that increased demand for coconut oil for other uses (in cooking and cosmetics) could mean it becomes less competitive as a fuel compared with diesel. The price of coconut oil on the international market affects producers' willingness to supply coconut oil to electricity generators.

²⁴ UNELCO, Vanuatu Electricity Road Map 2015-2030. October 2015 Update.

²⁵ IRENA, Vanuatu Renewables Readiness Assessment, 2015.

4 Targets for the Future

The Government remains committed to achieving the NERM's original targets, and all quantitative targets from the 2013 version of the NERM are being retained in the update.

Nevertheless, various developments since the NERM was published in 2013 justify some refinements and additions. In particular:

- **Setting a common end-date of 2030**—Some targets in the original NERM had an end-date of 2020, while others had an end-date of 2030. The targets in the updated NERM all have a common end-date of 2030 (as well as interim targets for 2020). This allows a longer-term view across all targets, and aligns with the duration of the National Sustainable Development Plan to be launched later this year
- **Using new information to develop new targets**—In some cases, more information has come to light since the original NERM was published, allowing the development of quantitative targets for objectives (in particular, energy efficiency) that previously did not have targets attached
- **Ensuring the targets can be monitored**—challenges to monitoring some of the targets have been identified. For example, the Government does not currently collect and monitor detailed data on petroleum distribution costs to and within Vanuatu. The Implementation Plan includes an action to collect these data in order to enable better monitoring in the future.

It is also worth noting that some targets are likely to be less meaningful or less appropriate in the future. In particular, improving the efficiency of diesel generating units may involve a trade-off with the renewable electricity target—as increasing the use of coconut oil as a substitute for diesel increases the amount of fuel needed per unit of electricity. In addition, as progress is made towards the renewable electricity targets by incorporating new solar, wind, or geothermal generation, diesel generation will become less important. The Government does not wish for the diesel efficiency target to constrain generators' flexibility to use biofuels instead of diesel. Nevertheless, this target is retained for now and its relevance will be reviewed periodically.

Table 4.1 lists the quantitative targets that apply from 2016 to 2030. For simplicity, these are categorised under the NERM priority they relate most directly to. However, the majority of these targets also relate to other priority areas. In particular, the energy efficiency targets listed under 'sustainable energy' will, if achieved, also have a positive impact on energy security and energy affordability.

Unless otherwise stated, these targets are the same as in the 2013 version of the NERM. New targets are highlighted in blue and explained in footnotes. New targets are intended to be consistent with other government documents, such as the INDC. Additional targets may be added to the NERM over time, as the availability of data improves. In particular, some of the green growth objectives do not currently have corresponding targets. The Implementation Plan does, however, include several green growth-related actions that will help the Government develop a better information base that can be used to set and monitor targets in the future. The possibility of adding new green growth-related targets will be re-considered as part of the next review of the NERM. Similarly, there is currently no quantitative target under 'secure and reliable energy'. Improved availability of data on the petroleum sector will help set targets in the future (one possibility may be adding a target to increase the ratio of petroleum stocks in Vanuatu compared to demand, thereby providing greater physical hedging).

Appendix C provides a plan to guide the monitoring and evaluation of these quantitative targets.

The NERM also contained some more qualitative 'targets'. In some cases, quantitative measures have been attached to these (the transport energy efficiency improvement target). The remaining qualitative targets are included as actions in the Implementation Plan (see Appendix B).

Table 4.1: Updated NERM Targets

Priority	Target	Indicator	Current ²⁶	2020 Target	2030 Target
Accessible energy	Increase electricity access by households in and near concession areas	% of households with access	62%	90%	100%
	Increase electricity access by households in off-grid areas	% of households with access	9%	100%	100%
	Increase electricity access by public institutions (on- and off-grid)	% with access	54%	100%	100%
Affordable energy	Improve the efficiency of diesel generation	Grams of diesel fuel per kWh of electricity	2% improvement from 2010 (248.33 g/kWh)	20% improvement from 2010 (202.41 g/kWh)	20% ²⁷ improvement from 2010 (202.41 g/kWh)
	Reduce the cost of distributing petroleum products in Vanuatu	Vatu per litre	No data ²⁸	10% reduction from 2012	15% ²⁹ reduction from 2012
Sustainable energy	Increase the proportion of electricity generated from renewable sources	% of grid-based electricity from renewable sources	29%	65%	100% ³⁰
	Improve electricity sector end-use efficiency	% saving on BAU projection ³¹	n/a	5%	13.5%

²⁶ As at end-2015 or based on latest available data (which may be earlier than 2015).

²⁷ Assumes limited further progress can be made without capital-intensive investments or reducing the use of renewable energy for electricity generation (see commentary above).

²⁸ The Implementation Plan in Appendix B includes an action to collect and monitor data on petroleum distribution costs. This should allow DoE to monitor achievement of this target in the future.

²⁹ Based on discussion with Pacific Energy, which highlighted an opportunity to reduce distribution costs by 10-15 percent (primarily by using a barge to supply outer islands, and developing wharves in Port Vila and outer islands).

³⁰ The 100 percent target is contingent on the availability of suitable financing and technical assistance (from Vanuatu's Intended Nationally-Determined Contribution under the UNFCCC).

³¹ Progress against the three energy efficiency targets will be measured relative to the BAU projections of energy consumption prepared by GGGI.

Priority	Target	Indicator	Current ²⁶	2020 Target	2030 Target
	Improve transport (land and marine) energy efficiency	% saving on BAU projection	n/a	2%	10%
	Improve biomass end-use (cooking and drying) efficiency	% saving on BAU projection	n/a	5%	14%
	Ensure all energy infrastructure projects comply with Government and donor environmental and social safeguard requirements ³²	% of projects complying	n/a	100%	100%
Green growth	Increase the proportion of electricity generated from biofuels	% of electricity generated from biofuels ³³	5%	10%	14%
	Increase renewable electricity use by rural tourism bungalows	% of bungalows using renewable energy sources for electricity supply	TBD ³⁴	25%	65%

³² Major projects (in the case of electricity, 1kW or more) should undergo formal environmental and social impact assessment in accordance with government guidelines and regulations. For smaller projects such as solar home systems, environmental and social issues will be assessed and addressed as part of project design, to comply with donor and government requirements.

³³ On-grid electricity generated from biofuels, plus micro-grid or other projects for which data are available.

³⁴ The Department of Tourism is in the process of collating these data.

5 Implementation Approaches

The NERM provides a framework for how multiple parties—government, donors, the private sector, communities, and others—can come together to implement a coordinated, prioritised set of actions that will enable Vanuatu to achieve its objectives for the energy sector.

The roles envisaged for different parties are discussed below, under the categories of government-led, donor-led, private sector-led, or community-led. These options are not mutually-exclusive—in many cases multiple parties will be involved in leading initiatives. In such cases, implementation efforts will be most effective if the roles and responsibilities of different parties are clearly defined, and communicated to stakeholders. For example, the respective roles of DoE and the Departments of Health and Education in relation to electricity access for health facilities and schools, and how the utilities and the URA will work constructively together.

Appendix B provides a more detailed Implementation Plan, including a separate list of projects and initiatives to be led by, or to involve, different parties.

5.1 Government-led Approaches

The Government sees its role in NERM implementation as four-fold:

- **Source funding**—Use its access to domestic funding (taxes and levies) and low-cost donor funding to mobilise financial resources to implement NERM initiatives
- **Regulate**—Provide the policy, regulatory, and legislative framework, and supporting institutions, that empower and enable other economic actors to implement the actions and investments needed to achieve the NERM's objectives (while guarding against adverse social and environmental impacts)
- **Engage and coordinate**—Use its convening power to engage and coordinate multiple stakeholders—both within and outside government—that can implement NERM initiatives
- **Manage planning and implementation**—Use its administrative experience and systems to manage the planning and implementation of initiatives, and to monitor and evaluate their impact.

The Government's immediate focus is mobilising and channelling financial resources to accelerate NERM implementation—in particular, through the creation of a National Green Energy Fund. Various activities in the other three areas are in progress and expected to continue.

5.1.1 National Green Energy Fund

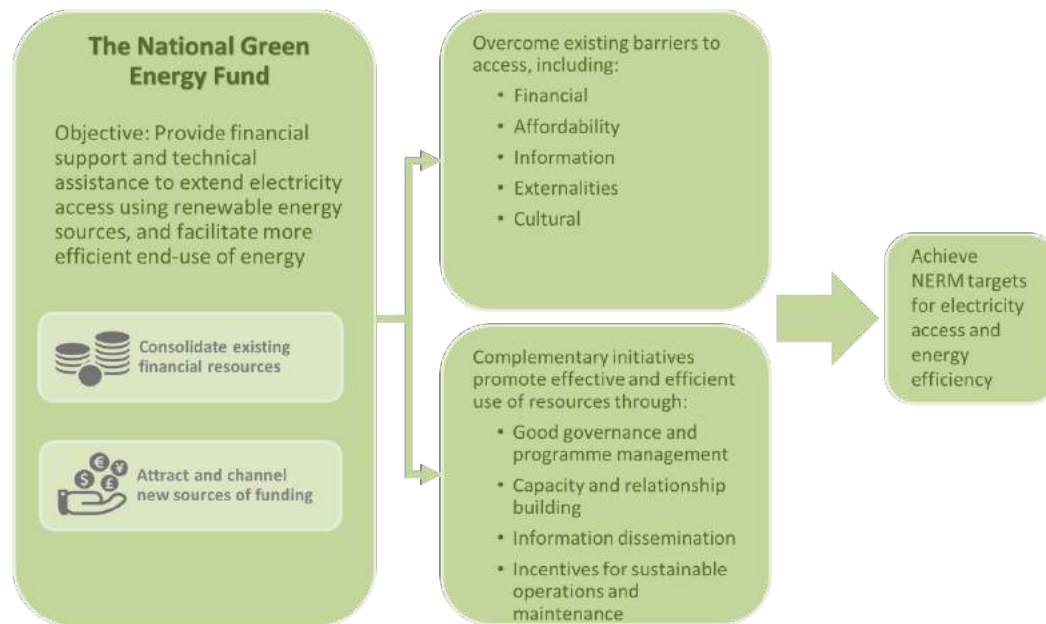
The Government recognises that additional funding will be critical to implementing the actions needed to achieve the NERM objectives. With this in mind, the Government commissioned an assessment of the viability of establishing a new financial mechanism that would support the key NERM objectives related to electricity access, energy efficiency, and green growth.

This assessment recommended the establishment of an umbrella fund—the 'National Green Energy Fund' (NGEF)—to be managed by the Government. The Fund will consolidate existing financial resources, source new domestic and international funding, and channel funding to support renewable-energy based electricity access, energy

efficiency, and other green energy investments in Vanuatu under the framework of the NERM.

The Fund will be administered by a Board, which will be responsible for accountability and the transparent use of the Fund. The Fund will use existing government systems and processes to deliver payments, procure goods and services, and track the use of funds. Figure 5.1 illustrates how the Fund helps to achieve the NERM objectives.

Figure 5.1: Overview of the National Green Energy Fund



Source: Castalia, Designing a National Green Energy Fund for Vanuatu, February 2016

In March 2016, the Council of Ministers approved this Fund. A subsequent phase of work (included in the NERM Implementation Plan) will develop the structure of the Fund and the process for establishing it.

Why establish a National Green Energy Fund?

To meet the NERM electricity access targets and help realise Vanuatu’s energy efficiency potential, the Government needs to mobilise a significant pool of financial resources, equivalent to at least US\$20 million. This should provide all households with access to electricity (primarily through individual solar systems) and make some reasonable progress on energy efficiency by 2030. Depending on the availability of funding, the scope of the Fund could be expanded to cover a range of other green energy-related activities in the NERM Implementation Plan.

Existing electricity access initiatives such as the Global Partnership for Output Based Aid (GPOBA) and the Vanuatu Rural Electrification Project (VREP) are expected to make a valuable contribution, but will not be sufficient to meet the NERM targets. Current estimates indicate that, even after these initiatives are completed, many thousands of households in Vanuatu will still not have access to electricity. There are currently no programmes or projects in Vanuatu that address energy efficiency, although a bill on energy efficient appliances is currently with Parliament and some preliminary work has been done on incorporating energy efficiency into the building code.³⁵

³⁵ Under the ADB’s Promoting Energy Efficiency in the Pacific (PEEP phase 2, 2014).

Consolidating existing and new funding for electricity access and energy efficiency under a single NGEF umbrella will promote more effective use of funding. It will help to avoid overlaps and inconsistencies across existing initiatives, facilitate good governance, target existing and new funding more effectively towards high priority NERM objectives, and allow a long-term strategic view of how best to achieve those objectives.

Core focus of the Fund

The Fund’s objective is to extend electricity access—especially using renewable energy sources—and facilitate more efficient end-use of energy. It is envisaged that the NGEF will initially support:

- Electricity access investments, especially in rural areas—primarily through solar systems, some micro-grids, and some grid connections
- Initiatives to encourage energy efficiency in electricity end-use and biomass (and potentially transport, once a sufficient analytical base is available).

This focus is consistent with the Government’s priorities under the NERM, and responds to identified financial barriers holding back progress against NERM targets.

Households, businesses, and public institutions will all be eligible for support. As the Government’s intention is to develop a financial mechanism that will be durable, the design will also remain open to supporting additional technology and investment types, and targeting different beneficiaries, as and when circumstances change.

The Government will take the lead in managing the Fund

The Government of Vanuatu will manage the NGEF (with appropriate external support), and allocate funding support based on established processes. NGEF implementation is expected to rely primarily on existing government systems.

Putting the Government in the driver’s seat in setting up and administering the Fund will also signal greater government commitment to achieving energy policy goals and help attract the new funding required.

The Government will appoint a board of government officials from the following designated ministries and departments:

- Ministry of Climate Change (represented by DoE)
- Department of Strategic Policy, Planning, and Aid Coordination
- Department of Finance and Treasury
- Ministry of Internal Affairs (represented by the Department of Provincial Affairs).

The Board will initially be supported by external advisors in key areas, and will solicit participation from broader stakeholders. These arrangements aim to promote good governance, transparency, and effective implementation of the Fund—providing potential contributors with greater confidence in the processes, activities, and impact of the NGEF.

The Board—assisted by government officials and external advisors—will then ensure that outcomes are monitored and communicated to contributing organisations, financing agencies, energy sector representatives, and the broader Vanuatu population.

Taking a long-term perspective to achieve results and sustainability

The NGEF will take a long-term view focused on achieving durable results. Previous initiatives in Vanuatu have faced significant challenges translating initial success (for

example, in mobilising investments) into long-term success (by making these investments last). Many rural electricity access initiatives have not put in place appropriate arrangements to facilitate the long-term engagement of beneficiaries and ensure that equipment is maintained and valued over time.

With this in mind, the NGEF will approach its role and decision-making with a long-term view. This means that its activities are intended to go beyond providing one-off support to catalyse particular investments, by devoting resources to developing institutions, processes, and arrangements that ensure a lasting impact.

There are several design choices that can be made to promote sustainability. For example, channelling support through supply chain intermediaries such as equipment vendors and utilities (rather than directly to consumers) provides an opportunity for the NGEF to use incentives and long-term relationships to achieve sustainable progress. These details, and other operational details such as types of support, will be determined in a second phase of work on the NGEF.

Financial and legal implications

Establishing the Fund will require funding from various sources (both domestic and international). Potential sources of funding will be discussed in more detail and recommended in the second phase of this work.

It may be necessary to incorporate the governing rules and guidelines pertaining to the management and use of the Fund, and the appointment of Board members, into existing energy sector legislation, or to create new legislation. This will also be examined, and a recommendation made, during detailed Fund design.

5.1.2 Policy, law, and regulation

The NERM Implementation Plan highlights a range of regulatory reforms that could facilitate progress towards the NERM's objectives. The Government is preparing, or proposing to introduce, new or amended legislation in the following specific areas:

- New mandatory Minimum Energy Performance Standards (MEPS) for electrical appliances and lights (draft Bill is with Parliament)
- Changes to the Geothermal Energy Act, Petroleum Act, Electricity Supply Act, URA Act, and Government Tenders and Contracts Act
- Legislation to enable the URA to monitor and report on petroleum prices, and conduct 'light-handed' regulation of Liquefied Petroleum Gas (LPG) prices
- New environmental, health, and safety requirements for petroleum storage and supply
- New fuel (petroleum) quality standards.

These reforms are included in the NERM Implementation Plan, along with other high priority policy and legislative actions.

5.1.3 Stakeholder engagement and coordination

Achieving the NERM's objectives and targets will require a concerted effort and collaboration from the Government, donors, private sector, and communities, consistent with the principle of 'Many Partners, One Team, One Plan'. The Government is in a strong position to facilitate this process.

In particular, achieving the NERM's objectives in cross-cutting policy areas like green growth will require a coordinated, inclusive, cross-sectoral approach. Most of the green

growth actions proposed in the updated NERM Implementation plan involve more than one government department working together. The private sector, non-government organisations (NGOs), Civil Society Organisations (CSOs), and others will also need to be involved, as appropriate.

The Implementation Plan also includes specific actions to facilitate better engagement and collaboration both across the Government, and across the energy and other relevant sectors. In particular:

- Set up a body to facilitate and coordinate the implementation of green growth actions between the energy sector and other sectors, with participation from key government agencies, private sector, NGOs, CSOs, and others

This coordinating body's role would include identifying strategic locations in the country for the implementation of green growth programmes, to ensure that adequate departmental resources are allocated to coordinating green growth actions, and identifying and applying jointly for new possible funding sources for productive energy projects

- Carry out joint planning sessions between different ministries to identify key energy sector activities that can contribute to objectives in other sectors.

5.1.4 Administration

DoE's capacity has increased significantly since the NERM was published in 2013. From a unit of two permanent staff in 2011, DoE has grown to have 10 permanent staff and seven project officers in 2015. DoE's budget almost tripled between 2011/2012 and 2015/2016. DoE currently manages a project portfolio of over US\$40 million, including the GPOBA and VREP programmes.

DoE's new position within the Ministry of Climate Change also provides an opportunity to ensure appropriate alignment between the government's strategies for rural electricity access and for climate change mitigation.

Even so, there remain opportunities to further build DoE's capacity to coordinate NERM implementation. For example, training officials to collect, analyse, interpret, and communicate NERM-related data is included as an action in the Implementation Plan.

5.2 Donor-led Approaches

The Government does not have sufficient funds to do all that will be needed to achieve the NERM's goals, so donor support will be critical. Many donors already make valuable contributions to achieving the NERM goals, both through investing in infrastructure (for example, the European Union (EU) investment in biofuel-fired electricity generation on the outer islands), and providing technical assistance, capacity building and studies (for example, Global Green Growth Institute (GGGI)-funded work to assess the potential for energy efficiency). Donors can also help with monitoring and evaluation.

The NERM Implementation Plan includes a range of ongoing donor initiatives, as well as several initiatives that are proposed for funding (for example, the NAMA and SREP). The Government will continue to liaise with donors to seek their support for other actions in the Implementation Plan.

5.3 Private Sector-led Approaches

The active participation of the private sector provides an opportunity to access funding, technical expertise, and market knowledge, and to share risk.

The nature of many infrastructure projects (particularly the high cost) is such that they are outside the Government's capacity to fund, finance, and operate. For this reason, new large-scale electricity generation facilities such as the proposed Takara geothermal plant are likely to be particularly well-suited to a public-private partnerships (PPP) approach. There may also be an opportunity for private sector involvement in installing and operating micro- or mini-grids (with price regulation by the URA).

The potential for private sector involvement in NERM implementation also goes beyond formal arrangements for PPPs in large infrastructure investments. In particular:

- The electricity concessionaires will remain important drivers of progress towards the NERM's objectives
- Equipment vendors are likely to play a key role in extending electricity access in off-grid areas, and in promoting energy efficiency
- Financial institutions may have an increasing role in financing investments by consumers in electricity access and energy efficiency.

5.4 Community-led Approaches

Community-led approaches are likely to be particularly relevant in the areas of green growth, and electricity access in off-grid areas.

Green growth initiatives in the energy sector are expected to be implemented mostly at the community level, with technical and capacity building support from the national level agencies, NGOs, and established training and vocational institutions in Vanuatu. Successful implementation of green growth policies will require strong political commitment at all levels: national government, the six provincial governments, and the many communities.

The communities involved should organise themselves under a governance framework that supports long-term sustainability. Green growth programmes should form part of the existing or planned broader government provincial and community plans.

It is envisaged that green growth initiatives (implemented by DoE, other government agencies, or jointly) proposed in this updated NERM would be administered under business models that would either empower the communities to manage, operate and maintain their own power generation systems through a local cooperative (for example, a fisheries or agriculture cooperative), contract out the energy service to a company (a Renewable Energy Service Company (RESCO)), or a combination of the two.

Given a current lack of local technical capacity in rural areas, the various government agencies will play an important role in training local entrepreneurs, including on marketing new services and products. On the governance side, input from the provincial authorities is required to integrate national objectives into local area and community programmes and activities. The current community-based governance system will also need strengthening to create an environment conducive to business development and structures where benefits are shared with the community.

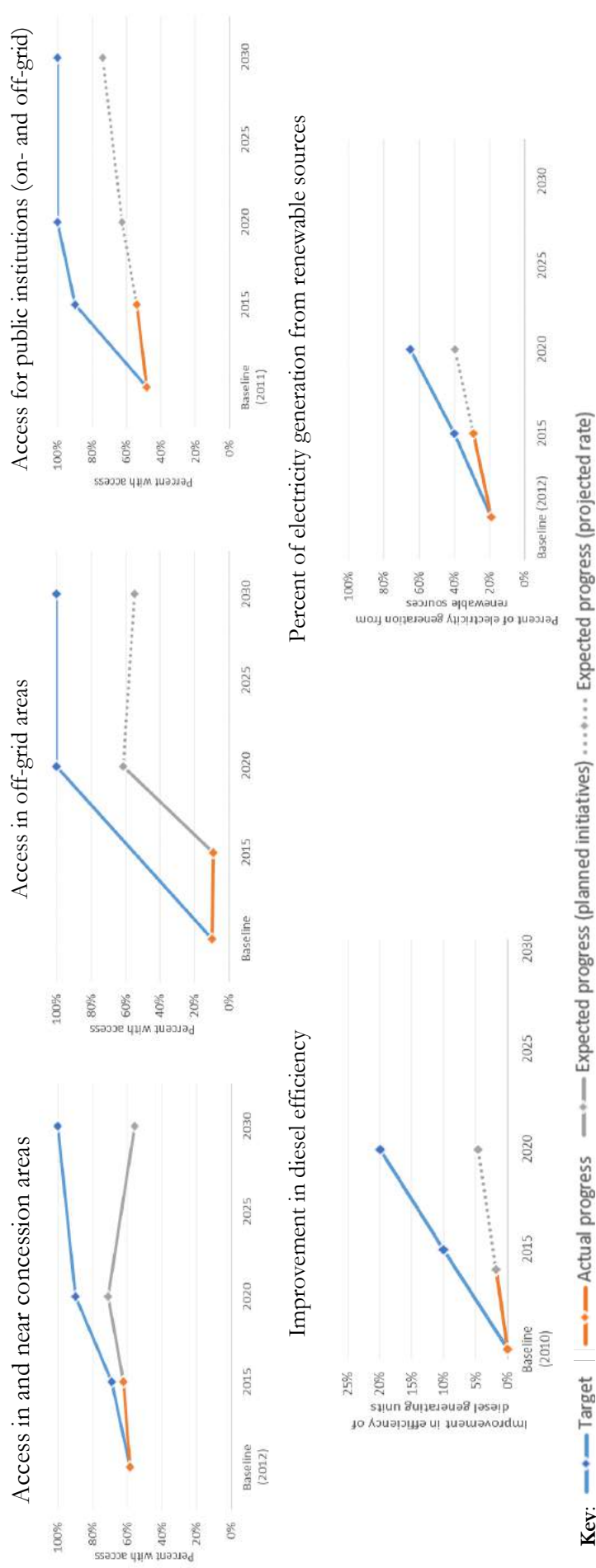
Appendix A: Progress Review

The NERM set quantitative and qualitative targets for the five priority areas: access, petroleum supply, affordability, energy security, and climate change.

Figure A.1 shows the progress (since the NERM was published) against the quantitative targets set out in the NERM, and projections of progress to 2030. While petroleum distribution costs were also listed as a target, there were insufficient data to assess progress, although this appendix includes a commentary on related topics.

In addition to the targets, the NERM also identified several objectives within each priority area. The following sections describe the progress against the NERM targets and objectives under the five priority areas. Some targets and objectives relate to multiple priority areas. Where this occurs, targets and objectives are described under the priority heading where they best fit, while acknowledging overlaps with other priorities.

Figure A.1: Overview of Progress Against NERM Targets



Note: The expected progress between 2015 and 2020 for access for public institutions is based on both planned initiatives and a projected rate of the progress made to end-2015 (or the latest date for which data are available)

A.1 Progress on Access

The NERM set targets for access to electricity for households in the concession areas, those near the concession areas, those off-grid, and for public institutions (on- and off-grid).

Vanuatu has made positive progress in providing access to households in and near concession areas

The NERM sets out specific targets for households in the concession areas, and for those near the concession areas. As data on connections do not distinguish between these two groups, our progress review combines these targets.³⁶

Figure A.2 illustrates the progress made against the combined target. Measuring progress against the target relies on assumptions about household growth. This assessment projects the number of households out to 2030 using an annual growth rate of 3 percent.³⁷

The progress made between 2012 and 2015 is based on connection data (actual and estimated at December 2015)³⁸ from UNELCO and VUI.³⁹ Based on this increase in connections, 62 percent of households have access (which is just short of the 2015 target of 69 percent). If this same rate of increase in connections was maintained out to 2030, Vanuatu would not meet its target of 100 percent of households with access (with just under 80 percent having access by 2030).

Future progress relies on existing and new programmes committing to connecting more households between 2015 and 2020. A notable example is the GPOBA programme, which aims to connect 4,375 households by 2019.⁴⁰ As a result, access will be available to 71 percent of households in and near concession areas by 2020, which falls short of the 2020 target of 90 percent of households with access.

As a result of household growth, only 56 percent of households will have access by 2030. Further efforts will be required between 2020 and 2030 to connect the remaining 16,200 households in order to achieve the 2030 target (100 percent).

³⁶ The access targets for concession areas are 75 percent connected by 2015, 90 percent by 2020, and 100 percent by 2030. The access targets for households near the concession areas are 33 percent connected by 2015, 90 percent by 2020, and 100 percent by 2030. Combining these targets (weighted by the number of households in the different areas), the targets for households in and near the concession areas are 69 percent by 2015, 90 percent by 2020, and 100 percent by 2030. The baselines for each target (68 percent of households in the concession areas, and 0 percent near the concession areas) were also combined to create a combined baseline of 59 percent of households connected.

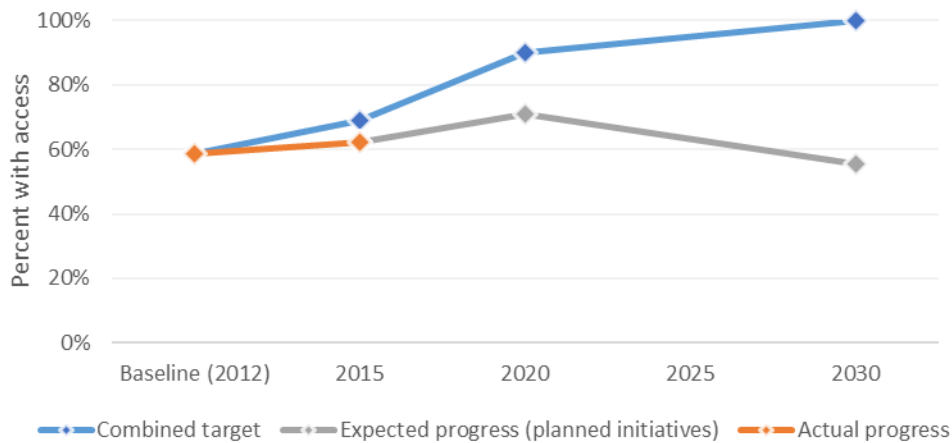
³⁷ Household growth is based on projecting the baseline figures using the compound annual growth rate for urban households (3 percent) between 2013 and 2030 (in GGGI's Vanuatu Energy Demand Business as Usual Scenario report).

³⁸ Customer numbers for VUI (actual) and UNELCO (estimated) at 2015 were provided by the URA. These customer numbers included all customer categories. To estimate the number of households connected, the proportion of households (see footnote 36 for definition) that made up customer numbers in December 2014 (based on technical reports submitted to the URA) is applied to the customer numbers in December 2015. These household numbers may be revised when the technical reports for 2015 are available.

³⁹ Households are defined as the categories of consumers listed as small domestic consumers including prepaid, and residential all-purpose usage (Categories 3-5) in UNELCO's technical reports, and small domestic usage and other low voltage (Rates 1 and 2) in VUI's technical reports.

⁴⁰ The progress reported by the GPOBA programme between June 2014 and November 2015 is excluded from the progress projected between 2015 and 2020. During this time, GPOBA provided 755 people with access, which is equivalent to around 157 households (with an average of 4.8 people per household). See www-wds.worldbank.org/external/default/WDSContentServer/WDS/EP/2015/12/10/090224b083c43e51/1_0/Rendered/PDF/Vanuatu000GPOB0Report000Sequence003.pdf.

Figure A.2: Progress in Access to Electricity in and Near Concession Areas



Source: Utilities Regulatory Agency, communications with UNELCO, GPOBA: World Bank. October 2014. “Rural Electrification Project.”

Achieving the targets for access in off-grid areas is unlikely without a step-change in progress

The NERM estimated that under 10 percent of households in off-grid areas had access to electricity in 2012.⁴¹ The target is to provide access to 100 percent of off-grid households by 2020.

There has been no reported progress on providing access to off-grid households since the baseline, and data are difficult to obtain in this area. There may have been some progress with households buying their own solar home systems, for example. Without data, the number of households with access is assumed to have remained constant.

However, the number of off-grid households overall (with or without access) could have grown, and may continue to grow, over time. This assessment projects the overall number of households in off-grid areas out to 2030 using an annual rate of 2 percent.⁴² Based on the projected number of households overall, the proportion of households with access decreased to 9 percent in 2015.

Figure A.3 illustrates the progress made against this target since the NERM was published, and incorporates the projects that are both planned and funded and expected to help provide electricity access in off-grid areas between 2015 and 2020.

Several new initiatives for providing access to off-grid households between 2015 and 2020 are being considered. These are listed in Table 3.3 in Section 3.3. If these initiatives achieve their targets, around 61 percent of off-grid households will have access by 2020.

So far, there are no projects with secured funding expected to be completed between 2020 and 2030. However, some progress (an additional 2,000 households with access) is expected by households buying their own systems during this period.⁴³ Incorporating

⁴¹ Access is defined as having grid-connected electricity or individual home systems, permanent electricity solutions. Products such as solar lanterns are not included in this definition of access.

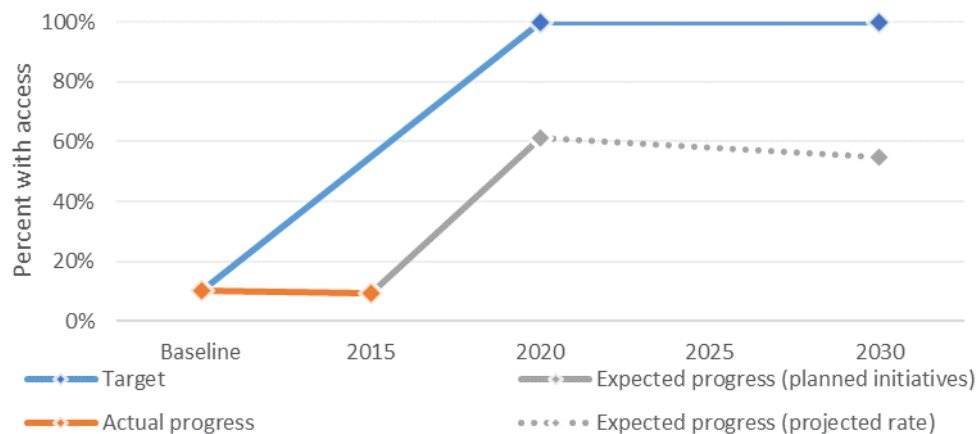
⁴² Household growth is based on projecting the baseline figures using the compound annual growth rate for rural households (2 percent) between 2013 and 2030 (in GGGI’s Vanuatu Energy Demand Business as Usual Scenario report).

⁴³ This assumption is different to the ‘no progress’ assumption between the baseline year and 2015. However, progress may be more likely to be made between 2020 and 2030, given that it is a longer timeframe, and technology may be comparatively cheaper.

projected household growth and the progress from households buying their own systems, the proportion of off-grid households with access would be 55 percent by 2030.

There is a risk that this target may overlap with the data collected on extensions to the grid. For example, if grid extensions expand the concession area into previously off-grid areas, those households are now near or in concession areas.

Figure A.3: Progress in Access to Electricity in Off-grid Areas



Source: GGGI, 2016, “Vanuatu Energy Demand Projections, Business as Usual Scenario.”, World Bank, 2014. “Project Paper for a Small RETF Grant in the Amount of US\$4.7 million Equivalent to the Republic of Vanuatu for a Rural Electrification Project”.

Achieving the targets for access for public institutions requires additional efforts

The NERM estimated that 48 percent of public institutions⁴⁴ had access to electricity (25 percent of health centres and 42 percent of schools), and set targets for 90 percent to have access by 2015 and 100 percent by 2020. Figure A.4 illustrates the progress made against this target.

Overall, around 54 percent of public institutions have electricity access. The progress made so far is largely based on the increased access to electricity by schools. Vanuatu has 589 schools in total (496 primary, and 93 secondary). The Department of Education collects data on the types of connections (grid, solar and so on) at schools, and surveys schools on the condition of the connection (good, fair, poor, or not stated).⁴⁵ These data show that 46 percent of primary schools, and 71 percent of secondary schools, currently have access to electricity. Data supplied by the Department of Health suggest that since the NERM, the percent of connected health facilities rose to 71 percent.

There are a few projects planned and funded to extend access to public institutions. These include:

- VREP, which aims to provide plug and play solar systems to 230 aid posts⁴⁶

⁴⁴ The NERM interprets public institutions as health and education facilities. In reality, public uses of electricity include sports fields, aid posts, government administration buildings, and street lighting. These are not included in the calculations for this progress review.

⁴⁵ This assumes that a “not stated” condition suggests that the school does not have access. Where schools report both “not stated” on one type of connection, and reported good, fair or poor on another type of connection, these schools are assumed to have access.

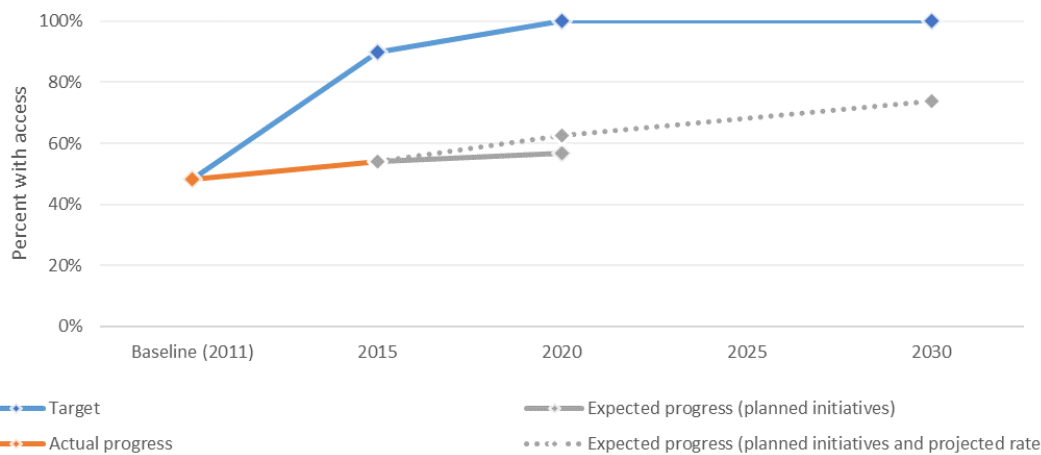
⁴⁶ In accordance with the original NERM calculations, aid posts are not included in the calculation of overall public institutions with access. However, connecting 230 aid posts would mean that 100 percent of aid posts would have access to electricity.

- The Biofuel Rural Electrification Project, which will connect two hospitals, four dispensaries and 10 schools in Penama and Torba
- The Talise Hydro Project, which aims to increase electricity services in Maewo, including one health centre and three schools.

Factoring in these planned initiatives only, about 57 percent of public institutions will have access by 2020 (the thick grey line in Figure A.4). However, some progress is also expected from public institutions connecting to the grid or purchasing plug and play systems themselves. Combining the planned initiatives and the observed progress rate (between the baseline and 2015), 63 percent of public institutions could have access by 2020 (the grey dotted line).

No initiatives are currently planned between 2020 and 2030, so the observed rate of progress (between the baseline and today) is applied. If this level of progress was achieved, then 74 percent of public institutions would have access by 2030.

Figure A.4: Progress in Access to Electricity for Public Institutions



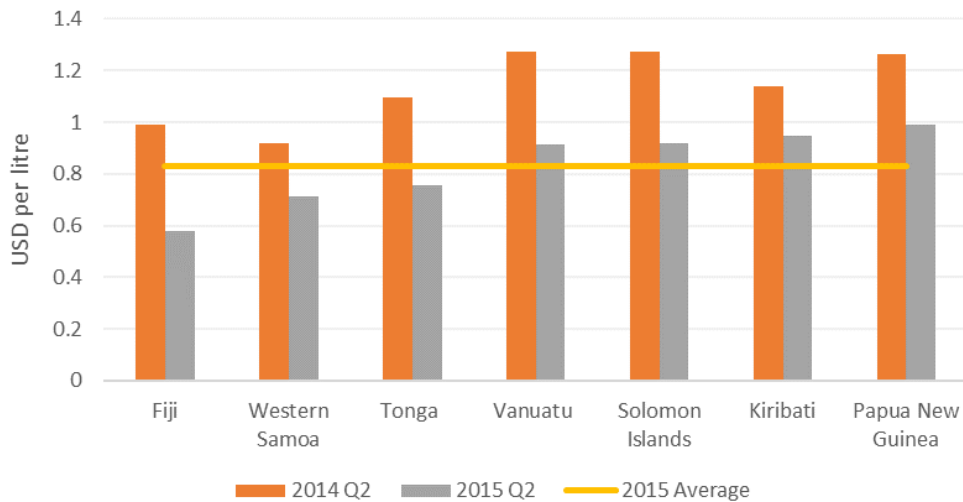
Source: GGGI, 2016, “Vanuatu Energy Demand Projections, Business as Usual Scenario.”, World Bank, 2014. “Project Paper for a Small RETF Grant in the Amount of US\$4.7 million Equivalent to the Republic of Vanuatu for a Rural Electrification Project”.

A.2 Progress on Petroleum Supply

The targets and objectives for petroleum supply also help support progress towards affordable and secure and reliable energy objectives. In the petroleum sector, the NERM established quantified targets for petroleum distribution costs, as well as broader objectives and specific actions to achieve affordability and energy security.

In terms of affordability, Figure A.5 shows that retail petroleum prices (excluding tax and duty) have substantially dropped between the second quarters of 2014 and 2015. However, Vanuatu’s petroleum prices are still higher than the average of comparable countries. These prices have direct impacts on the cost of transport in Vanuatu.

Figure A.5: Retail Petroleum Prices (excluding tax and duty) in 2014 and 2015 (ranked by 2015 prices)



Note: The retail prices for Tonga and Kiribati price are the average retail prices by the different providers in those countries (for Tongatapu and Vavau in Tonga, and Gilbert Group and Line & Phoenix Group in Kiribati). All figures exclude tax and duty.

Source: SPC Pacific Fuel Price Monitor (Quarter 2 2014 and Quarter 2 2015)

While little data are available on reductions in petroleum distribution costs, it is possible that progress has been made in this area

The NERM did not have a baseline for this target in 2013 as data on distribution costs were unavailable. No direct monitoring of distribution costs has been introduced since the NERM. However, there is some anecdotal evidence of distribution cost savings. For example, Pacific Petroleum advises that its acquisition of three service stations allowed a reduction in margins.⁴⁷

Despite a lack of direct monitoring of this target, other information can shed light on trends in petroleum distribution costs. For example, trends in the difference between the Vanuatu price and international prices for petrol could suggest whether distribution costs have been reduced (although the difference in prices could reflect differences in retail margins and/or distribution costs).

Figure A.6 and Figure A.7 show the petroleum and automotive diesel prices in Vanuatu and the average price in the Pacific Islands.⁴⁸ These are plotted against the Singapore-based price benchmarks (MOPS 95 for petroleum; and Platts 10ppm for automotive diesel).⁴⁹ This information is collected from the Secretariat of the Pacific Community’s Pacific Fuel Price Monitor.⁵⁰

⁴⁷ Communications with Pacific Petroleum.

⁴⁸ Markers in the figure identify where quarterly data are available in SPC’s Pacific Fuel Price Monitor. See www.spc.int/edd/en/document-download/viewcategory/77-pacific-fuel-price-monitor.

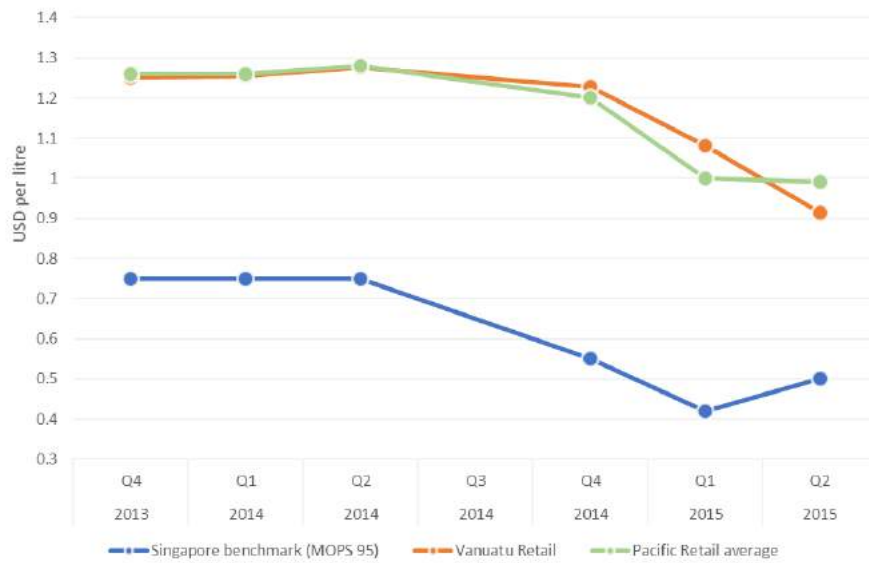
⁴⁹ These benchmarks are both produced by Platts. The petroleum benchmark is the Mean of Platts Singapore (MOPS) benchmark (the average of Singapore-based price assessments) for Research Octane Number 95 (RON95) fuel, which is the petroleum product imported in Vanuatu. For diesel, the price benchmark is for 10ppm diesel products.

⁵⁰ Markers in the figure identify where quarterly data are available in SPC’s Pacific Fuel Price Monitor. See www.spc.int/edd/en/document-download/viewcategory/77-pacific-fuel-price-monitor.

The top panel shows that the difference between the Singapore benchmark (MOPS 95) and the Vanuatu price for petroleum did not decrease between the last quarter of 2013, and the second quarter of 2015. These prices are generally consistent with the average Pacific price, although the retail price in Vanuatu has trended above the Pacific average more recently (except in the second quarter of 2015). However, the difference between the Singapore benchmark (Platts 10ppm) and Vanuatu price for automotive diesel has decreased, as shown in the bottom panel.

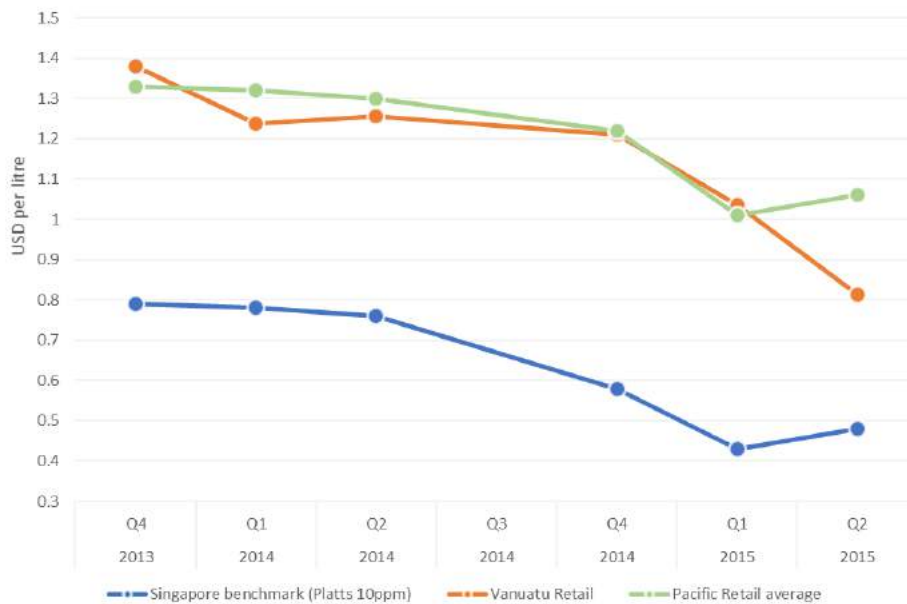
These data do not show the prices charged in outer islands of Vanuatu. Development of these data would indicate the impact of outer island delivery on distribution costs, and potentially where distribution could be more efficient.

Figure A.6: Retail Petroleum Prices (excluding tax and duty) in Vanuatu, the Pacific Region, and from Singapore Benchmarks



Source: Available editions of the SPC Pacific Fuel Price Monitor

Figure A.7: Retail Automotive Diesel Prices (excluding tax and duty) in Vanuatu, the Pacific Region, and from Singapore Benchmarks



Source: Available editions of the SPC Pacific Fuel Price Monitor

Work to strengthen the legislative and regulatory framework for the petroleum sector is underway

The NERM set an objective for all operators in the petroleum sector to meet new health, safety, and environment standards by 2020. Local legislation and policies for operators to comply with were expected to be in place by 2015.

To date, these standards have not been put in place. However, legal consultants Jones Day are currently reviewing legislation and will draft appropriate revisions to address gaps and otherwise strengthen the provisions to support this objective. The revisions to be developed include environmental and safety requirements for petroleum storage and supply, and instruments for the disposal of solid wastes (particularly lead acid batteries).

This work is underway but has been delayed. Nevertheless, the standards should be introduced and underway well before 2020.

A foundation has been set to facilitate energy efficiency improvements in the transport sector

The NERM identified transport efficiency improvements as a way to reduce Vanuatu’s reliance on imported diesel and petroleum products. They can also improve energy affordability and sustainability.

Since the NERM, GGGI has been providing support to the Government to develop projections of transport sector energy demand and identify opportunities to use energy more efficiently in the transport sector. This work served as the basis for identifying targets (Section 4) and actions (Appendix B) to improve transport energy efficiency.

Despite the NERM’s emphasis on the benefits of financial hedging, operators have focused more on physical hedging to support secure and reliable energy

The NERM suggested that both financial and physical hedging can be used to manage volatile and rising fuel prices. The NERM particularly advocated financial hedging as physical storage was thought to be sufficient.

Since the NERM, Pacific Petroleum has invested in physical hedging through expanding facilities. The company has also investigated financial hedging opportunities, but considers these too risky and costly.⁵¹

Further progress on hedging seems unlikely without government support.

Little progress has been made in transitioning to bulk deliveries to outer islands

The NERM set an objective to improve efficiency and reliability of fuel distribution by moving to bulk deliveries to outer islands. The Government and Pacific Petroleum had signed a Memorandum of Understanding at the time of the NERM to invest in a new barge to distribute petroleum products to outer islands more efficiently.

There has been limited progress on this objective since then, as Pacific Petroleum is still seeking funding for the venture.

Future opportunities to improve the efficiency and security of fuel supply are described in progress against reducing the costs of distributing petroleum in Section 3.5.

A.3 Progress on Affordability

The NERM has established several targets and priorities to improve the affordability of energy in Vanuatu. These include a quantified target for diesel generation efficiency, as well as broader objectives and specific actions to achieve affordability. While renewable energy generation was also included as a target for affordability, discussion of progress against that target is discussed under climate change (Section A.5).

The affordability of electricity in Vanuatu varies between customers

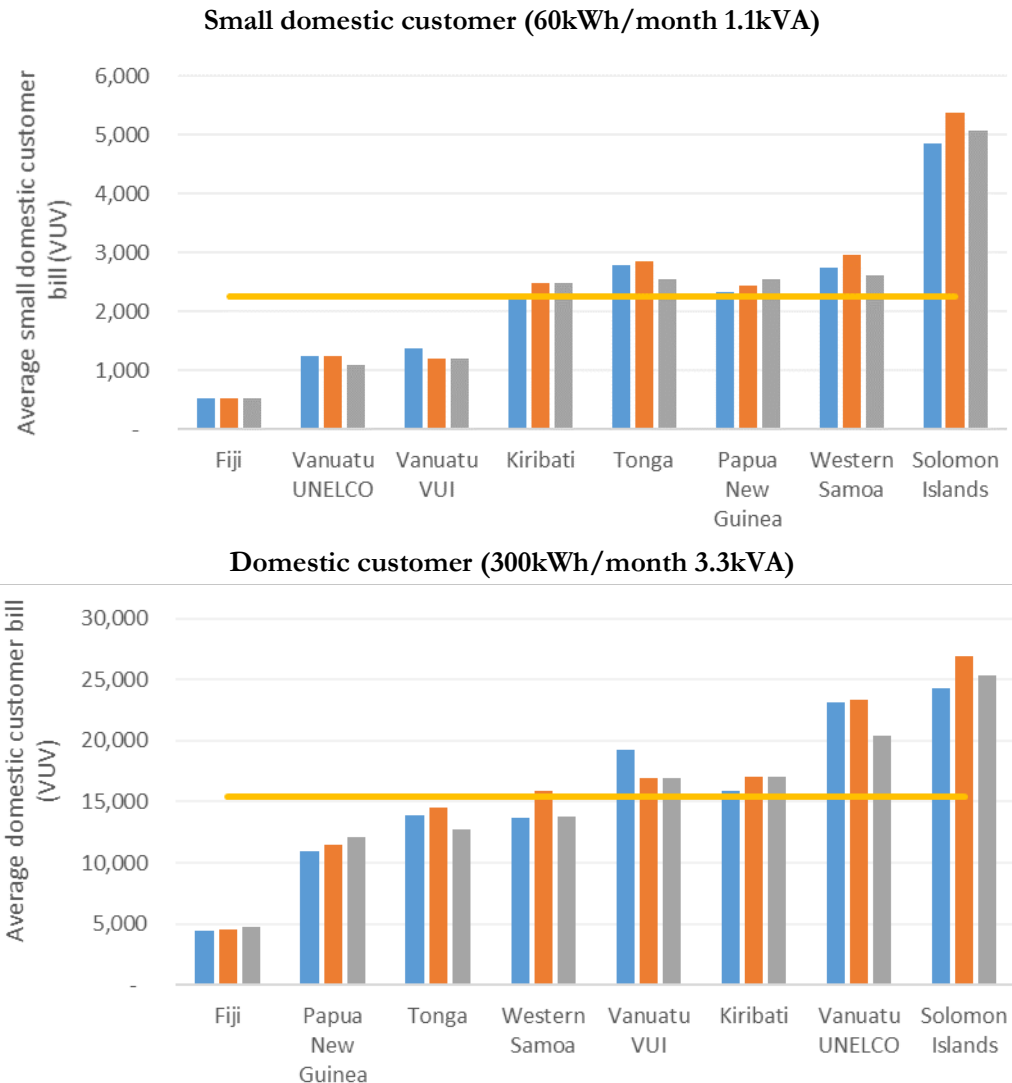
Vanuatu has relatively low electricity bills for small domestic customers, while electricity bills for domestic customers, as well as pre-tax retail petroleum prices, are higher than the average for comparable countries.

Figure A.8 compares the average electricity bills of small domestic customers and domestic customers (and other low voltage customers) in seven Pacific Island countries between 2013 and 2015. UNELCO's and VUP's bills are presented separately. Both UNELCO's and VUP's low voltage customers have lower average customer bills than similar customers in countries like Tonga and Samoa. These bills have also reduced since 2013.

In contrast, in the last 3 years, electricity bills for average domestic customers in Vanuatu have been higher than those for similar consumers in other comparable countries. The difference in bill size between a small domestic customer and a domestic customer in Vanuatu (compared to the difference in a country like Fiji) is also considerable, and may provide an incentive for customers to overly restrict their use of electricity.

⁵¹ Communications with Pacific Petroleum.

Figure A.8: Comparison of Average Electricity Bills (Selected Pacific Island Nations)



Key:

■ Average Bill 2013 ■ Average Bill 2014 ■ Average Bill 2015 — Average of comparable countries in 2015

Source: URA. June 2015. “Comparative Report: Pacific Region Electricity Bills” (2013, 2014, and 2015).

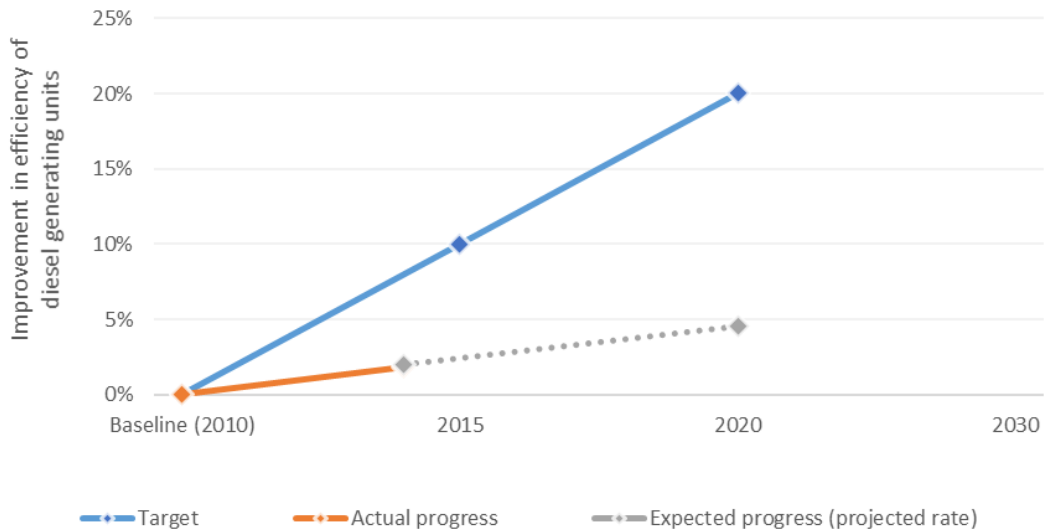
There has been an improvement in diesel generation efficiency at the national level

A priority objective in the NERM was an improvement in the efficiency of diesel generating units (that is, a decrease in the amount of diesel used to produce each unit of electricity). The NERM set a target for a 10 percent improvement in diesel efficiency by 2015, and a 20 percent improvement by 2020. This was intended to reflect what would be required to meet the Pacific benchmark of good performance (between 168 and 210

g/kWh).⁵² Reaching the lower bound of this benchmark would be an improvement of 17 percent.⁵³

Figure A.9 illustrates the average improvement for Vanuatu in diesel efficiency between 2010 and 2013/2014. This is based on comparing the average diesel efficiency discussed in the NERM⁵⁴ to the g/kWh rates reported in 2013 (for Port Vila, Malekula and Tanna) or 2014 (for Santo).

Figure A.9: Efficiency of Diesel Generating Units



Source: UNELCO, Annual Technical Report Year 2013, VUI, 2014 Annual Performance Report for Luganville Concession.

The overall progress hides the variation in the improvement in diesel efficiency between different generating units and concessions. For example, generating units in Port Vila and Malekula made modest improvements in diesel efficiency between 2010 and 2013, Tanna had a 5 percent improvement, while Santo’s efficiency decreased by 1 percent.⁵⁵ The overall progress is likely due in large part to UNELCO recently replacing some of its equipment.⁵⁶

Expected progress beyond 2013/2014 is based on the trend of progress made to date.⁵⁷ As Figure A.9 shows, there would have to be a substantial increase in diesel efficiency to reach the 2020 target of a 20 percent improvement against the NERM baseline. Further possibilities to improve diesel efficiency are described in Section 3.4.

⁵² Government of Vanuatu. “National Energy Road Map 2013-2020.” 2013, page 55.

⁵³ Government of Vanuatu. “National Energy Road Map 2013-2020.” 2013, page 56. This was based on the average fuel efficiency derived from UNELCO Annual Technical Reports from 2006-2010.

⁵⁴ The baseline average diesel efficiency is 253 g/kWh, based on the statement that a 17 percent improvement in efficiency would be 210 g/kWh (i.e. $210/0.83=253$).

⁵⁵ UNELCO. Annual Technical Reports for 2010 and 2013.

⁵⁶ Communications with UNELCO.

⁵⁷ However, this may be optimistic as much of the recent progress is due to UNELCO refurbishing some of its equipment. Such refurbishments only take place periodically.

Initiatives to support consumers' ability to afford grid connection fees and electricity tariffs are underway

The NERM also prioritised addressing consumers' ability to pay for electricity connections and ongoing tariffs, and explore options to improve affordability more generally. The main initiatives to support this objective are listed in Table A.1.

Table A.1: Initiatives to Enable Affordable Electricity

Name of Initiative	Purpose	Target Market
GPOBA	Targeted subsidies that provide 80% of connection and wiring cost	Households (up to 5A)
UNELCO	Covers 80% of connection costs	Households and public facilities (up to and over 5A)
Santo Fund	Funds projects to extend electricity access through a charge collected from Santo electricity consumers	Rural and outlying areas in Santo
Article 6 Fund	Investment support fund to expand electricity access	Areas within the Port Vila concession
Lifeline tariffs	Tariffs heavily discounted (cross-subsidised by other consumers)	Low-consumption households (<60 kWh/month)

Continuing to achieve (or improve on) other NERM targets and priorities also supports these long-term affordability priorities. For instance, developing renewable energy helps to reduce the ongoing costs of electricity generation and reduces the risk of a high diesel price making electricity less affordable. The introduction of energy efficiency targets, and new energy efficiency initiatives, will also help improve affordability.

Given the progress made, and expected to be made, in terms of access in and near concession areas, affordability concerns about connecting to the grid seem to be less of a barrier. However, this may not be the case for off-grid households and public facilities. There may also be ongoing concerns with the ongoing costs of electricity as well as the connection costs. Future initiatives should focus on these areas to make the greatest gains against affordability and access targets.

Other affordability priorities are being progressed as part of a legislative review

The NERM committed the Government to review the energy sector legislation currently in place and draft appropriate revisions to address gaps and otherwise strengthen the provisions to support the NERM. Aspects of this review that relate to affordability goals include:

- Promote least cost investment in the electricity sector
- Introduce price monitoring for petrol, kerosene and diesel
- Introduce price regulation for LPG.

Work to review these is underway. The Government has engaged a legal consultant to review and draft changes to the Geothermal Energy Act, Petroleum Act, the Electricity Supply Act, the URA Act, Government Tenders and Contracts Act, and other relevant legislation and regulations. Changes are to enable instruments to facilitate the URA to

monitor and report on petroleum prices; and conduct “light-handed” regulation of prices for Liquefied Petroleum Gas (LPG).

This work is underway but has been delayed. These initiatives should be introduced and underway well before 2020—providing impetus to achieving NERM targets in this area.

A.4 Progress on Energy Security

The NERM sets out several priorities to achieve energy security: diversifying the energy mix; making petroleum supply more secure, reliable and efficient; and providing a framework for investment. This priority area also included the targets for diesel-generation efficiency and renewable energy generation that are described under affordability (Section A.3) and climate change (Section A.5) respectively.

The mix of energy sources has diversified, but there is space for further diversification

Due to Vanuatu’s reliance on imported fossil fuels, international fuel prices largely determine the affordability of electricity and transport energy in Vanuatu. For instance, the decrease in the price of diesel fuel at the end of 2014 led to an 11 percent drop in the electricity price (Vt53.77 in November 2014 to Vt47.82 in March 2015). This highlights the importance of diversifying the sources of Vanuatu’s electricity generation to include domestic renewable energy resources. This will reduce Vanuatu’s vulnerability to volatile prices, as well as achieving renewable energy targets (and reducing greenhouse gas emissions).

The ability to assess the diversity of Vanuatu’s primary energy supply is limited because much of the supply comes from biomass, where there is a lack of recent and accurate data. Given this, the assessment below focuses on the mix of sources used for electricity generation.

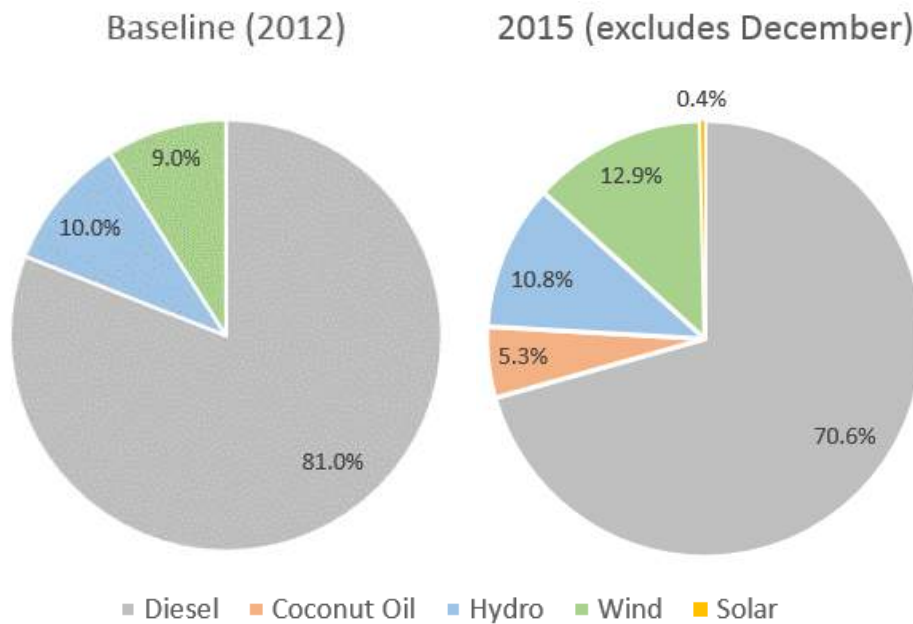
Figure A.10 compares the mix of electricity generation in 2012 and 2015. In 2012, 19 percent of electricity was generated from renewable energy sources,⁵⁸ and this proportion increased to 29 percent in 2015.⁵⁹ This reflects the introduction of 0.1MW of grid-connected solar photovoltaic capacity,⁶⁰ and considerable development of other renewable resources including wind and coconut oil. This growth is encouraging as it provides confidence that Vanuatu is developing alternatives to diesel for generating electricity. This will reduce reliance on a single fuel (and the related risks to affordability) as well as achieve renewable energy targets for sustainability purposes.

⁵⁸ Government of Vanuatu. “National Energy Road Map 2013-2020.” 2013, page 35.

⁵⁹ UNELCO and VUI data (excludes data for December 2015), Utilities Regulatory Authority, December 2015.

⁶⁰ UNELCO, Vanuatu Electricity Road Map 2015-2030. October 2015 Update.

Figure A.10: Comparison of Electricity Generation Sources



Source: Vanuatu National Energy Roadmap 2013, Utilities Regulatory Authority

Energy sources could be further diversified in future through the use of geothermal resources, for instance the proposed Takara project to generate electricity on Efate. However, this project—which, with a proposed capacity of at least 4MW, is a significant size relative to Vanuatu’s electricity market—faces the challenge of low demand growth and sufficient existing capacity. This situation might change if additional demand was created through achieving other NERM targets, particularly access targets.

Little progress has been made towards making petroleum supply more secure, reliable and efficient

The NERM set an objective to develop petroleum energy and security policy and work with industry to optimise petroleum storage capacity and shipping schedules to ensure national energy security and reliability is maintained.

There have been no significant developments in these areas. For instance, a petroleum energy and security policy has not been developed. However, this may arise as a topic area in the ongoing review of electricity and petroleum sector legislation and regulations.

In terms of investigating shipping options, the Government and Pacific Petroleum had signed a Memorandum of Understanding at the time of the NERM to invest in a new barge to distribute petroleum products to outer islands more efficiently. Pacific Petroleum is still seeking funding for this venture.

Future opportunities to improve the efficiency and security of fuel supply are highlighted as part of the discussion in Section 3.5 on progress in reducing the cost of distributing petroleum.

A framework for investment is yet to be fully developed

As part of the priority for secure and reliable energy, the Government was interested in exploring the opportunities that PPPs could offer in the energy sector. The Government wanted a well-defined policy for structuring PPPs to ensure that it, and the private

partner(s), take on efficient levels of risk and have a clear understanding of each other's roles.

The NERM stated that the Government would prioritise the preparation of a PPP policy framework for approval by the Council of Ministers. This would also include provisions for independent power producer (IPP) licensing and compliance, Power Purchase Agreement (PPA), and PPA pricing policy.

Vanuatu does not yet have a PPP policy and framework.⁶¹ However, the URA issued preliminary guidelines for IPPs and PPAs for public consultation in June 2014. There is yet to be a final decision on these guidelines. As of 2015, two energy PPPs have been implemented in Vanuatu. These should help to provide the impetus and capacity to develop a PPP policy for future projects.

A.5 Progress on Climate Change

The NERM's original priorities to mitigate climate change through renewable energy and energy efficiency were to increase the proportion of electricity generated from renewable sources; examine options for increasing renewable energy and improving energy efficiency and conservation; and establish comprehensive data in order to set realistic targets and begin energy efficiency initiatives. The priority area also included the target to improve diesel-generation efficiency, which is discussed under affordability (Section A.3).

As outlined in Section 2.5 the updated NERM also incorporates additional priorities to facilitate the use of green energy to catalyse socially and environmentally-responsible growth in key economic sectors (including agriculture, fisheries, and tourism). The below progress review covers the NERM's original priorities.

Renewable energy sources now contribute more to electricity generation

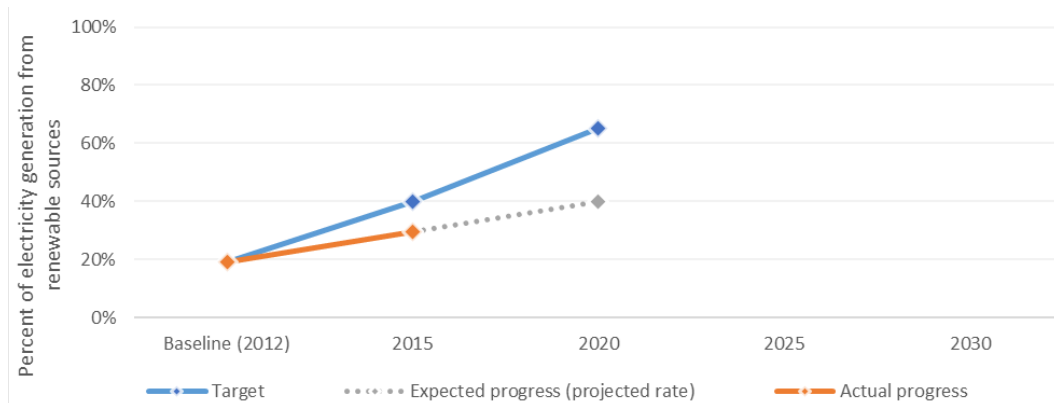
The NERM set a target of 40 percent of electricity generation from renewable energy sources in 2015, and 65 percent by 2020. A goal of 100 percent renewable electricity by 2030 was also recently included in Vanuatu's Intended Nationally Determined Contribution under the UNFCCC.⁶²

Figure A.11 shows the progress made against this target compared to the baseline year (2012), where 19 percent of electricity was generated by renewable energy sources. The proportion of electricity generated from renewable energy sources in 2015 (29 percent) falls short of the NERM target. If the rate of progress stays constant, Vanuatu will also not meet the 2020 target (65 percent) or the INDC target for 2030 (100 percent).

⁶¹ See <https://pppknowledgelab.org/countries/vanuatu>.

⁶² Government of Vanuatu, "Intended Nationally Determined Contribution (INDC)," September 21, 2015. The INDC recognises this target is conditional on technical assistance and sufficient financial support.

Figure A.11: Progress in Proportion of Electricity Generation from Renewable Sources



Source: Vanuatu National Energy Roadmap 2013, Utilities Regulatory Authority, Government of Vanuatu, “Intended Nationally Determined Contribution (INDC).”

It is worth noting that the proportion of renewable electricity can vary from month to month, and from year to year. This is due to the inherent variability of the quantity of electricity that can be produced by wind, hydro, solar, and coconut oil depending on the conditions in the environment. For instance, in 2015 the proportion of electricity generated from renewable sources varied between 13 percent in March and 50 percent in August.

Future potential for increasing renewable energy generation is discussed in Section 3.6.

Options for increasing the use of renewable energy, and improving energy efficiency, have been identified

The Government—in collaboration with other parties—has investigated and proposed several initiatives to promote energy efficiency and the use of renewable energy (see Table A.2 for examples). Many such initiatives are included in the NERM Implementation Plan.

Table A.2: Initiatives to Promote Renewable Energy and Energy Efficiency

Initiative/Development	Focus Area	Purpose/Achievements
Intended Nationally Determined Contribution to the UNFCCC	Renewable energy	Explores future potential of renewable electricity and cost to achieve 100% renewable electricity by 2030
Rural electrification programme	Renewable energy	GIZ supporting the development of a renewable energy-based electrification plan for remote islands in 2016
NAMA Intervention 1	Renewable energy	Seeks financing for the installation of new micro-grids based on renewables (mainly focusing on solar), identifying five priority sites
Scaling Up Renewable Energy in Low Income Countries Programme (SREP)	Renewable energy	Piloting and showing the opportunities for development by creating new economic opportunities and increasing energy access through the use of renewable energy

Minimum Energy Performance Standards (MEPS) and Mandatory Labels

Energy efficiency

- GoV preparing to enact legislation to set MEPS for imported electrical appliances
- DoE expects MEPS to result in net electricity cost savings to households of 9,750 to 10,000 Vatu per year by 2020, and nearly 30,000 Vatu per year by 2038⁶³

Source: Government of Vanuatu, “Intended Nationally Determined Contribution (INDC)”, Department of Energy, UNDP. “Rural Electrification in Vanuatu” (“NAMA Report”), GGGI, 2016, “Vanuatu Energy Demand Projections, Business as Usual Scenario.”

Some data on energy efficiency have been collected and targets have been set

There are practical and affordable ways to use energy more effectively in Vanuatu, with social, economic, and environmental benefits. In addition to mitigating climate change, energy efficiency improvements are expected to contribute to at least two other priority outcomes (affordability, and secure and reliable energy).

The importance of energy efficiency to Vanuatu was highlighted in the original NERM, but a lack of data at that time on energy usage made it difficult to define any meaningful policy targets. A conscientious effort has been undertaken over the past year to gather additional data to allow more explicit objectives and targets in this area to be incorporated into the NERM.

⁶³ See <http://pidp.org/pireport/2014/May/05-15-11.htm>.

Appendix B: Implementation Plan

Table B.1 provides an updated list of investments and actions that could help meet the NERM targets.

Recognising funding and human capacity constraints, the table highlights the initiatives that warrant the most attention in the short-term. Actions already in progress (and which should be completed) are highlighted in blue. The highest priority actions being proposed are highlighted in green. The table also lists (in white) a range of other actions that the Government proposes to implement if funding and capacity are available. While these could also make a valuable contribution to meeting the NERM's objectives, they are lower priority than the highlighted actions.

Some actions and investments envisaged when the NERM was published in 2013 are not included in this updated Implementation Plan. Investments and actions that have already been completed have been removed. Similarly, the Implementation Plan does not include actions and investments that, due to changes in circumstances (such as new or similar initiatives being launched), are now considered less of a priority. Several other investments and actions have been added to the Plan, especially to reflect the NERM's increased emphasis on green growth (and the improved information base on energy efficiency, which has allowed specific actions to be defined).

Where possible, the table provides information on the estimated cost and timing for implementing the actions. In some cases, budget and timing will be determined as part of more detailed action design.

Table B.1: NERM Implementation Plan 2016-2030

Investment/ action	Main outcome(s) it contributes to	Priority	Cost ⁶⁴	Lead responsibility	Status	Timing
Investments and Donor Programmes						
Undine Bay Solar PV System (510kW)	Access, sustainability, green growth	Immediate	US\$1.1m	UNELCO	Construction completed; ready to launch	2016
GPOBA Grid Based Electricity Project	Access	Immediate	US\$4.85m	World Bank	In progress	2014-2018
Efate Ring Project (grid extension)	Access	Immediate	US\$23.5m	UNELCO	In progress	2015-2020
Lighting of Luganville Town Streets	Access	Immediate	US\$2.5m	VUI	In progress	2011-2016
Demonstration Rural Biofuel Project (Ambac, Vanua Lava)	Access, sustainability, green growth	Immediate	US\$2.2m	EU	In progress	2012-2016
North East Malekula Rural Electrification Project	Access	Immediate		UNELCO	In progress	2015-2016
Vanuatu Rural Electricity Project (VREP) Phase 1 (Off-grid households and public facilities)	Access, sustainability, green growth	Immediate	US\$4.7m	NZMFAT/ World Bank	In progress	2015-2019
Kawene 1.5MW Grid-connected Solar Facility, Efate (Energy Facility 2)	Sustainability	Immediate	US\$4.3m	EU, UNELCO, GoV	In progress	2016
Loltong Hydro Project, North Pentecost	Access, sustainability, green growth	Immediate	US\$0.02m	Governments of New Zealand, Australia, and Vanuatu	In progress	2016

⁶⁴ Costs of investments in many cases represent only the upfront costs, with ongoing O&M costs extra. Some items may overlap with others (in particular, the National Green Energy Fund's budget could potentially cover other initiatives listed in this table).

Investment / action	Main outcome(s) it contributes to	Priority	Cost ⁶⁴	Lead responsibility	Status	Timing
Talise Hydro Project, Maewo (Phase 2—installing distribution lines)	Access, sustainability, green growth	Immediate	US\$0.7m to US\$1.0m	IUCN, Governments of Austria, Italy, and Vanuatu	In progress	2016-2017
Solar Light Industrial Centres and Agro-processing Power Stations	Access, green growth	Immediate	US\$1m to US\$1.5m	Village Infrastructure Angels	In Progress	2016-2018
Prepare a detailed design for, and establish, a National Green Energy Fund to support investments in RE-based electricity access and energy efficiency, especially in rural areas	Access, sustainability, green growth	Immediate	US\$0.1m to design; at least US\$20m size of fund (depending on scope)	DoE, with MoF	In progress	2016-2017
Whitesands Solar PV Micro-grid, Tanna	Access, sustainability, green growth	Highest			Proposed	
Efate Grid Connected Solar PV Project (1MW)	Sustainability	Highest	US\$5.6m	UNELCO	Proposed	2016-2018
Vanuatu Rural Electricity Project (VREP) Phase 2	Access, sustainability, green growth	Highest	TBD	TBD	Proposed	TBD
Invest in a barge to improve the efficiency and reliability of fuel distribution within Vanuatu by shifting away from deliveries of fuel in drums and towards the use of regular bulk deliveries to outer islands	Security and reliability, affordability	Highest	US\$1.6m	GoV & Pacific Petroleum	Proposed	2016-2017
Grid Extension, East Cost Santo (Matelevu to Shark Bay, Port Olry, Stone Hill and Palekula)	Access	Highest	US\$2.4m	VUI/Santo concessionaire	Proposed	2017-2018

Investment / action	Main outcome(s) it contributes to	Priority	Cost ⁶⁴	Lead responsibility	Status	Timing
Sarakata Hydro Power Extension Project (600kW), Santo	Access, sustainability, green growth	Highest	US\$4.25m	GoV, VUI/Santo concessionaire	Proposed	2018-2021
Brenwe Hydro Power Project (< 1.2MW), Malekula	Access, sustainability, green growth	Highest	US\$5.6m to US\$6.45m	SREP, ADB and GoV	Proposed	2018-2021
Low Voltage and Medium Voltage Extensions (Vila, Santo, Malekula)	Access	High	US\$18m	UNELCO and VUI/Santo concessionaire	Proposed	2020-2023
NAMA Intervention (5 solar PV micro-grids)	Access, sustainability, green growth	High	US\$2.1m	TBD	Proposed	TBD
Takara Geothermal Power Plant (4+4MW) preparatory study & investment	Access, sustainability, green growth	Medium	US\$108m	Geodynamics	Proposed	TBD
NAMA Intervention 2 (5 sites for grid extension)	Access	Medium	US\$1.6m	TBD	Proposed	TBD
NAMA Stabilisation Fund	Affordability, access	Medium	US\$0.7m	TBD	Proposed	TBD
NAMA capacity development and operational costs	Access, sustainability, green growth, affordability	Medium	US\$1.8m over 5 years	TBD	Proposed	TBD
SREP Rural Electrification Project (off-grid solar and micro-grids)	Access, sustainability, green growth	Medium	US\$15.6 (excl. VREP)	TBD	Proposed	TBD

Investment / action	Main outcome(s) it contributes to	Priority	Cost ⁶⁴	Lead responsibility	Status	Timing
Rural biogas project	Access, sustainability, green growth	Medium	TBD	GIZ	Proposed	TBD
Relocation of two new 5 million litre petroleum storage tanks in Port Vila, Efate	Security and reliability	Medium	US\$10m	Pacific Petroleum/GoV	Proposed	TBD
Upgrade safety of petroleum infrastructure (develop plan to reduce risk of capital investment; initial capital investment to improve safety of infrastructure)	Security and reliability, sustainability	Medium	TBD	Petroleum suppliers and Government of Vanuatu	Proposed	TBD
Policies, laws and regulations						
Introduce mandatory standards and labelling system (MEPS) for refrigerators, freezers, air conditioning, and lighting through Parliamentary approval of the Energy Efficiency of Electrical Appliances, Equipment and Lighting Products Bill	Sustainability, affordability	Immediate		DoE	In progress	2016
Incorporate MEPS into Government procurement policies for appliances and vehicles	Sustainability, affordability	Immediate		DoE & Dept. of Finance and Treasury	In progress	2016
Review and draft changes to the Geothermal Energy Act, Petroleum Act, Electricity Supply Act, URA Act, Government Tenders and Contracts Act, and other relevant legislation and regulations. To include: <ul style="list-style-type: none"> ▪ Enabling the URA to monitor and report on petroleum prices, and conduct “light-handed” regulation of LPG prices ▪ Developing environmental, health and safety requirements for petroleum storage and supply 	All	Immediate		DoE	In progress	2016 (with implementation ongoing) All operators to meet new health and safety standards by 2020

Investment / action	Main outcome(s) it contributes to	Priority	Cost ⁶⁴	Lead responsibility	Status	Timing
<ul style="list-style-type: none"> Developing an instrument to facilitate requirement for and the development and adoption of fuel (petroleum) quality standards 						
Retender the Luganville concession agreement	Affordability, security and reliability	Immediate		DoE	In progress	2016
Develop a national energy efficiency strategy and action plan	Sustainability, green growth	Immediate		DoE & GGGI	In progress	2015-2016
Develop an effective policy and risk-sharing framework for PPP transactions in order to accelerate major investments (to include legislation and regulations to facilitate IPPs and PPAs)	Access, affordability, security and reliability, sustainability	Highest	US\$0.8m	DoE	Proposed	TBD
Reform import duties, tariffs and VAT to encourage imports of energy efficient and renewable energy equipment: <ul style="list-style-type: none"> Energy efficient products for use in buildings—in particular, efficient electrical appliances and lights Spare parts for vehicles and marine vessels Energy efficient vehicles Improved cook stoves and crop dryers Renewable energy systems (solar PV, wind, biomass) and spare parts 	Sustainability, green growth	Highest		MoF (with DoE)	Proposed	2016-2021
Work with Department of Tourism to develop energy efficiency guidelines for bungalows and hotels	Green growth, sustainability	Highest	US\$0.06m- US\$0.08m	DoE & Dept. of Tourism	Proposed	2017-2018

Investment / action	Main outcome(s) it contributes to	Priority	Cost ⁶⁴	Lead responsibility	Status	Timing
Support Ministry of Internal Affairs and Ministry of Infrastructure and Public Utilities to review the draft National Building Code to incorporate energy efficiency measures as a requirement for all building constructions and renovations	Sustainability, affordability	Highest		DoE, Ministry of Internal Affairs, & Ministry of Infrastructure	Proposed	2017-2018
Support the Department of Agriculture to develop a policy for the coconut industry, which would cover coconut oil for electricity generation, coconut oil-based fuel for land and sea transport, and increasing production of copra value-added products	Green growth, sustainability	High	US\$0.06m	DoE & DoA, in collaboration with agriculture sector	Proposed	2017-2018
Establish national bio-fuel standards	Green growth, security and reliability	Medium	US\$0.08m	DoE	Proposed	2018-2019
Analysis and studies						
Improve the collection, analysis, monitoring, and collation (within a central system) of data on energy end-use by sector (electricity, liquid fuels, biomass) and use (cooking, transport, etc.). To include training of DoE officials as needed	All	Immediate		DoE	In progress	2015-ongoing
Develop an electrification plan for renewable energy in remote islands	Access, sustainability, green growth	Immediate		GIZ	In progress	2016
Commission a national study on biomass resource and use in Vanuatu, and develop a national biomass strategy	Green growth, sustainability	Highest	US\$0.1m	DoE, DoA, & Dept. of Forestry	Proposed	2018-2019
Investigate the costs of urban and rural biomass cooking and the extent to which forest resources may be affected by deforestation related to population growth, cooking, and drying	Green growth, sustainability, affordability	Highest	US\$0.05m	DoE & Dept. of Forestry	Proposed	2016-2020

Investment / action	Main outcome(s) it contributes to	Priority	Cost ⁶⁴	Lead responsibility	Status	Timing
Explore options for promoting energy efficiency in the transport sector (including in tourism uses) and develop an action plan for cost-effective implementation	Green growth, sustainability, security and reliability, affordability	Highest		DoE & DoT	Proposed	2018
Establish an energy audit programme for all government buildings, and implement cost-effective energy efficiency actions identified by the audits	Sustainability, affordability	Highest	US\$0.07m	DoE & relevant govt agencies	Proposed	2016-2021
Explore the use of mini-grid renewable energy systems in communities that have the potential to develop businesses in the agriculture, fisheries, and/or tourism sectors	Green growth, access, sustainability	Highest	US\$0.08m- US\$0.1m	DoE, MoF, DoA and DoT	Proposed	2017-2018
Undertake resource mapping for micro and small renewable energy systems	Green growth, access	High	US\$0.08m- US\$0.1m	DoE	Proposed	2016-2017 and periodically after that
Develop and implement a business model for electricity and water services that would be able to manage, operate and maintain the systems	Green growth	High	US\$0.08m- US\$0.1m	DoE and Water Dept.	Proposed	2017-2018
Explore and implement business models (such as cooperatives and RESCOs) for rural electricity services that would empower communities and local industries to manage, operate and maintain the systems and services	Green growth	High	US\$0.06m- US\$0.09m	DoE, with DoA, and Depts. of Provincial Government and Fisheries	Proposed	2017-2018
Identify and prioritise communities suitable for cost-effective renewable energy for rural water supply systems	Green growth	High	US\$0.08m- US\$0.1m	DoE and Water Department	Proposed	2017-2018
Review coconut oil use for electricity production and other potential coconut value-added products, and	Green growth, sustainability,	High		DoE & DoA	Proposed	

Investment / action	Main outcome(s) it contributes to	Priority	Cost ⁶⁴	Lead responsibility	Status	Timing
develop an action plan based on the recommendations of the review	security and reliability					
Create a net-metering framework within the grid concession areas and a framework for RESCOs in off-grid areas	Green growth, sustainability, security and reliability	Medium		DoE	Proposed	
Carry out a scoping study for the use of coconut-oil based fuel in the land and sea transport sectors	Green growth, sustainability, security and reliability	Medium		DoE and Ministry of Infrastructure	Proposed	
Explore the potential for powering sea-going vessels and land-based vehicles with renewable energy	Green growth, sustainability, security and reliability	Medium		DoE and agencies responsible for maritime and land transport	Proposed	
Capacity building and institutional development						
Develop and implement a campaign to promote efficient cook stoves, efficient dryers for agriculture products, and solar water heaters in tourism accommodation	Green growth, sustainability, access	Highest	US\$0.5m (cook stove programme)	DoE & DoA	Proposed	2016-2020
Set up a body to identify and coordinate the implementation of green growth actions between the energy sector and other sectors, with participation from key government agencies	Green growth	Highest		DoE, other government agencies (with involvement from private sector, NGOs and CSOs)	Proposed	2016

Investment / action	Main outcome(s) it contributes to	Priority	Cost ⁶⁴	Lead responsibility	Status	Timing
Carry out joint planning sessions between different ministries to identify key energy sector activities that can contribute to objectives in other sectors	Green growth	Highest		DoE and other government agencies	Proposed	2016-2017
Support relevant Government departments and training institutions to provide technical, management and financial trainings to local entrepreneurs on how to manage their businesses in areas where new renewable energy community projects would be implemented	Green growth	Highest		DoE and other Government agencies and training institutions	Proposed	2017-2018
Develop a strategic and working partnership arrangement with the Department of Rural Water Supply so that there is coordinated and parallel rollout of both electricity and water projects throughout the country	Green growth	High		DoE and Dept. of Rural Water Supply	Proposed	2017-2018
Assess the technical capacity available in Vanuatu and capacity requirements to develop and sustain a RE-based power sector; and prepare a capacity development plan with local technical colleges and tertiary institutions	All	Medium		DoE, other government departments, training institutions	Proposed	
Build in-country capacity in operating and maintaining bio-fuel technologies	Green growth, sustainability, security and reliability	Medium			Proposed	
Other						
Encourage the systematic implementation of standalone renewable energy systems within communities with strong governance, a track record of maintaining infrastructure, and community plans that are well-established and linked to provincial and national plans, while not prioritising the implementation	Green growth, access	Highest		DoE, Dept. of Provincial Affairs, MoF, & DoA	Proposed	2017-2018

Investment / action	Main outcome(s) it contributes to	Priority	Cost ⁶⁴	Lead responsibility	Status	Timing
of standalone renewable energy projects in communities that are likely to have problems maintaining systems in the future						
Develop petroleum energy and security policy and work with industry to optimise petroleum storage capacity and shipping schedules to ensure national energy security is maintained	Security and reliability	Highest		DoE and petroleum companies	Proposed	
Support Department of Tourism and Agriculture to promote the use of solar technologies in these sectors	Green growth, access	Medium		DoE, DoA, & Dept. of Tourism		2018-2019
Promote the use of appropriate technologies to process agricultural products in order to increase productivity by minimising ongoing costs of energy use and maintenance	Green growth, affordability	Medium		DoE & DoA	Proposed	
Where appropriate, develop community-based improved water systems powered by renewable energy in areas that have poor water access	Green growth	Medium		DoE & Dept. of Water	Proposed	
Encourage tourism resorts and bungalows to use energy efficient lighting and appliances through the Vanuatu Tourism Standards Programme	Green growth, sustainability	Medium		DoE & Dept. of Tourism	Proposed	

Sources: NERM 2013-2020, VISIP 2015-2024, CDDRRS, GGGI draft working papers on green growth and energy efficiency, NAMA on Rural Electrification in Vanuatu, SREP Investment Plan for Vanuatu, discussions with stakeholders, and various other sources.

Appendix C: Monitoring, Verification, and Evaluation Plan

Targets that are not monitored have limited value. There are four key elements in effective monitoring and evaluation for the NERM:

- Defining performance measures
- Collecting, collating, and analysing performance data
- Communicating the results
- Using the information to improve performance and hold agencies accountable.

The NERM's objectives, quantitative targets, and Implementation Plan set the framework for DoE to monitor and evaluate NERM implementation

Section 4 established 12 quantitative targets for the NERM, and specified indicators and baselines against which progress will be measured. These are intended to be Specific, Measurable, Achievable, Relevant, and Time-bound (SMART) so that they can be used effectively for monitoring and improving progress. Although the target on petroleum distribution costs is currently not monitored, this is expected to change once regulations (currently under development) to monitor petroleum prices are in place. Similarly, biomass consumption data may not be available on a frequent basis, but the Implementation Plan also includes an action to develop a better information base on biomass use in Vanuatu.

The Implementation Plan sets out 68 actions to meet the NERM's objectives and targets. It proposes timing for implementing each action, and assigns lead responsibility for implementing each action to one or more agency or stakeholder group. Implementation progress will be measured against these parameters.

DoE will lead the process to collect and analyse progress information, in collaboration with other government agencies, donors, and energy sector stakeholders

As the lead agency for energy policy, DoE is responsible for leading the collection and analysis of data on progress towards the NERM's quantitative targets. The NERM Implementation Plan includes an action to improve the collection, analysis and monitoring of data on energy consumption by DoE (to include training of DoE officials as needed). DoE will need to collaborate with other government agencies and other energy sector stakeholders to obtain the required information. DoE will then collate the data and maintain a central database.

Table C.1 summarises the targets, indicators and data sources that will be used to track progress, and how often data will be collected. Ideally, data should be collected and reviewed more frequently than once a year (for example, quarterly). This allows DoE to remain up-to-date with implementation progress, and gives more of an opportunity to address implementation challenges and redirect attention to better meet the targets. For data that are available on a quarterly basis, DoE will collect and review these each quarter. However, recognising that some data may be available less frequently, DoE will only consolidate and report on its findings once a year (for example, in March to allow time for data from the previous calendar year to be consolidated).

The Implementation Plan assigns a lead agency to each action. For most actions, DoE is expected to lead implementation, often in close partnership with other key government agencies.

The information will be used to improve performance and hold DoE and other implementing agencies accountable

The results will be communicated to senior government officials, and to broader stakeholders.

DoE will prepare annual reports for the Minister of Climate Change and the Energy Task Force⁶⁵ that: (i) summarise progress in implementing the NERM, especially the quantitative targets, (ii) highlight key implementation deficiencies, and (iii) propose ways to accelerate progress. Summary information could also be shared with interested stakeholders such as development partners and the utilities, and/or published on DoE's website.

The Energy Taskforce, Minister of Climate Change, and other implemented parties will use the information to direct action that could help improve progress, and to hold the lead implementing agency for each action accountable for implementation progress.

Verifying that actions implemented through the NERM continue to have an impact will be particularly important

Previous initiatives in Vanuatu have faced significant challenges translating initial success (for example in mobilising investments) into long-term success (by making these investments last).

The Government seeks to achieve durable results from all actions implemented under the NERM. Confirming that an investment has taken place, or that a piece of legislation has been enacted, will not guarantee that the NERM's objectives are achieved over the long-term. An important task for DoE will therefore be regular verification that investments (such as micro-grids or solar home systems) remain operational over the long-term in order to make an ongoing contribution to achieving the NERM's objectives up to 2030 and beyond. Similarly, legislation—if not enforced and acted upon—has limited benefit.

DoE's responsibility to track the progress of an action in the NERM Implementation Plan does not end after the action is first implemented. DoE will need to conduct regular checks throughout the full duration of the NERM to confirm that the desired results continue to be achieved.

⁶⁵ The Taskforce was established to develop the 2013 NERM. It includes senior government officials representing DoE, the Prime Minister's office, and other key government agencies with an interest in energy policy.

Table C.1: Monitoring Progress Towards the NERM's Quantitative Targets

Priority/Objective	Indicator	Current	2020 Target	2030 Target	Data source	Frequency of collection
Accessible energy	Increase electricity access by households in and near concession areas	62%	90%	100%	URA (connections data from UNELCO and VUI)	Quarterly
	Increase electricity access by households in off-grid areas	9%	100%	100%	DoE, VREP, other programmes	Quarterly
	Increase electricity access by public institutions (on- and off-grid)	54%	100%	100%	Dept. of Education & Dept. of Health	Annually
Affordable energy	Improve the efficiency of diesel generation	2% improvement from 2012	20% improvement from 2012	20% improvement from 2012	UNELCO & VUI Technical Reports	Annually
	Reduce the cost of distributing petroleum products in Vanuatu	No data ⁶⁶	10% reduction	15% reduction	Pacific Petroleum & Origin Energy	Annually
Sustainable energy	Increase the proportion of electricity generated from renewable sources	29%	65%	100%	URA	Quarterly

⁶⁶ The Implementation Plan in Appendix B includes an action to collect and monitor data on petroleum distribution costs. This should allow DoE to monitor distribution costs in the future.

Priority/Objective	Indicator	Current	2020 Target	2030 Target	Data source	Frequency of collection
	Improve electricity sector end-use efficiency	n/a	5%	13.5%	DoE to collate energy consumption data from various sources	Annually
	Improve transport (land and marine) energy efficiency	n/a	2%	10%		
	Improve biomass end-use (cooking and drying) efficiency	n/a	5%	14%		
	Ensure all energy infrastructure projects comply with government and donor environmental and social safeguard requirements	n/a	100%	100%	DoE; Dept. of the Environment and Conservation; Dept. of Strategic Policy; Planning and Aid Coordination; and other government agencies	Annually
Green growth	Increase the proportion of electricity generated from biofuels	5%	10%	14%	URA (for on-grid) and DoE (for off-grid)	Quarterly
	Increase renewable electricity use by rural tourism bungalows	TBD	25%	65%	Dept. of Tourism	Annually



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