The University of Melbourne, Pacific Climate Change Centre, Caribbean Community Climate Change Centre

Discussion paper: Vanuatu Energy Transition Pathways and System Resilience

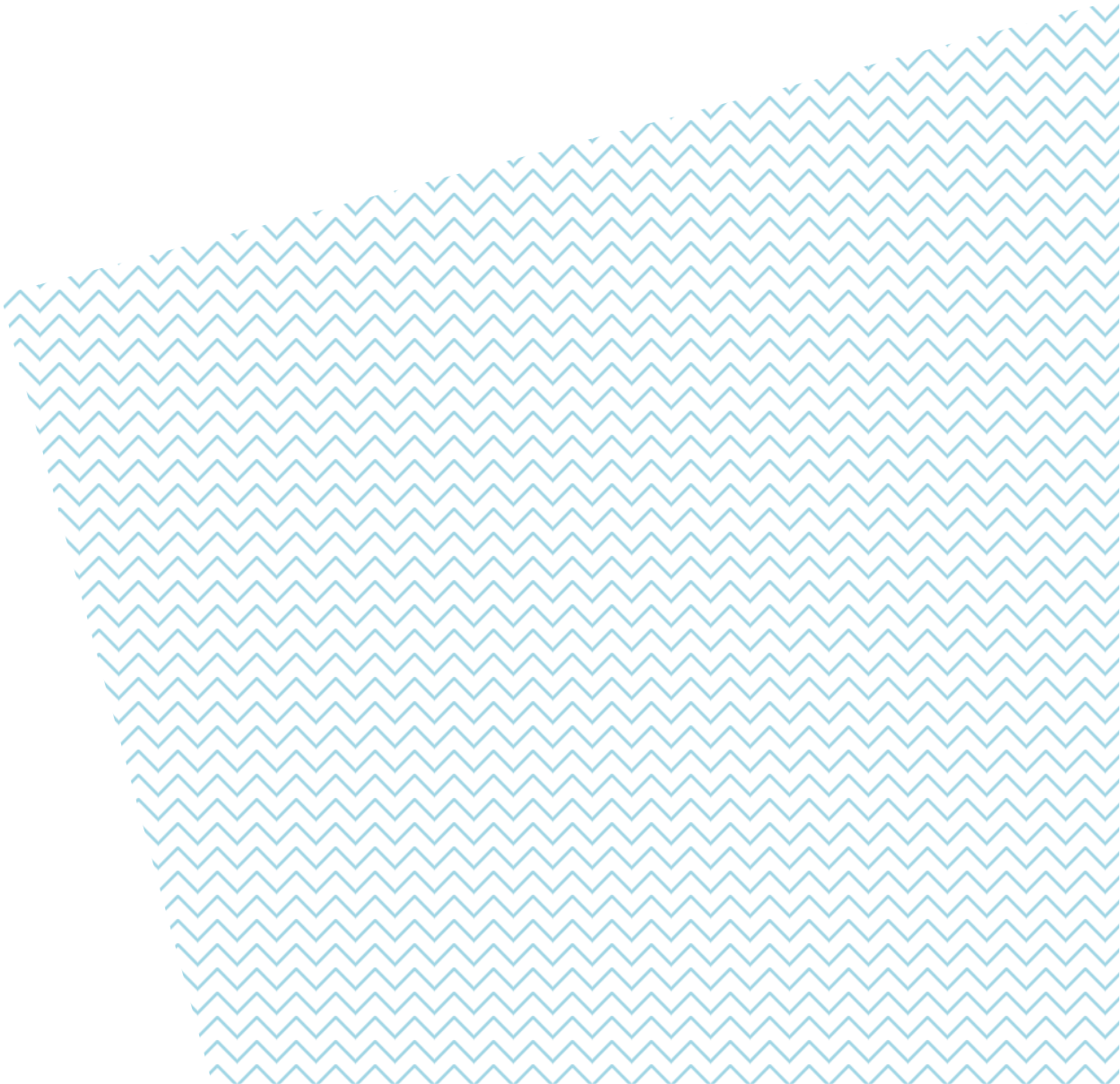

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Table of Acronyms

Acronym	Full Name
ADB	Asian Development Bank
AFD	Agence Française de Développement (French Development Agency)
AOSIS	Alliance of Small Island States
BESS	Battery Energy Storage System
CCDRR	Climate Change and Disaster Risk Reduction
CEC	Clean Energy Council (Australia)
DoE	Department of Energy
ENSO	El Niño–Southern Oscillation
GCF	Green Climate Fund
GHG	Greenhouse Gas
JICA	Japan International Cooperation Agency
KRQ	Key Research Question
LEDS	Low Emissions Development Strategy
LDC	Least Developed Country
MoCC	Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Energy, Environment and Disaster Management
NDC	Nationally Determined Contribution
NERM	National Energy Road Map
NGEF	National Green Energy Fund
NSDP	National Sustainable Development Plan
PMU	Project Management Unit
PV	Photovoltaic
RE	Renewable Energy
RESSET	Renewable Solar Storage on Efate and Tanna
SIDS	Small Island Developing States
SOP	Standard Operating Procedure
STAR-C	Solar Technology Application Resource Centre
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
URA	Utilities Regulatory Authority
VAN-PAWA	Vanuatu National Power and Water Authority Limited
VERP	Vanuatu Energy Sector Resilience Project
VGET	Vanuatu Green Energy Transformation
VUI	Vanuatu Utilities Infrastructure Ltd. (or the official company name used in your paper)

Executive Summary

This discussion paper looks at how Vanuatu can gradually transition from diesel-based electricity to Renewable Energy, while ensuring energy security, affordability, and climate resilience. Although Vanuatu has committed to achieving **100% renewable electricity by 2030**, diesel currently accounts for approximately **81% of electricity generation**, highlighting the significant gap between national targets and current energy realities.

This policy paper analyses key structural and policy barriers that affect the expansion of Renewable Energy in Vanuatu. The country faces high infrastructure and transport costs across dispersed islands that limit grid capacity, have little resilience to climate-related hazards, and are dependent on donor financing. These factors complicate efforts to scale Renewable Energy systems.

Several policy pathways are explored to support a gradual and equitable energy transition. These include hybrid energy systems combining solar, hydropower, battery storage, and diesel backup; decentralized mini-grids for rural electrification; and stand-alone solar systems for remote communities with the importance of social inclusion and governance considerations.

Key Findings

- Vanuatu's electricity system remains **highly dependent on imported diesel**, creating energy security risks for the nation and high electricity costs for individuals.
- Renewable technologies such as **solar PV, pico- and micro-hydropower and hybrid systems** are technically suitable for Vanuatu.
- Renewable energy investments rely heavily on **donor grants and concessional finance**, highlighting the need for stronger national financing mechanisms.
- Climate change and extreme weather events increasingly threaten **energy infrastructure reliability and Renewable Energy systems**.

Key Policy Recommendations

- ✓ Strengthen the **National Green Energy Fund (NGEF)** as the central financing mechanism for renewable energy investments.
- ✓ Establish a **Renewable Energy Project Management Unit (PMU)** to improve coordination and implementation of Renewable Energy projects through cross-sectoral collaboration.
- ✓ Develop a **Renewable Energy Community Benefit-Sharing Framework** to ensure communities benefit from Renewable Energy development.
- ✓ Invest in **technical training, gender-responsive energy planning, and climate-resilient infrastructure** to support long-term sustainability of Renewable Energy systems.

Introduction

The policy issue addressed in this paper examines how ***Vanuatu can design a phased and financially viable transition pathway from diesel-based electricity generation to Renewable Energy while enhancing grid resilience, energy security, and climate resilience, and minimizing social and economic disruption***.

The discussion paper focuses on answering four (4) key questions;

1. What is the current progress of Vanuatu's transition from diesel to Renewable Energy?
2. What Renewable Energy technologies are most suitable for Vanuatu's island context?
3. What financial mechanisms can support a viable Renewable Energy transition?
4. How can Vanuatu ensure the long-term sustainability and maintenance of Renewable Energy systems while addressing climate and disaster risks to strengthen the resilience of its energy infrastructure and grid systems?

To inform this policy discussion, this paper draws on:

- key national policy frameworks such as the Vanuatu National Energy Road Map,
- relevant legislative and regulatory frameworks governing the energy sector including the Electricity Supply Act [CAP 65], Utilities Regulatory Authority Act No. 11 of 2007 (as amended), Energy Efficiency of Electrical Appliances, Equipment and Lighting Products Act 2016, Geothermal Energy Act 1987, and the Environmental Management and Conservation Act [CAP 283]
- reports from the International Renewable Energy Agency (IRENA) and other international organisations, and
- academic literature on energy transitions in Small Island Developing States (SIDS).

Issue

Despite national commitments to increase Renewable Energy generation to 100% by 2030, Vanuatu remains highly dependent on imported diesel which exposes the country to volatile fuel prices, energy security risks, and high electricity costs, while also contributing to greenhouse gas emissions. This transition is complex due to dispersed island geography in conjunction with high capital cost, limited technical capacity, and vulnerability to climate-induced disasters.

The Vanuatu government has plans to explore transitioning from diesel to Renewable Energy, recognising that this presents a multi-dimensional policy challenge involving various areas such as;

1. ***Renewable Energy systems and Transition processes:*** Vanuatu electricity remains largely diesel dependent and to progress towards 100% Renewable Energy by 2030 requires expansion of Renewable Energy system and concessional financing mechanism supported by development parters. Current status of Vanuatu Renewable Energy systems highlighting a slow progress with ongoing challenges in transitioning to Renewable Energy.
2. ***Renewable Energy Technology Options:*** Several existing Renewable Energy technologies are particularly suitable for small islands and dispersed geography. These include solar photovoltaic (PV) systems, which are well suited for both grids connected and off-grid applications due to Vanuatu's strong solar resource and relatively low installation costs; pico and micro hydropower, which can provide stable baseload generations in islands with reliable hydrological resources.

3. ***Financial sustainability:*** Vanuatu relies heavily dependent on external financing through mix donor grants and concessional loans to support Renewable Energy investments. To strengthen financial sustainability and improve coordination, the National Green Energy Fund (NGEF)[1] could be positioned as the central financing mechanism for Renewable Energy investments in Vanuatu.

4. ***Climate, Disaster Resilient and Sustainability of Renewable Project:*** Climate change is increasingly affecting Vanuatu's small-scale Renewable Energy systems; an example is the Loltong hybrid which was designed based on historical rainfall patterns. Increasing ENSO-related climate variability, including droughts and extreme rainfall, is creating operational and investment risks.

   To ensure sustainability and maintenance of the Renewable Energy systems, stablished a Renewable Energy Community Benefit-Sharing Framework based on international best practice from the Australian Clean Energy Council[2]. Under this framework, Renewable Energy developers would contribute to community benefit funds, provide direct payments to host communities, support local employment and training, and expand energy access programs.

[1] **National Green Energy Fund (NGEF) Vanuatu**, official institutional repository (2026), established to mobilize public and private investment for climate-resilient energy infrastructure across all provinces. See the National Green Energy Fund Portal.

[2] **Clean Energy Council (CEC)**, official institutional industry framework (2026), representing businesses across solar, wind, hydro, and renewable hydrogen networks. See the Clean Energy Council Portal

Context

The global and national policy frameworks guiding the energy transition are shaped by international climate commitments, constitutional obligations, and national policies. Vanuatu is a signatory to the **United Nations Framework Convention on Climate Change (UNFCCC)**[3] and supports the **Paris Agreement**[4], which aims to limit global temperature rise to well below 2°C through the implementation of interventions outlined in Nationally Determined Contributions (NDCs).

These commitments align with **Sustainable Development Goal 7**[5], which promotes universal access to affordable, reliable, and sustainable energy. At the national level, the Vanuatu Constitution requires the protection of natural resources for present and future generations, supported by legislation such as the **National Energy Act (2016)** and the **Vanuatu Geothermal Act No. 40 of 2019** [6], as well as policies including the **National Sustainable Development Plan (NSDP) 2016–2030**[7], **Low Emission Development Strategy (LEDS)**[8], **Climate Change and Disaster Risk Reduction (CCDRR) Policy**, **Loss and Damage Policy**[9], and the **National Energy Road Map (NERM)**[10] targeting 100% Renewable Energy by 2030. Key institutions involved include the **Ministry of Climate Change**[11], the **Department of Energy**[12], and the **Utilities Regulatory Authority**[13], while electricity services are delivered by providers such as **UNELCO**[14], **VUI**, and **VAN-PAWA**[15].

Provincial governments, customary leaders, and international development partners—including Australia, Asian Development Bank (ADB), Japan, the World Bank, and United Nations Development Programme (UNDP)—also play important roles in supporting Renewable Energy expansion, rural electrification, and sustainable energy development across the country.

Regionally, the Alliance of Small Island States (AOSIS) has emphasized the importance of advancing a 'Just Transition', noting that the decision at COP30 was the first under this agenda since the Just Transition Work Programme was adopted at COP28. The decision reaffirms the 1.5°C temperature goal, recognizes the special circumstances of Small Island Developing States (SIDS) and Least Developed Countries (LDCs), and links just transition efforts with loss and damage, while calling for dialogue that produces practical outcomes to support vulnerable countries with the tools and resources needed for sustainable transition pathways. Within this context, Vanuatu has emerged as a leading voice in global climate diplomacy, including its historic

[3] United Nations Treaty Collection, *United Nations Framework Convention on Climate Change*, vol. 1771, p. 107; Vanuatu signed on 9 June 1992 and ratified on 25 March 1993. See the UNFCCC Party Status Page.

[4] United Nations Treaty Collection, *Paris Agreement*, vol. 3156; the **Republic of Vanuatu signed the Agreement on 22 April 2016** and deposited its **instrument of ratification on 21 September 2016**. See the UNTC Treaty Details Page. [1, 2

[5] United Nations Department of Economic and Social Affairs, *Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all*, UN Sustainable Development Goals Knowledge Platform (2026), available at UN SDG Goal 7 Portal

[6] Parliament of the Republic of Vanuatu, ***Geothermal Act No. 40 of 2019***, assented to on 23 December 2019, available via the Vanuatu Ministry of Climate Change

[7] Government of the Republic of Vanuatu, *Vanuatu Low Emissions Development Strategy: Pathway to 2050* (December 2022), submitted to the United Nations Framework Convention on Climate Change, available at the UNFCCC Long-Term Strategies Portal

[9] Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Energy, Environment and Disaster Management, ***Vanuatu Climate Change and Disaster Risk Reduction Policy 2022–2030***, Government of the Republic of Vanuatu (2022), available via the Ministry of Climate Change Policy Portal.

[10] Government of the Republic of Vanuatu, ***Updated Vanuatu National Energy Road Map (NERM) 2016–2030***, developed by the Department of Energy, available via the DoE Implementation Repository.

[11] Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Energy, Environment and Disaster Management, **Government of the Republic of Vanuatu**, official institutional framework (2026). See the Ministry of Climate Change Portal.

[12] Department of Energy (DoE), **Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Energy, Environment and Disaster Management**, Government of the Republic of Vanuatu (2026), official institutional overview, available at the Vanuatu Department of Energy Portal.

[13] Utilities Regulatory Authority (URA), **Government of the Republic of Vanuatu**, institutional overview (2026). See the Utilities Regulatory Authority Portal.

[15] **Vanuatu National Power and Water Authority Limited (VAN-PAWA LTD)**, official institutional overview (2026); established in 2023 as a subsidiary of the Vanuatu National Provident Fund (VNPF) to manage utility operations. See the VANPAWA Corporate Portal. [1, 2]

2022 call at the UN General Assembly to halt the expansion of new fossil fuel projects and pursue a global just transition away from coal, oil, and gas. This leadership has been reinforced in regional discussions, where the Vanuatu Minister for Climate Change highlighted that Just Transition should not be viewed simply as an addition to current emission reduction obligations.

Findings and discussion

Most Small Island Developing States (SIDS) are dependent on fossil fuel for power generation (IEA, 2023; UNDESA, 2022). Consistent with the broader SIDS literature, this policy paper finds that Vanuatu remains highly dependent on imported diesel which exposes the country to volatile fuel prices, energy security risks, and high electricity costs, while also contributing to greenhouse gas emissions. Transition remains complex due to island geography with a high capital cost, limited technical capacity, and vulnerability to climate-induced disasters.

Theme 1: Energy System & Transition Progress

KRQ1: What is the current progress of Vanuatu's transition from diesel to Renewable Energy?

Vanuatu has made important progress toward its renewable electricity target through the expansion of off-grid renewable energy programmes, hydropower developments, solar PV installations, and financing mechanisms such as the National Green Energy Fund (NGEF), supported by development partners. However, the country's electricity system remains predominantly diesel-based. Efate, which has the largest installed generation capacity, operates approximately **32 MW**, of which **26 MW** is generated from fossil fuels and **6 MW (19%)** from renewable sources. Santo has approximately **6 MW** of diesel generation and **1.2 MW (17%)** of hydropower, with additional hydropower projects currently under development. Other islands—including Malekula, Tanna, Maewo, Pentecost, Ambae, Ambrym, and Banks rely on smaller electricity systems, often below **1 MW**, combining diesel, solar, hydropower, and hybrid mini-grids.

While these investments demonstrate positive progress, they also illustrate that renewable energy deployment has been uneven across the country. The continued reliance on diesel generation, particularly on larger grids, indicates that achieving the 2030 target will require accelerated investment, improved project coordination, and strengthened operation and maintenance capacity. Without addressing these constraints, progress is likely to remain incremental, increasing the risk that Vanuatu will fall short of its renewable electricity ambitions.

Theme 2: Renewable Energy Technology Options

KRQ2: What Renewable Energy technologies are most suitable for Vanuatu's island context?

Given Vanuatu's dispersed island geography and relatively small electricity demand, no single renewable energy technology can meet the country's energy needs across all locations. Instead, different technologies are appropriate depending on local resource availability, community size, and existing infrastructure.

Suitable renewable energy technologies include:

- **Solar photovoltaic (PV) systems**, which are well suited to both grid-connected and off-grid applications because of Vanuatu's abundant solar resources and relatively low installation costs.
- **Pico- and micro-hydropower systems**, which can provide reliable baseload electricity in islands with suitable hydrological resources, such as Santo and parts of Malekula.
- **Hybrid renewable energy systems**, combining solar PV, hydropower (where available), battery energy storage systems (BESS), and diesel backup to improve reliability, reduce fuel consumption, and enhance system resilience.

These technologies are particularly well suited to Vanuatu because they can be deployed through modular and decentralised systems, improving rural electrification while reducing dependence on imported fossil fuels. Among these options, **hybrid renewable energy systems represent the most appropriate long-term solution for many of Vanuatu's provincial grids and larger rural communities**. By combining multiple renewable energy sources with battery storage and limited diesel backup, hybrid systems provide greater reliability than stand-alone technologies, particularly during periods of low solar generation or extreme weather events. Although they require higher upfront investment and greater technical expertise, their lower operating costs, improved energy security, and increased climate resilience make them the most viable pathway for supporting Vanuatu's long-term energy transition.

Theme 3: Financial Sustainability

KRQ3: What financial mechanisms can support a viable Renewable Energy transition?

Like many Small Island Developing State (SIDS), Vanuatu relies heavily on external financing to support Renewable Energy infrastructure development. Current investments are financed through a combination of donor grants, concessional financing, and in-kind assistance from bilateral and multilateral development partners. As shown in **Table 1**, major investments include the **Renewable Solar Storage on Efate and Tanna (RESSET)** project supported by the Government of New Zealand (VUV 1.5 billion), **the Saudi Sustainable Energy Project** (VUV 435.4 million), the **Disaster Resilience Renewable Energy Project** funded by the Asian Development Bank (VUV 301.9 million), the **Sarakata Hydropower Station** supported by JICA (VUV 558 million), and the **Vanuatu Green Energy Transformation (VGET) Phase II** implemented by UNDP (VUV 112 million). Additional investments include the **Vanuatu Energy Sector Resilience Project**, the establishment of the **Solar Technology Application Resource Centre (STAR-C)**, hydro feasibility studies, and solar electrification for schools and health centres.

These investments have significantly expanded renewable energy access, strengthened energy security, and improved climate resilience across Vanuatu. However, they also demonstrate that progress remains largely dependent on external development assistance rather than sustained domestic investment. While donor financing has enabled the implementation of major renewable energy projects, it is often delivered through separate programmes with different funding priorities, procurement requirements, reporting arrangements, and implementation timeframes.

To achieve a sustainable and nationally led energy transition, Vanuatu will need to complement external assistance with stronger domestic financing mechanisms. The **National Green Energy Fund (NGEF)** provides an opportunity to serve as the country's central financing platform by coordinating bilateral and multilateral investments while attracting private sector participation and climate finance. Strengthening the NGEF could support a more strategic approach to renewable energy investment, improve project coordination, reduce duplication, and mobilise blended finance for both utility-scale and community-based renewable energy systems.

Table 1 Renewable Energy major investments

Project	Technology/Focus	Funding Source	Support Type	Amount (VUV million)
RESSET	Solar PV & Battery Storage	Government of New Zealand	Grant	1,500

Saudi Sustainable Energy Project	Rural Renewable Energy	Government of Saudi Arabia	Grant	435.4
Disaster Resilience Renewable Energy Project	Renewable Energy & Resilience	ADB	Grant	301.9
Sarakata Hydropower Station	Hydropower	JICA	Aid in Kind	558
VGET Phase II	Pico-hydro & Hybrid Systems	UNDP	Grant	112
VERP/CDRI	Energy Sector Resilience	UNDP	Grant	45.1
STAR-C	Solar Training & Certification	International Solar Alliance	Grant & Aid in Kind	18.4
Naone & Baitora Feasibility Study	Hydro Feasibility	Government of Serbia	Grant	7.7
Solar PV for Schools & Health Centres	Solar PV	Governments of Australia & UK	Aid in Kind	122.9

To strengthen financial sustainability and improve coordination, the National Green Energy Fund (NGEF)[16] could be positioned as the central financing mechanism for Renewable Energy investments in Vanuatu. By channelling bilateral, multilateral, and government funding through the NGEF, and establishing a dedicated Project Management Unit (PMU) within the NGEF or the Department of Energy, the Vanuatu government could improve project coordination, accelerate implementation, and expand financing options for utilities, communities, and households. This approach would support both utility-scale renewable infrastructure and decentralized energy systems, helping to achieve the National Energy Road Map (NERM) target of 100% renewable electricity by 2030 while ensuring long-term financial sustainability.

Theme 4: Climate, Disaster Resilient and Sustainability of Renewable Projects

KRQ 4: How can Vanuatu ensure the long-term sustainability and maintenance of Renewable Energy systems while addressing climate and disaster risks to strengthen the resilience of its energy infrastructure and grid systems?

To ensure long-term sustainability and maintenance, Vanuatu should establish a Renewable Energy Community Benefit-Sharing Framework based on international best practice from the Australian Clean Energy Council[17]. Under this framework, Renewable Energy developers would contribute to community benefit funds, provide direct payments to host communities, support local employment and training, and expand energy access programs. The NGEF could play a coordinating role in managing these mechanisms,

[16] https://ngef.vu/
[17] https://cleanenergycouncil.org.au/

ensuring equitable distribution of benefits, strengthening community ownership of Renewable Energy projects, and supporting the long-term sustainability of the country's energy transition.

Gender Dimension

An ADB (2024) assessment indicates that 44% of female-headed households rely on solar systems for lighting and phone charging, offering a safer alternative to kerosene. However, these systems can become unreliable during prolonged rainy periods when solar output declines. Evidence from the UNDP Vanuatu Green Energy Transition (VGET) Gender Study (2025) highlights an important role that electricity plays in supporting women's livelihoods by improving access to clean, reliable, and affordable energy. Access to electricity enables women to prepare meals while carrying out other household responsibilities, reducing the time and effort required for daily chores. It also improves household health by reducing exposure to indoor air pollution from traditional cooking fuels. Furthermore, reliable electricity enhances community safety by providing lighting at night and strengthens healthcare services by ensuring that health clinics can operate after dark, enabling women and their families to access essential medical care when needed.

Despite these benefits, progress remains constrained, slowing the rollout of Renewable Energy systems and limiting access for many households. Even where Renewable Energy systems have been installed, a lack of local technical expertise and maintenance capacity often results in system failures, forcing families to revert to diesel generation or other traditional energy sources. Upskilling women in Renewable Energy technologies, technical maintenance, and repair presents a critical opportunity to address gender disparities in technical training while strengthening local capacity. This approach not only enhances the long-term sustainability of Renewable Energy systems but also supports a more inclusive, equitable, and resilient energy transition in Vanuatu's communities.

Climate and Disaster Impacts on Renewable Energy systems

Climate change is increasingly affecting Vanuatu's small-scale Renewable Energy systems. An example is the Loltong hybrid which was designed based on historical rainfall patterns. Increasing ENSO-related climate variability, including droughts and extreme rainfall, is creating operational and investment risks. The cost projection graph (**Figure 1**) shows that maintaining the Loltong hybrid mini-grid under current failure conditions will create a significant financial burden for the community. Based on recent expenditure patterns, the system is projected to cost between **VUV 14 million and VUV 20.5 million over the next five years**, increasing to **VUV 28 million to VUV 41 million over ten years** due to repeated technical failures, repair costs, and diesel use during outages. This means that within a decade, the community may spend **90–130% of the original VUV 31 million investment** simply to keep the system operational, without improving reliability. The projection highlights that continuing repairs without addressing underlying design flaws is financially unsustainable, and that targeted system redesign and investment in more resilient renewable components would be more cost-effective in the long term.

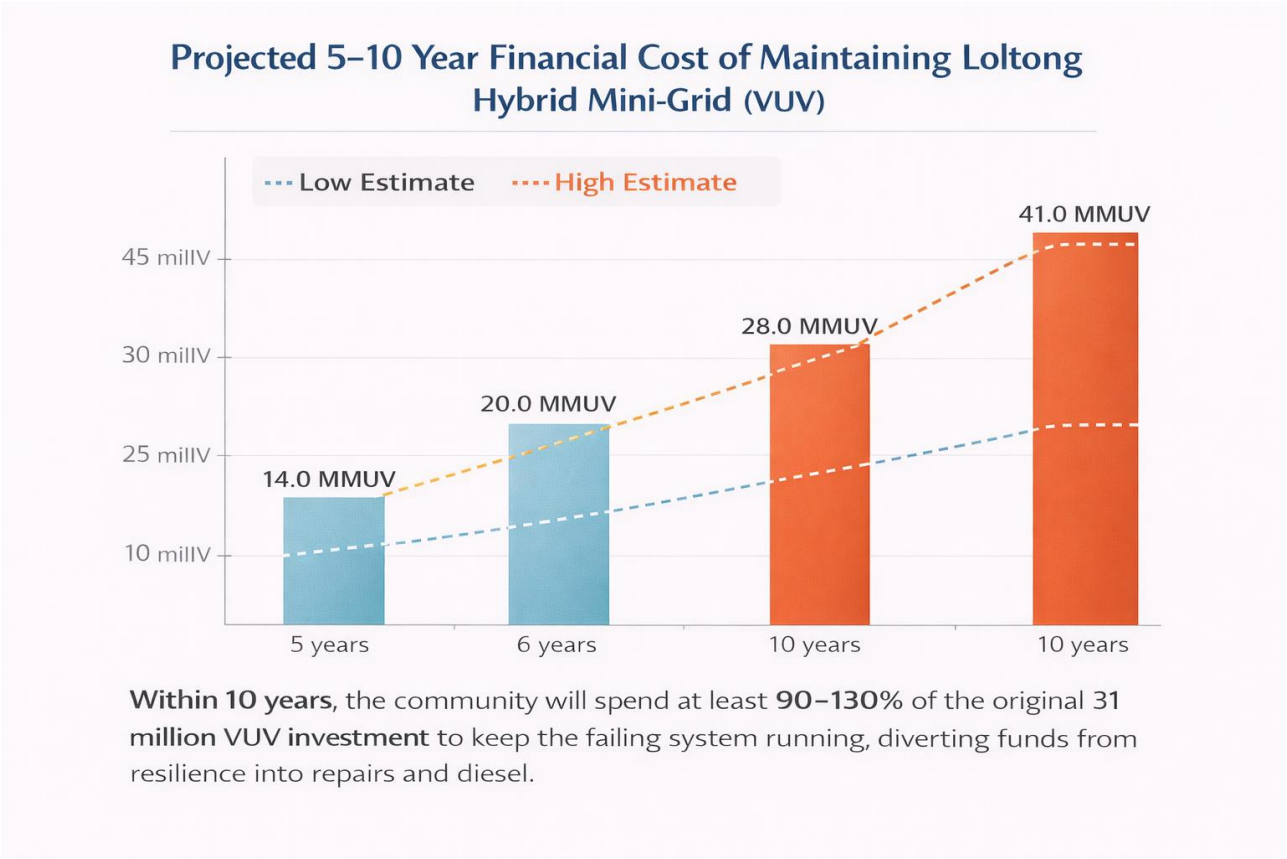

Figure 1: Projected 5-10 year maintenance costs for Loltong Hybrid Mini-Grid (VUV)

Short-term Policy Recommendations (3-6 months)

Table 2: Short-term Policy Recommendations

Recommendation	Actions
1. Ensure vulnerable households have access to energy systems	Department of Energy to conduct a national mapping of vulnerable households, including **female-headed households and communities already connected to Renewable Energy systems**, to identify gaps in access and prioritize energy support programs.
2. Renewable Energy stocktake	Department of Energy to undertake a **national stocktake of all Renewable Energy systems** across the country to assess operational status, maintenance needs, and performance, and update progress against the **National Energy Road Map (NERM)** targets.

Long-term Policy Recommendations (1-5 years)

Table 3: Long-term Policy Recommendations

Recommendation	Actions
1. Gender Responsive Energy Planning	• Ensure gender balance committees that include women, youth and people living with disabilities.
2. Strengthen capacity building in RE Technologies	• Support Renewable Energy short-term and long-term training programs integrating Renewable Energy technologies (such as hydro and energy storage). • Integrating Renewable Energy technologies (such as hydro and energy storage) into curriculum in technical, vocational, and other national institutions. • Conduct Renewable Energy knowledge exchange programs with international organizations, universities, and private sector. • Project developers should provide structured Renewable Energy technical training for on-site technicians and relevant departmental staff to ensure a clear understanding of system design, operation, and maintenance.
3. Community Benefit-Sharing for Renewable Energy Development	• Conduct feasibility studies on the financial and social benefits of Renewable Energy projects in host communities. • Develop and implement a **Renewable Energy Community Benefit-Sharing Framework** to ensure local communities receive economic and social benefits from Renewable Energy development. Such a Framework would include local capacity building, such as providing community members Renewable Energy technical expertise to ensure long-term sustainability. • Invest in formal and informal Renewable Energy education and skills development, particularly for young people and women, by embedding Renewable Energy into national education curricula and delivering community-based training in project sites.

4. Strengthen Compliance and Sustainability of Renewable Energy Projects	• Revisit agreements between donors and the government and ensure these include:
	  ○ sustainability clauses to all new donor-funded Renewable Energy projects
	  ○ provisions for spare parts, lifecycle costs, and system handover
	  ○ clear responsibilities for operation and maintenance, training, and long-term support and reporting
	  ○ adopting an existing management model within country that ensures accountability for system performance and sustainability

5. Established and Operationalise a Renewable Energy Project Management Unit	• Establish a dedicated Renewable Energy PMU within the National Green Energy Fund (NGEF) or the Department of Energy to coordinate Renewable Energy project planning, implementation, monitoring, and maintenance.

	• Review and update the NGEF Solar PV Manual and the NGEF Resource Mobilization and Financial Sustainability Plan. Develop a PMU Standard Operating Procedure (SOP) to guide project implementation and monitoring.
6. Promote Suitable Renewable Energy Technology Models for Vanuatu	• Promote Renewable Energy systems that are appropriate for Vanuatu's island context, including hybrid mini-grids, solar home systems, and small hydropower systems. Refer to **Table 3** below for the analysis of technology options, including strengths, costs, and risks.

Table 4: Suitable Renewable Energy Technology models for Vanuatu

Electricity Options	Strength	Weakness	Cost	Risk	Suitability for Vanuatu
Diesel	Very reliable and well-known technology; easy to scale to meet higher demand; widely used in island grids.	High operational cost; dependent on imported fuel; high greenhouse gas emissions; requires continuous fuel logistics.	High ongoing fuel import cost; generator maintenance and replacement costs	Fiscal vulnerability to global fuel price fluctuations; supply chain disruptions (shipping delays, fuel shortages); environmental and climate policy risks.	**Short-term backup only**
Hybrid **Example: Imaki Hydro + Solar PV + BESS + genset**	Dual electricity supply improves reliability; reduces diesel consumption; lower emissions; more stable long-term operating costs	High upfront capital cost; requires technical expertise for system integration; battery replacement needed every 10–15 years.	High initial investment; moderate maintenance cost; reduced annual fuel cost compared to diesel-only systems.	Battery degradation and disposal challenges; technical complexity; funding sustainability risks.	**Highest priority for provincial grids and larger communities**
Mini-grid **Example: Wintua Lorlow Electrical Cooperative**	Community-based management; suitable for rural or remote communities;	Limited coverage area; management capacity challenges; revenue	Medium to high upfront capital cost; lower long-term operating costs if renewable-	Poor maintenance due to limited technical skills; financial sustainability	**Suitable for rural communities with strong local governance**

	can integrate solar, hydro or hybrid systems; encourages local ownership and employment.	collection difficulties.	based; requires governance and management funding.	risks; governance and accountability challenges.	
Stand-alone solar home system with BSS and back-up generator	Reliable energy supply (solar + battery + generator backup); reduced diesel consumption; suitable for remote households; flexible and scalable; supports productive use (e.g., freezers, tools, small businesses).	High upfront capital cost; system complexity requiring technical expertise; battery replacement every 10–15 years; generator requires fuel and maintenance.	High initial investment (solar panels, batteries, inverter, generator); medium operating cost; battery replacement every 5–10 years; generator servicing costs.	Fuel price volatility; battery degradation or disposal issues; technical failure if poorly installed; limited local technical capacity; theft or damage of equipment.	**Suitable for remote households and institutions**
Biofuel (Coconut Fuel)	Renewable and locally sourced; compatible with some engines; environmental benefits; high lubricity; lower carbon deposits.	High viscosity; potential engine durability issues; lower calorific value; high free fatty acids (FFA).	High raw material and labour costs; Infrastructure requirements for production and distribution.	Supply chain vulnerability; potential food security concerns; high NOx emissions; maintenance and technical failure risks.	**Potential supplementary fuel where sustainable coconut supply exists**
Wind farm	Renewable and Sustainable; Low Greenhouse gas emission; Low operating cost; Energy Independence; Scalable Technology; Land Use compatibility.	Intermittent energy source; High Initial capital cost; Location Dependence; Visual and noise impact; Energy storage requirement.	Capital Costs; Operation and Maintenance cost.	Wind resources risk; Technical Failures: Extreme weather; Grid integration challenges; Environmental Impact; Financial risk (long payback period)	**Suitable only where detailed wind assessments confirm viability**

Geothermal	Reliable base load power; Heat from the earth is continuously produced; Low greenhouse gas emissions; Small land footprint; Stable power supply; Long plant lifetime (30-50 years).	Location specific; High Exploration risk; High initial Investment; Potential resource decline; Requires specialised engineers and technology.	Exploration and drilling; Capital cost (power plant); Operation and Maintenance cost	Exploration risk; High upfront financial risk; Reservoir depletion; Induced seismicity; Corrosion and scaling; Environmental concerns.	**High long-term potential but limited to resource-rich locations and requires major investment**

Conclusion

Vanuatu's transition from diesel-based electricity generation to Renewable Energy is essential for improving energy security, reducing greenhouse gas emissions, and strengthening climate resilience. While progress has been made through the expansion of solar, hydropower, and hybrid systems, the transition remains constrained by the country's dispersed island geography, high infrastructure costs, reliance on imported fuel, and dependence on external financing.

Addressing these challenges will require strengthening national coordination mechanisms, particularly by positioning the National Green Energy Fund (NGEF) as a central financing platform and establishing a dedicated Renewable Energy Project Management Unit to support implementation and maintenance of Renewable Energy systems. At the same time, integrating community benefit-sharing mechanisms, gender-responsive energy planning, and climate-resilient infrastructure design will be essential to ensure that Renewable Energy investments remain sustainable and inclusive.

Achieving 100% renewable electricity by 2030 is technically feasible, but success will depend on coordinated financing, strengthened institutions, investment in local capacity, and community ownership. By adopting these policy pathways, Vanuatu can build a resilient, inclusive, and sustainable energy system that supports both national development and global climate commitments.

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