CIF CLIMATE INVESTMENT FUNDS

## Meeting of the Global Climate Action Programs (GCAP) Sub-Committee

**Washington DC,** (Hybrid)

**Thursday, November 9, 2023**

# FIJI (REI) INVESTMENT PLAN

CLIMATE INVESTMENT FUNDS
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GCAP/TFC.5/05.Rev01
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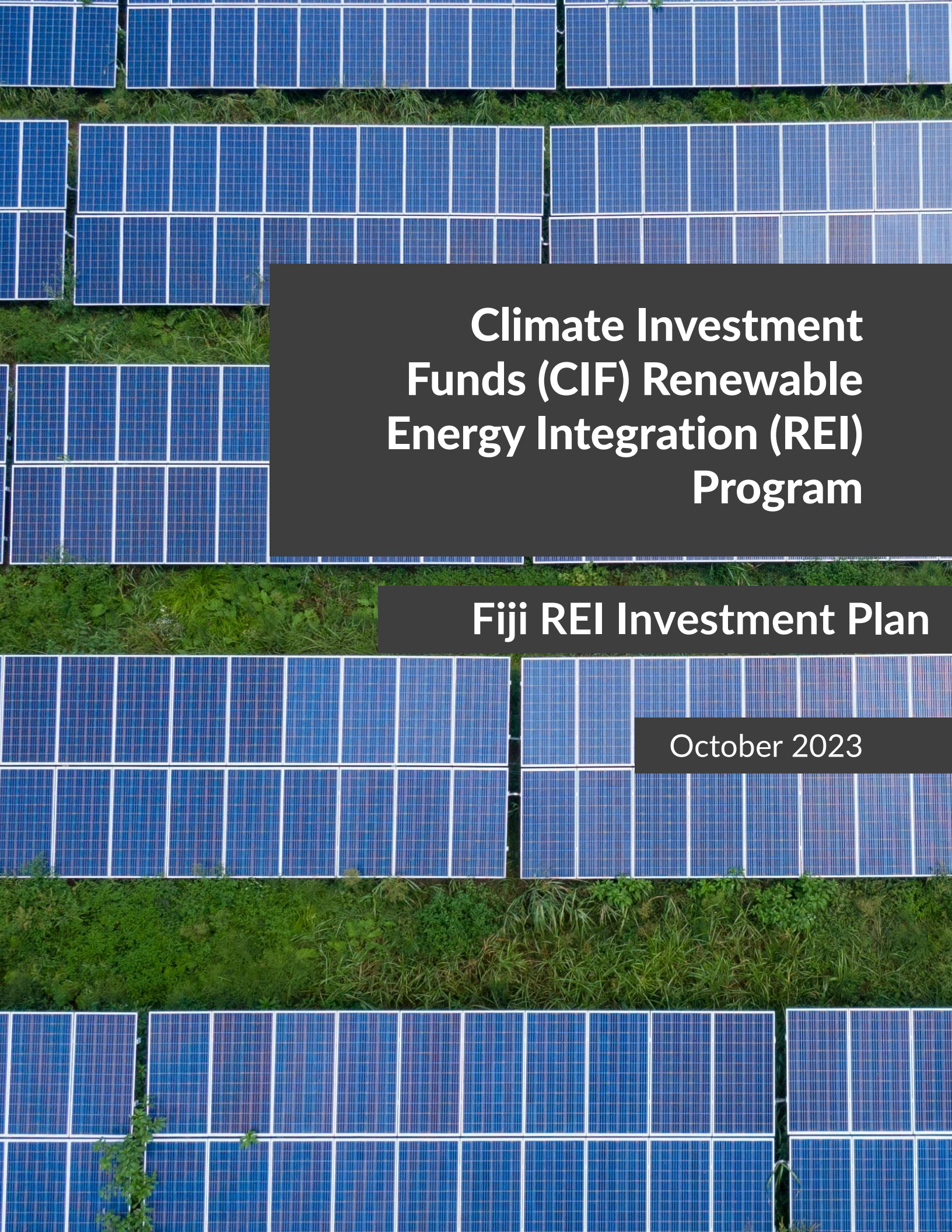


# Climate Investment Funds (CIF) Renewable Energy Integration (REI) Program

## Fiji REI Investment Plan

October 2023

**To Mr. Luis Tineo**
**Head (Interim)**
**Climate Investment Funds Secretariat**
1818 H Street NW
Washington D.C. 20433, USA

October 06, 2023

Dear Mr. Tineo,

It is with great pleasure that I submit Fiji's Renewable Energy Integration Investment Plan (REI IP) aimed at advancing the nation's clean and inclusive energy transition. The Government of Fiji (GoF) extends its gratitude to the Climate Investment Funds (CIF), the Asian Development Bank (ADB), and the World Bank for their invaluable support in the development of this IP plan.

This Plan was led by the Ministry of Finance, Strategic Planning, National Development & Statistics (MoF) as technical coordinator, with contributions from the Climate Change Division, Office of the Prime Minister. As a result, this IP is conceived as a tool to move towards a productive economy, accelerating the shift towards clean energy use and the democratization of electricity production.

CIF-REI concessional resources will be blended with resources from multilateral development bank partners (ADB, IFC and World Bank) and private investment to finance projects that will support Fiji's Nationally Determined Contribution commitment of achieving net zero annual emissions by 2050. The IP will be articulated and implemented through two components with a combined investment of $195 million.

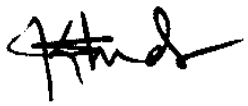
For the first component of this proposed IP, CIF and ADB resources will support the development of the Viti Levu Green Circuit, primarily consisting of transmission investments foreseen as part of this component crucial for harnessing and efficiently managing the abundant renewable energy resources available on the island. IFC and private sector financing will complement this effort by supporting the development of new renewable energy generation, with collaboration from partners both within and outside Fiji.

The second component will pool resources from CIF and the World Bank to fund the electrification of outer islands and remote communities in order to allow Fiji to reach its goal of 100% electrification. In both components, Fiji's MoF will serve as the borrower, acting as an intermediary to allocate CIF REI resources effectively by on-lending to EFL, which will act as the Implementing Entity (IE).

The expected project portfolio will address key challenges in Fiji's energy sector modernization, such as its dependence on expensive and volatile oil imports, as well as the need to provide affordable and reliable electricity access to rural communities.

The GoF is grateful for the opportunity to take part in the Renewable Energy Integration Program. We look forward to working with CIF, ADB, IFC, the World Bank, and our local partners to successfully implement the project's portfolio.

Yours sincerely,



Shiri Gounder, Permanent Secretary for Finance, Strategic Planning, National Development and Statistics

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# APPENDICES

# Table of Abbreviations

| | |
|---|---|
| ADB | Asian Development Bank |
| ADO | Automotive Diesel Oil |
| AFD | *Agence Française de Développement* |
| AGC | Automated Generation Control |
| AIFFP | Australian Infrastructure Financing Facility for the Pacific |
| AMI | Advanced Metering Infrastructure |
| APV | Agrophotovoltaic |
| ASEAN | Association of Southeast Asian Nations |
| BAU | Business as Usual |
| CCID | Climate Change and International Cooperation Division |
| CDM | Clean Development Mechanism |
| CIF | Climate Investment Funds |
| DBO | Design Build Operate |
| DFAT | Department of Foreign Affairs and Trade |
| DMS | Distribution Management Systems |
| DoE | Department of Energy |
| DRMS | Demand Response Management Systems |
| DSA | Dynamic security assessment |
| DSM | Demand-side Management |
| DV | Domestic violence |
| ED | Executive Director |
| EEZ | Exclusive Economic Zones |
| EFL | Energy Fiji Limited |
| EIA | Environmental Impact Assessments |
| EIB | European Investment Bank |
| EMS | Energy Management Systems |
| EPC | Engineering Procurement and Construction |
| ER | Emission Reduction |
| EU | European Union |
| EUS | Employment and Unemployment Survey |
| EV | Electric Vehicle |
| FBoS | Fiji Bureau of Statistics |
| FCCC | Fijian Competition and Consumer Commission |
| FDB | Fiji Development Bank |

| | |
|---|---|
| FEA | Fiji Electricity Authority |
| FLIE | Female Leaders in Energy |
| FRA | Fiji Roads Authority |
| FRCS | Fiji Revenue and Customs Service |
| FREF | Fiji Rural Electrification Fund |
| FREPP | Fiji Renewable Energy Power Project |
| FSC | Fiji Sugar Corporation |
| GCF | Green Climate Fund |
| GDP | Gross Domestic Product |
| GEP | Georesources and Energy Programme |
| GESI | Gender Equality and Social Inclusion |
| GGGI | Global Green Growth Institute |
| GHG | Greenhouse Gases |
| GHG | Greenhouse gas |
| GoF | Government of Fiji |
| GSA | Greater Suva Area |
| GTF | Global Tracking Framework |
| HFO | Heavy fuel oil |
| HIES | Household Income and Expenditure Survey |
| HPP | Hydro Power Plants |
| IE | Implementing Entity |
| IE | Implementing Entities |
| IFC | International Finance Corporation |
| IMF | International Monetary Fund |
| IOC | International Oil Companies |
| IP | Investment Plan |
| IP | Implementation Plan |
| IPP | Independent Power Producers |
| IPV | Intimate partner violence |
| IRF | Integrated Results Framework |
| JICA | Japan International Cooperation Agency |
| KOICA | Korea International Cooperation Agency |
| LDA | Land Development Authority |
| LDF | Leonardo DiCaprio Foundation |
| LEDS | Low Emission Development Strategy |
| LPG | Liquid Petroleum Gas |

| | |
|---|---|
| LTA | Land Transport Authority |
| M&R | Monitoring & Reporting |
| MCTTT | Ministry of Commerce, Trade, Tourism and Transport |
| MDB | Multilateral Development Banks |
| MFAT | Ministry of Foreign Affairs and Trade |
| MIMS | Ministry of Infrastructure and Meteorological Services |
| MoF | Ministry of Finance |
| MOIT | Ministry of Infrastructure and Transport |
| MOPS | Means of Platts Singapore |
| MoWE | Ministry of Waterways and Environment |
| MPWTMS | Ministry of Public Works, Transport and Meteorological Services |
| MSAF | Maritime Safety Authority of Fiji |
| MW | Megawatt |
| MWCSP | Ministry of Women, Children & Social Protection |
| NCCP | National Climate Change Policy |
| NDC | Nationally Determined Contribution |
| NDP | National Development Plans |
| NEP | National Energy Policy |
| NIIP | National Infrastructure Investment Plan |
| OCR | Ordinary Capital Resources |
| ODA | Official Development Assistance |
| OPEX | Operating Expenditures |
| PDP | Power Development Plan |
| PEG | Pacific Energy and Gender |
| PIC | Pacific Island Countries |
| PMO | Prime Minister's Office |
| PPA | Power Purchase Agreement |
| PPA | Power Purchase Agreements |
| PPA | Pacific Power Association |
| PPP | Public-Private Partnership |
| PRF | Project Readiness Financing |
| PSH | Pumped Storage Hydropower |
| PSIP | Public Sector Investment Plan |
| PV | Photovoltaic |
| PWIP | Pacific Women in Power |
| RE | Renewable energy |

| | |
|---|---|
| REI | Renewable Energy Integration |
| ROW | Rights of Way |
| SAIDI | System Average Interruption Duration Index |
| SAIFI | System Average Interruption Frequency Index |
| SEFP | Sustainable Energy Finance Project |
| SIA | Social Impact Assessment |
| SOE | State-owned Enterprises |
| SPCZ | South Pacific Convergence Zone |
| STEM | Science, technology, engineering, and mathematics |
| T&D | Transmission and Distribution |
| TA | Technical Assistance |
| TPP | Thermal Power Plants |
| TVET | Technical and Vocational Education and Training |
| UAE | United Arab Emirates |
| USTDA | United States Trade and Development Agency |
| VAWG | Violence Against Women and Girls) |
| VRE | Variable Renewable energy |
| WACC | Weighted Average Cost of Capital |
| WB | World Bank |

# SECTION 1 PROPOSAL SUMMARY

Fiji's Renewable Energy Integration Investment Plan (REI IP), contained in this document, has been prepared by the Ministry of Finance (MoF), with support from the Climate Change Division, under the Office of the Prime Minister. Substantial contributions were also made by the Ministry of Public Works, Transport and Meteorological Services (MPWTMS) and its Department of Energy (DoE), the Fiji Development Bank (FDB), and Energy Fiji Limited (EFL). The Asian Development Bank (ADB) and World Bank provided extensive technical support throughout.

Fiji's proposed REI Investment Plan is based on project concepts developed in three recent policy documents: The National Infrastructure Investment Plan (NIIP), the Nationally Determined Contribution (NDC) Implementation Roadmap, and EFL's most recent 10-year Power Development Plan (PDP). These documents contain prioritized lists and detailed descriptions of priority clean energy and climate investments and are the result of extensive analysis and consultation with a wide range of stakeholders.

## 1.1 OBJECTIVES

The purpose of this REI IP is to seek financing and technical assistance for investments that will enhance the flexibility of Fiji's energy system in ways that allow for the integration of variable renewable energy, and for greater access to renewable energy in areas with limited connectivity. This will be achieved through two interventions or program "components" focused on two of Fiji's top energy sector priorities. The most important of those priorities is Fiji's commitment to achieving 100 percent renewable energy generation by 2036.[1] In addition, the National Energy Policy (NEP) 2023-2030—Fiji's main energy sector policy—has objectives that fall under five policy pillars: (i) Energy Security and Resilience; (ii) Energy Access and Equity; (iii) Energy Sustainability; (iv) Energy Efficiency; and (v) Energy Governance, which aim to provide the guidelines for energy sector policy development between 2023 and 2030. The NEP endorses and supports the target of achieving net zero annual greenhouse gas emissions by 2050, while also decarbonizing Fiji's transport sector.

The interventions set forth in this REI IP align completely with the NEP's five pillars and with Climate Investment Funds (CIF) REI's objectives for financing investments in renewable energy integration. Component 1 is focused on creating a "Green Energy Circuit" on Viti Levu, home to Fiji's capital, and roughly 70 percent of its population. The transmission investments—mostly in 132 kV transmission lines and substations—foreseen as part of this component are critical to harnessing and managing the huge renewable energy resource potential on the island which includes substantial solar resources, and existing and planned hydropower, wind, and biomass. Component 2 is focused on further electrifying the outer islands, to allow Fiji to reach its goal of 100% electrification. With 96% electrification at present, this goal is within reach, but

[1] While some policies, namely the National Climate Change Policy, the National Energy Policy, and the Nationally Determined Contribution set a target of *"as close to 100 percent renewable energy as possible"* by 2030, both Fiji's National Development Plan and National Infrastructure Investment Plan set a more concrete goal of 100 percent renewable generation by 2036. It is this latter target year – 2036 – that we adopt in this report.

will require substantial investment in rural, lower-income areas that do not yet have grid connections or for whom the grid connection provides only very limited reliability, and often depends heavily on diesel generation.

## 1.2 EXPECTED OUTCOMES

The financing and technical assistance foreseen under this REI IP is expected to facilitate the uptake of zero carbon electricity into Fiji's grids on Viti Levu and the outer islands and attract private sector investment in renewable energy generation and productive end-uses. The expected outcomes are:

- Increased renewable energy generation capacity by 40 MW, and an additional 91,104 MWh/year of renewable energy output by 2026.
- 200,000 customers connected to EFL's grid on Viti Levu (Component 1: Viti Levu Green Circuit) and 7,000 customers in the outer islands benefit from more affordable, reliable, and clean energy (Component 2: Electrification of Outer Islands) by 2026.
- 30,000 people with new or improved connections, of which 49 percent are expected to be female, resulting in universal access to electricity by 2030.
- A consequent reduction in the volume of global ($CO_2$) emissions of 50,000 t/year by 2026.
- Improved policies and institutional capabilities, including substantial revisions to the Electricity Act and regulations under the Act as well as the creation of centralized procurement of renewable energy generation.
- US$125 million leveraged under the financing plan, leading to the creation of ten permanent and one hundred temporary jobs by 2026.
- Better electricity reliability, resulting from a more diverse portfolio of domestically available renewable fuels and enhanced energy storage and grid management technologies and techniques.
- Better resilience—especially of the transmission and distribution network—to climate-induced disasters and damage to infrastructure.
- More than US$ 1 million reduction in total system costs, annually, resulting from the use of lower cost renewable energy generation, and the use of competitive tenders for the private sector to provide such generation on a least cost basis.
- Savings to Fiji's consumers and overall economy, resulting from a reduction in imported diesel used for electricity generation.

The two proposed components are critical to Fiji reaching its' targets under the NEP and NCCP for renewable energy generation and 100% electricity access.

## 1.3 PROGRAM CRITERIA, PRIORITIES, AND BUDGET

As noted above, Fiji's REI IP is based on project concepts developed in the NIIP, the NDC Implementation Roadmap, and EFL's PDP. Projects in these documents were grouped to match the categories of investments typically funded by CIF's REI Program. These projects were then ranked against 12 REI criteria. This ranking exercise is described in Appendix B. The highest-ranked groups were (i) Transmission & distribution investments for renewable energy projects; (ii) rural electrification, and (iii) Energy Storage & Grid

Management Technologies. It was ultimately decided that the focus of Fiji's REI IP should be on (i) and (ii) because of the priority these types of investments for Fiji, and because such investments are necessary precursors to eventual, expanded investment in (iii). However, it was also decided to include the need for technical assistance and possible investments in grid balancing as well—group (iii) as these would be important for ensuring grid stability as the uptake of renewable energy generation increases.

Targeted technical assistance is planned to support the physical investments. These include legal and regulatory reforms, and transaction advisory for the competitive procurement of renewable energy generation, recognition—through the amendment of the Electricity Act and other regulations—of the importance of storage as a sector activity and the facilitation of grid access and net metering and/or billing for solar rooftop and other types of distributed electricity generation. Technical assistance will also focus on network planning and operation. This will include assistance with reliability and risk assessment tools for generation adequacy, generation and transmission expansion tools, and generation dispatch and network operation tools.

Fiji is requesting $70 million in financing from CIF, of which only $4 million would be requested as project preparation grants. The two program components are together expected to mobilize nearly US$ 200 million in investment, with complementary investments or blended financing from ADB, World Bank, and the private sector. Private sector contributions will be primarily in the form of investment in renewable energy generation—a portion of that provided by the International Finance Corporation (IFC)—and possible contributions from EFL as counterpart financing.[2] It is expected that—at least for the first projects—roughly 40 Megawatts (MW) of solar capacity could be procured within 2-3 years. Table 1.1 shows the financing requested for each of the components described above.

**Table 1.1: Financing Plan for Fiji's REI IP**

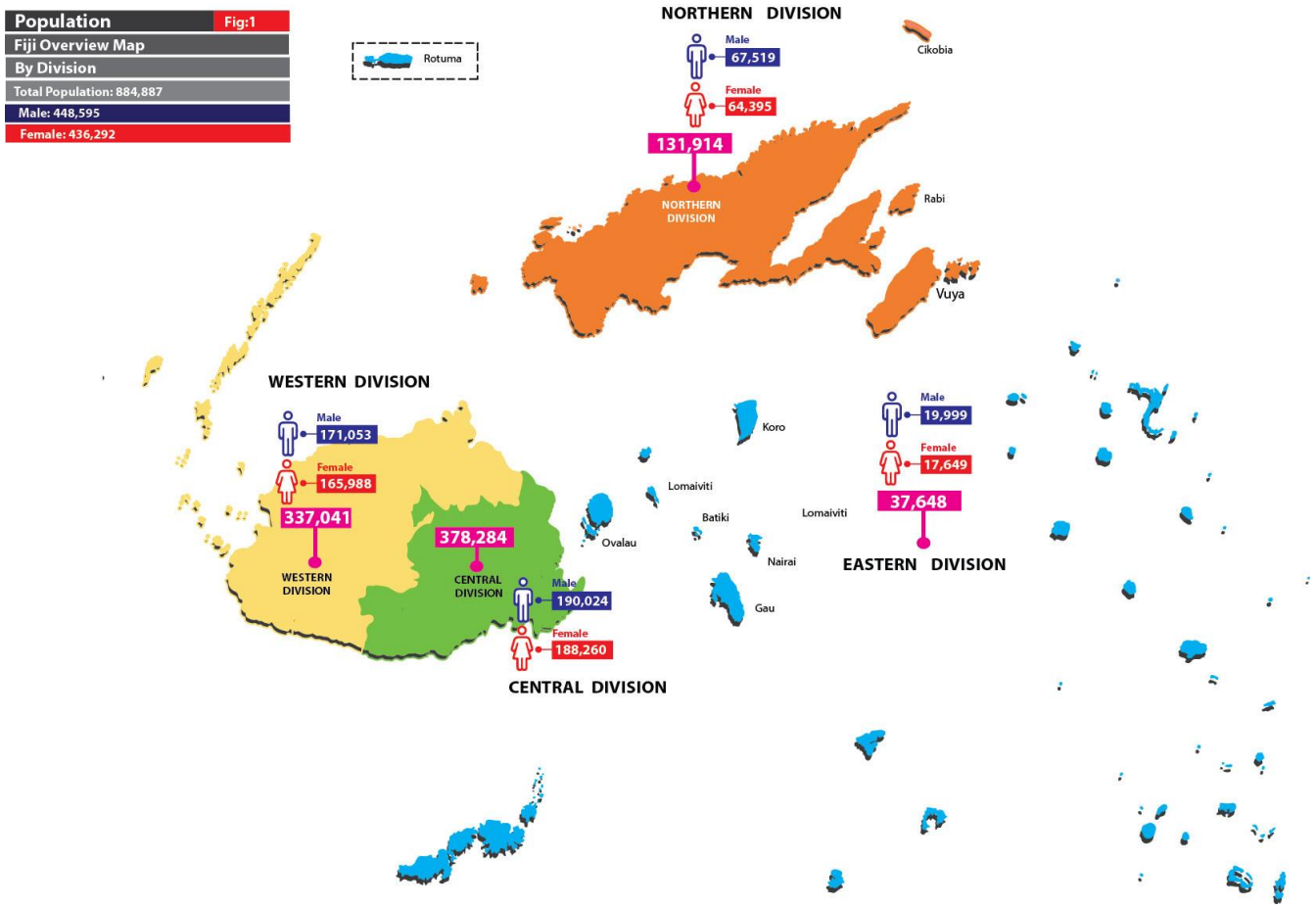
| **Financing Source** | **CIF** | | | | **Others** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Program** | **CIF Financing** | **CIF Guarantee** | **Project Preparation (Grant)** | **Total CIF** | **ADB** | **World Bank** | **IFC** | **Private Sector** | **Total** |
| | (US$Million) | | | | | | | | |
| Viti Levu Green Circuit | 25 | 8 | 2 | 35 | 60 | | 15 | 35 | **145** |
| Electrification of Outer Islands | 33 | | 2 | 35 | | 15 | | | **50** |
| **Total** | **58** | **8** | **4** | **70** | **60** | **15** | **15** | **35** | **195** |

[2] The counterpart financing would cover applicable taxes and duties as well as overhead costs associated with the transmission investments.

# SECTION 2 COUNTRY CONTEXT

The Republic of Fiji is an island country consisting of over 330 islands in the Southern Pacific Ocean. Fiji's territory is divided into four major administrative divisions further split into 14 provinces. The Central Division—where Fiji's capital, Suva, is located—is the most densely populated, with more than a third of the total population living across Rewa, Naitasiri, and Tailevu provinces.[3] Figure 2.1 provides a map of Fiji's population by gender by administrative division.

**Figure 2.1: Population of Fiji by Gender by Administrative Division**




Source: Fiji Bureau of Statistics. (2018). "2017 Population and Housing Census – Release 1." Available at *https://www.statsfiji.gov.fj/index.php/census-2017/census-2017-release-1*

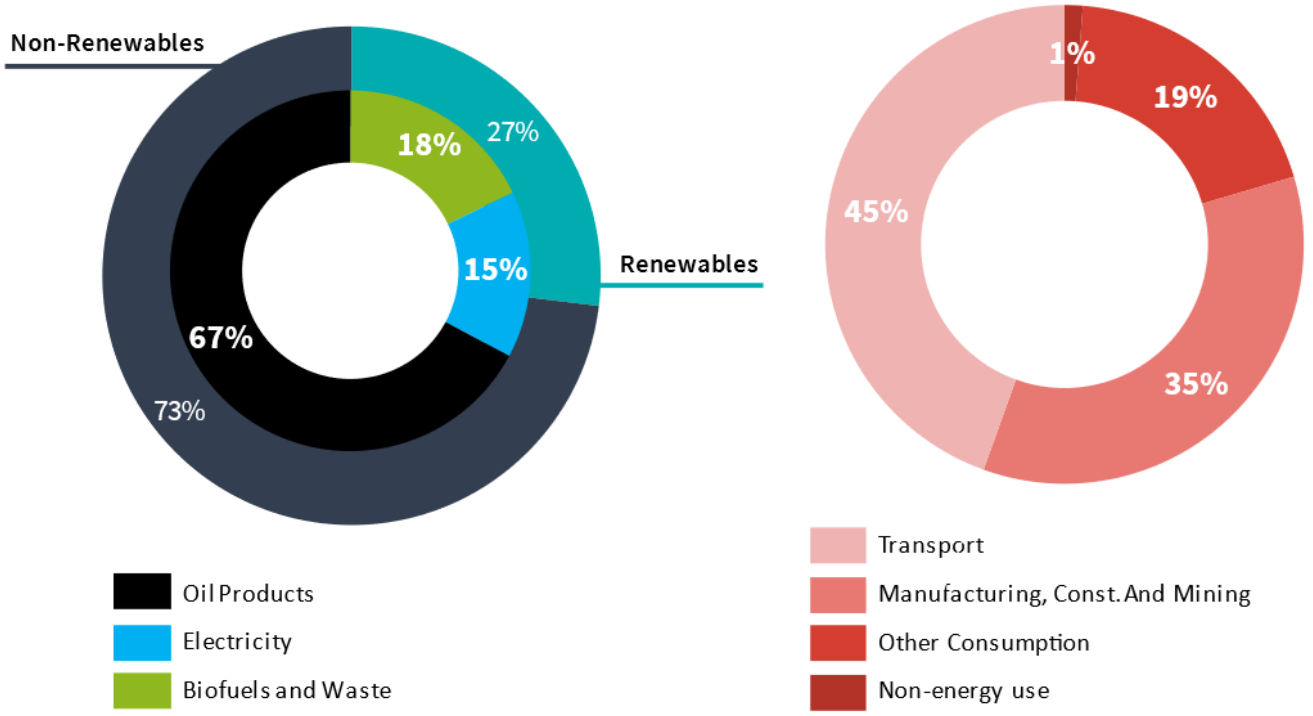
[3] Fiji Bureau of Statistics. (2018). "2017 Population and Housing Census – Release 1." Available at *https://www.statsfiji.gov.fj/index.php/census-2017/census-2017-release-1*

## 2.1 OVERVIEW OF FIJI'S ENERGY SECTOR

Two-thirds of Fiji's energy is derived from imported oil products, with the remainder being a mix of biofuel (18 percent) and electricity (15 percent).[4] Imported oil is used primarily as fuel in transportation and in manufacturing, but it is also used in thermal power plants (TPPs) and in home diesel generators. Biofuels are primarily used in manufacturing but also in bioenergy power plants and for cooking among rural households.[5] Electricity generation meets the demands of urban households, commerce, industry, and public services however requires investment to provide access to some parts of rural and maritime areas.[6]

The transport sector is the largest energy consumer in the country, representing 45 percent of total demand, followed by industry/manufacturing at 35 percent. Other consumption, which includes households and commerce, account for 19 percent of consumption.[7] Although renewable energy sources account for over half of electricity generation, they only represent 27 percent of total energy consumed. Figure 2.2 shows the composition of Fiji's energy consumption mix and the key sectors driving energy demand.

**Figure 2.2: Composition of Energy Consumption Mix, 2019**




[4] United Nations Statistics Division. (2022) "Energy Balance Visualization – Fiji." Available at https://unstats.un.org/unsd/energystats/dataPortal/
[5] Fiji Bureau of Statistics, "2019-20 HIES."
[6] United Nations Statistics Division, "Energy Balance Visualization – Fiji,"
[7] United Nations Statistics Division, "Energy Balance Visualization – Fiji,"

Note: "Electricity" refers to gross electricity production, which is the sum of the electrical energy production by all the generating units/installations concerned (but excluding from pumped storage) measured at the output terminals of the main generators. A thorough discussion of the electricity generation mix in Fiji can be found in Section 3.1.1.

Source: United Nations Statistics Division. (2022) "Energy Balance Visualization – Fiji." Available at https://unstats.un.org/unsd/energystats/dataPortal/.

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EFL is responsible for most electricity generation, transmission, and distribution in Fiji. EFL generates more than 93 percent of electricity in Fiji, with the remainder being provided by independent power producers (IPPs). After undergoing partial privatization in 2018, EFL remains profitable.

Imported oil is essential to Fiji's economy, with net oil imports accounting for 18.3 percent of all imports in 2020 (US$264 million),[8] a reflection of the country's lack of oil reserves, combined with its transport sector's complete reliance on petrol, and the fact that 35 percent of electricity generation is still provided by TPPs.[9]

Given the absence of local oil production, Fiji's energy sector—including its electricity sector—must rely on petroleum imports for all of its needs not met by domestic renewable sources. In order to generate enough power to meet the existing demand for electricity, EFL has generated 327GWh from oil (via TPPs) in 2021,[10] which accounts for 35 percent of total electricity consumption.[11] The continuous reliance on thermal generation and lack of necessary investments in RE alternatives, coupled with steady economic growth over the last decade, have resulted in a sustained dependence on foreign energy, as reflected in Figure 2.3 below, which shows the total energy supply in Fiji compared to total domestic production over the last 20 years.

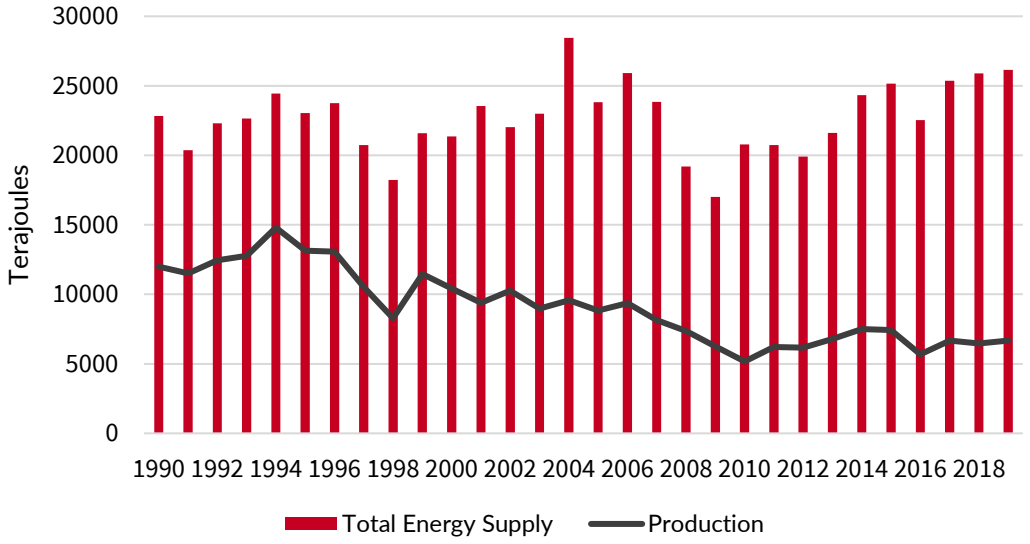
[8] Observatory of Economic Complexity. (2020). "What does Fiji import?" Available at *https://oec.world/en/visualize/tree_map/hs92/import/fji/all/show/2020/*

[9] Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*, p.87

[10] Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*, p.87

[11] Figure excludes consumption from own (non-grid connected) diesel generators.

**Figure 2.3: Dependence on Imported Energy (Domestic Production v. Total Supply), 1990-2019**




Source: United Nations Statistics Division. (2022) "Energy Balance Visualization – Fiji." Available at https://unstats.un.org/unsd/energystats/dataPortal/

## 2.2 NATIONAL AND INTERNATIONAL CLIMATE STRATEGIES AND PLANS

The Government of Fiji (GoF) fully committed to achieving 100 percent renewable energy generation by 2036.[12] An important part of this commitment is the implementation of the National Energy Policy (NEP) 2023-2030. The NEP 2023-2030 is Fiji's main energy sector policy, and a key component of the country's climate strategy. The NEP lays out the GoF's vision for the development of a resilient, resource-efficient, cost-effective, accessible, reliable, and environmentally sustainable energy sector. The policy establishes the development of the energy sector as a long-term priority for the GoF and recognizes the dependence on imported oil for the transport and electricity sectors as a major structural challenge, along with other factors such as rising energy demand, ageing infrastructure, and climate risks. The policy acknowledges the necessity for balancing the competing demands of energy security, access, and sustainability, and seeks to scale up renewable energy and the use of alternative fuels in its goal to transition to a sustainable net zero economy by 2050.

The policy also acknowledges that market competition and efficiency are required to promote innovation and affordability and commits to supporting competitive neutrality and regulatory improvements to promote opportunities for private sector participation in electricity and transport. Its objectives fall under five policy pillars: (i) Energy Security and Resilience; (ii) Energy Access and Equity; (iii) Energy Sustainability; (iv) Energy

[12] While some policies, namely the National Climate Change Policy, the National Energy Policy, and the Nationally Determined Contribution set a target of "as close to 100 percent renewable energy as possible" by 2030, both Fiji's National Development Plan and National Infrastructure Investment Plan set a more concrete goal of 100 percent renewable generation by 2036. It is this latter target year – 2036 – that we adopt in this report.

Efficiency; and (v) Energy Governance, which aim to provide the guidelines for energy sector policy development between 2023 and 2030. The NEP also endorses and supports the target established in Fiji's NCCP in order to achieve net zero annual greenhouse gas emissions by 2050, and decarbonizing Fiji's transport sector.

Other climate and sustainability strategies adopted by Fiji, and which have a meaningful impact on the country's energy sector include the Fiji Low Emission Development Strategy (LEDS); the NDC Implementation Roadmap; the SDG7 Roadmap for Fiji; the National Adaptation Plan; and the Maritime and Land Transport Policy. Table 2.1 below provides an overview of each of these key climate policies. Both the NCCP and the LEDS, alongside other low and zero carbon strategies, are also discussed in further detail in fix this cross-reference of this report.

**Table 2.1: Key Climate Policies and Strategies**

| Policy | Overview |
|---|---|
| National Energy Policy 2023-2030 | Fiji's main policy for developing an energy sector that is highly sustainable, inclusive, reliable, and can provide affordable energy services by the end of the decade. The policy has been informed by six principles: affordability; competitive neutrality; energy access for all; gender equity, equality, and empowerment; just transition; and renewable energy and sustainability. The NEP also defines five policy pillars that provide guidelines for energy sector policy development and promotes the scaling up of renewable energy to reduce the country's dependence on imported oil while improving energy security and affordability. |
| National Climate Change Policy 2018-2030 | The NCCP is endorsed by the GoF as a central policy instrument to protect Fiji's development priorities from current, future, and intergenerational climate change risks. It seeks to address the specific climate vulnerabilities faced by Fiji and the Fijian people through evidence-based policy on climate change, greenhouse gas emissions mitigation, risk reduction, and environmental protection. |
| Fiji LEDS 2018-2050 | Lays out four pathways for Fiji to achieve net zero carbon emissions by 2050 across all sectors of its economy, mainly through greenhouse gas (GHG) emission reductions. It also includes a commitment to a 40 percent reduction in transport sector emissions by 2030. |
| NDC Implementation Roadmap 2017-2030 | The document aims to provide a roadmap for the implementation of mitigation actions to be taken in the energy sector in order to comply with the country's NDC target (30 percent reduction in emissions from reference year 2013) by 2030. |
| Updated NDC (2020) | Fiji's updated NDC has the following 12 targets:<br>• Target 1: Reduce 30% of business as usual (BAU) $CO_2$ emissions from the energy sector by 2030 |

| | |
|---|---|
| | • Target 2: As a contribution to target 1, reach 100% renewable energy power generation (grid-connected) by 2030, thus reducing an expected 20% of energy sector $CO_2$ emissions under a BAU scenario<br>• Target 3: As a contribution to Target 1, to reduce energy sector $CO_2$ emissions by 10% through energy efficiency improvements economy-wide, implicitly in the transport, industry, and electricity demand-side subsectors Target 4: As a contribution to Target 1, to reduce domestic maritime shipping emissions by 40%<br>• Target 5: To adopt Climate Smart Agriculture practices, with emphasis on the promotion of sustainable practices in crop management, livestock, and sugarcane farming and fisheries.<br>• Target 6: To enhance resilience by upgrading, repairing, and relocating existing critical public infrastructure<br>• Target 7: Develop simplified and standardized early warning and monitoring systems, and prioritize nature-based solutions to mitigate the impact of flooding and cyclones<br>• Target 8: Relocate highly vulnerable communities, and implement the concept of 'build back better'<br>• Target 9: Build strong healthcare system by implementing the 'Guidelines for climate-resilient and environmentally sustainable health care facilities in Fiji'<br>• Target 10: To conserve natural environment and biodiversity wealth enabling sustainable long-term provision of ecosystem services, including carbon sequestration potential<br>• Target 11: To plant 30 million trees by 2035<br>• Target 12: To establish 30% of Fiji's Exclusive Economic Zones (EEZ) as Marine Protected Areas and work toward 100% management of EEZ by 2030 through the implementation of the National Ocean Policy. |
| SDG7 Roadmap for Fiji | Provides a roadmap with technological options and policy recommendations to assist the GoF in achieving the SDG7 targets. |
| National Adaptation Plan (2018) | The plan aims to enhance resilience against climate change and climate variability, which are projected to intensify in the future. It offers an all-inclusive evaluation of the impact of climate change on key sectors and establishes a long-term strategy for improving resilience in the energy sector, supported by a climate risk model. |
| Maritime and Land Transport Policy (2015) | Sets guidelines for pursuing key policies and objectives for improving the efficiency of the maritime and land transport sectors, including: the review of government subsidies for transport; promoting the use of fuel-efficient vehicles; attracting investors; reducing fossil fuel consumption; and encouraging alternative fuels for the transport sector. |

Note: Policies listed may be subject to revision.

## 2.3 GAPS/BARRIERS ANALYSIS

The Government of Fiji is strongly committed to accelerating the use of renewable energy for electricity generation and transport. Fiji has recently experienced its first change in government in 16 years, and with that change comes renewed commitment to renewable energy and climate resilience. Government is committed to achieving 100 percent renewable energy generation by 2036 and net zero annual GHG emissions by 2050. This will require a substantial acceleration in uptake of solar and other variable VREs as we seek to displace the use of fossil fuels in Viti Levu and less populous areas.

Hitting these ambitious targets will also require change, as there is broad recognition that the status quo has Fiji moving too slowly. In April of this year, GoF hosted a National Economic Summit, where discussions of energy sector reforms figured prominently. Representatives from the public and private sectors recognized the importance of the energy sector in driving Fiji's agenda for economic transformation and called on GoF to urgently address issues of supply security and reliability, and to further investigate the potential use of public-private partnerships. As part of this effort, GoF intends to review the country's 2017 Electricity Act with potential amendments in mind that would facilitate the entry of IPPs in renewable energy generation and facilitate uptake of distributed renewable energy generation.

A number of regulatory and institutional, technical, financial, environmental, and social challenges remain. These challenges will be addressed to accelerate the uptake of REI technologies and to ensure the success of Fiji's energy sector transformation. Table 2.2 summarizes the key barriers to scaling up REI and some proposed mitigation measures. Section 2.4 focuses more specifically on challenges related to equity and inclusion.

**Table 2.2: Summary of Barriers to Scaling Up REI and Potential Mitigation Measures[13]**

| Category | Specific Barrier | Potential Mitigation Measure(s) |
|---|---|---|
| Regulatory and Institutional | **Lack of coordination in the energy sector**<br>The lack of proper coordination between different energy sector stakeholders presents a challenge for the implementation of overarching policies, strategies, and regulations. | Develop an Integrated Energy Plan which covers EFL's service areas as well as networks built and operated by DoE, as well as set up institutional planning and implementation structures for major stakeholders such as DoE, MPWMST, and EFL. |
| | **Lack of coordination in the maritime transportation sector**<br>The existing maritime policy is not fully coordinated and there is no sectoral level policy providing an enabling environment for decarbonization of the sector, including for the enhanced enforcement of regulation. Conflicting fiscal policies in Fiji (e.g., duties, excises and import restrictions, fuel price controls, subsidies) currently discourage private sector investment in reducing emissions in this sub-sector.<br>There is also a lack of disaggregated fuel use data and detailed data on boats and motors, and this limits the ability of the Fijian Government to design appropriate fiscal incentives for the private sector and households to invest in low-carbon technologies and vessels. | Increased integration of intergovernmental coordination and cooperation, for planning, and incentives to increase the implementation of mitigation actions for the decarbonization of maritime transport.<br>Extend and broaden the use of existing stakeholder workshops and meetings, and private sector associations to encourage effective and efficient implementation of mitigation actions in the maritime transportation sector, such as the Transport Consultative Forum. |

[13] Table based on Ministry of Economy of Fiji. (2022). "NDC Investment Plan: 2022 Investment Planning for the Transport and Energy Efficiency Sectors."

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| **Electricity tariff structure that does not reflect the costs associated with variable renewable energy (VRE) integration**<br><br>EFL currently charges a variable rate of 34.01 cents per kWh of electricity to domestic consumers. This variable rate poses a challenge to VRE integration into the grid: as more domestic consumers opt to install their own solar rooftop photovoltaic (PV) systems, their demand for EFL-supplied electricity is reduced. At the same time, EFL must still pay for all fixed costs associated with the transmission and distribution (T&D) network used to serve these self-generating customers.<br><br>Additional VRE integration, therefore, negatively impacts the financial performance of EFL by reducing its variable revenues from the sale of electricity without an accompanying reduction in the fixed costs of operating the company's T&D network. As a result, it is not currently in the best interest of EFL to promote the expansion of domestic rooftop solar generation. | FCCC should develop a new tariff methodology that incorporates both a fixed and a variable component.<br><br>The fixed component (fixed charge) should reflect the fixed costs associated with the maintenance and operation of the company's T&D network as well as other fixed costs. The variable component should reflect all variable costs associated with the generation and sale of electricity. Balancing costs must also be included, to ensure that renewable energy generation capacity can be added without jeopardizing system security and reliability.<br><br>The new methodology should also consider the potentially substantial increase in the costs of firm capacity and ancillary services required in order to integrate substantially more VRE into the system.<br><br>By introducing a fixed charge for electricity supply, EFL will be able to cover the costs of T&D operations even for those consumers who opt to install their own solar rooftop PV systems.<br><br>This new tariff would therefore better align the interests of EFL with those of the GoF and Fijian society, which seek to increase renewable energy generation in the country. |
| **Lack of incentives for renewable energy development and private sector participation in the Electricity Act**<br><br>The Electricity Act sought to make the sector more attractive to private investors through the partial divestment of EFL and the establishment of the Fijian Competition and Consumer Commission (FCCC) as an independent regulatory body. However, transition toward a competitive generation marketplace has been slow, with only 3 IPPs operating and producing a minor fraction of Fiji's total electricity demand. | The GoF is determined to conduct a review of the Electricity Act and explore the potential to include provisions that further promote private sector participation in electricity and favor the adoption of alternative RE resources, such as wind and solar. Proposed amendments could be focused on, but not limited to further clarifying a transparent competitive procurement process and licensing parameters for IPPs; the further development of the legal framework for power purchase agreements (PPAs); and the inclusion of an obligation for the utility to accept renewable |

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| | Furthermore, the Electricity Act has failed to boost the adoption of additional RE resources such as solar and wind, resulting in a lack of diversification in Fiji's energy matrix. This lack of diversification leads to an overreliance on hydropower plants, which in turn make the country's electricity infrastructure less resilient and more vulnerable to climate risks, such as drought or floods. | electricity from IPPs, at a reasonable price regulated by the FCCC (on basis of costs and fair profit under a competitive bidding process).<br><br>It is also important to create a transparent process of direct tendering, reverse auctioning, or direct private sector initiatives for renewable energy generation. |
| Technical/Capacity | **Low availability and retention of skilled and technical employees**<br><br>Fiji is experiencing a deficit of skilled and technical employees, which are essential for the efficient functioning of the electricity sector. Although the country provides training through its education system, that is not currently sufficient to meet the increasing electricity demand and the coming shift toward a fully renewable energy matrix.<br><br>This challenge is exacerbated by the fact that highly skilled professionals often migrate from Fiji to larger countries that provide more opportunities for career growth, higher salaries, and access to a more dynamic social environment.<br><br>The lack of incentives to train and retain skilled professionals can lead to a lack of expertise in key areas, such as renewable energy, and result in reduced productivity and increased costs. It can also lead to delays in project completion, and adversely affect the quality of services provided.<br><br>The problem is aggravated by the lack of female participation in the energy sector. Societal norms and socialization discourage girls from taking science, technology, engineering, and mathematics (STEM) courses. As a result, less than a quarter of the STEM workforce is female. In addition, the absence of training courses for women in community-based energy projects further limits their participation in the sector. | The GoF should extend its support for the training of skilled professionals in the energy sector through academic and career incentives.<br><br>Proposed incentives to foster the creation of a highly skilled workforce could include: reintroducing apprenticeship schemes and increasing opportunities for apprenticeships; providing tax deductions for approved training courses; supporting the establishment of a Training Center for Renewable Energy at TAFE USP; offering more scholarships for energy-related courses; providing regular trainings for operating and maintaining renewable energy technologies; and creating re-training opportunities for professionals in both the public and private sectors. The GoF should also consider establishing partnerships with sector organizations that can offer training and certification/accreditation.<br><br>In order to address the particular technical and capacity challenges faced by women, the GoF should also create a number of focused interventions for women and girls to address gender gaps through academic and career incentives and support female participation in the energy sector.<br><br>Potential interventions could include quotas, targeted bursaries and scholarships, apprenticeships, focused |

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| Unequal distribution of housework also contributes to lower female participation in the workforce, particularly in rural areas, where women spend up to 80 hours per week on unpaid care work, compared to 30 hours per week for men. This is aggravated by social norms, which dictate that women should prioritize caregiving as their primary role. As a result, those who work outside the home often face criticism, and may even experience violence for disrupting cultural norms. | outreach to female students and upskilling training on solar systems maintenance.<br><br>The GoF should also expand its support to vocational training for women, in particular those in rural areas. A great example of a current initiative that should be expanded is the Fiji Barefoot Vocational Training College in Vanua Levu. The school, currently under construction by the Ministry of Women, Children & Social Protection (MWCSP), will be a solar electrification training center jointly supported by the Government of Fiji and the Government of India. The goal of the center, the first of its kind in the Pacific, is to empower rural women in Fiji to be solar engineers, build local capacity, and electrify the poor, "off-the-grid" communities with clean, low-cost solar energy. The college will provide solar engineering training for mothers and grandmothers because women, especially older women normally stay in their community. |
| **Electric grid infrastructure that is inadequate for the integration of RE technologies**<br><br>The intermittent nature of RE resources, like solar and wind, requires the electric grid to be able to handle fluctuations in supply and demand in real-time. This in turn requires the use of advanced technologies and communication systems, such as smart grid technologies. The addition of electric vehicle (EV) charging stations to the grid also increases demand for electricity and requires additional grid capacity to handle the load.<br><br>At the present moment, however, Fiji's electricity infrastructure does not fully comply with the necessary standards to handle the increased demand and fluctuations in supply associated with the integration of RE technologies, while maintaining the reliability and stability of the electric grid. | Provide an asset management plan for upgrading electric grid infrastructure for better accommodation of RE resources and EV stations. A critical component of this plan should also include balancing services ((energy storage; back-up; black start; frequency and voltage support, etc.) which are critical to ensuring the uptake of renewable energy generation can be accommodated on the grid without jeopardizing system stability and reliability.<br><br>The plan should provide a framework for the introduction of smart grid technology in order to allow for the expected increase in VRE by new RE projects or individual households in the coming years. This would have the additional benefit of improving grid reliability in the face of increased climate risks, including increased |

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| | frequency and severity of storms and cyclones, which often lead to supply interruption.<br><br>Possible actions include grants or subsidies for the implementation of smart grid technology, estimating the increased electricity demand from EV charging stations, and working together with FCCC and Fiji Revenue and Customs Service (FRCS) to determine prices that better reflect maintenance costs. |
| **Fragmentation of responsibilities across stakeholders**<br><br>Responsibilities are fragmented among various ministries, departments, agencies and authorities, and sub-sector boundaries are not always 100 percent clear, which makes the process of employing wide-sector actions such as the approval and implementation of REI projects unnecessarily difficult and complicated. | Additional capacity building for improving the Fiji Bureau of Statistics (FBoS) ability to collect energy sector data would also be important for key statistics needed for the renewable energy integration planning process. |
| **Limited storage capacity and reliance on acid lead batteries**<br><br>There remains a significant untapped potential to scale up the use of renewable energy for power generation in Fiji. A key barrier for further expansion of VRE based power is reported to be storage capacity, especially for grid-connected systems managed by EFL and IPPs. The demand for battery storage for individual power projects is expected to increase in the future in Fiji, in line with the increased deployment of on- and off-grid renewable energy power generation, based on the GoF's goal to achieve 100% renewable energy power generation by 2036, and increase energy power generation in rural areas.<br><br>Furthermore, the majority of energy for off-grid VRE based individual power projects is currently stored using lead acid batteries, with only newer systems using | Batteries should be installed on a larger scale by EFL or IPPs to smoothen the variability and vulnerability to the grid created by the increased usage of VRE based power. This should be based on a comprehensive assessment of the firm capacity and balancing needs of the power system based on which it is decided what needs to be added and when. Pumped storage and in general storage hydro should be included in the assessment; also demand response and longer term the use of EV batteries for power system balancing.<br><br>Where lead acid batteries are currently in use, both for off-grid applications by households and private firms and for on-grid application by EFL, should be replaced by Li-Ion batteries.<br><br>At present the initial investment needed is higher for Li-Ion batteries compared to lead acid batteries |

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| | Lithium-Ion batteries. In terms of energy consumption and investment requirements, Li-Ion batteries have several advantages over traditional lead acid batteries. Li-Ion batteries are more efficient which reduces energy lost in storage and conversion.<br><br>They also have longer life, which reduces the frequency of replacements required and the investment needs over a longer period of time. Li-Ion batteries also have a higher Depth of Discharge through which a larger amount of energy can be withdrawn from it, reducing the capacity needed to be installed and thereby the investment requirements. | (US$800/kWh vs US$400/kWh), but the cost of Li-Ion batteries is predicted to reduce in the near future.<br><br>Nonetheless, given the current price differential, natural use of Li-Ion batteries is unlikely to happen unless there is a concerted effort in terms of policy development, awareness raising, advocacy, capacity building for service provider, procurers/operation, as well as maintenance personnel. Further vendor development is also necessary.<br><br>Finally, the systems for the recycle and reuse of Li-Ion battery are not as well developed as that for lead acid battery, partly because it is a relatively new and more complex technology and also because it is less standardized. However, there is good recycling infrastructure in Asia, with South Korea and China being the global leaders in recycling of Li-Ion batteries. Battery manufacturers and miners are also setting up recycling facilities, and reuse of Li-Ion is also happening due to its longer life. |
| | **Peak Demand Management**<br><br>Meeting peak demand for power is always a challenge in a growing economy, and all options to manage peak demand need to be fully exploited in order to limit the additional needs of investment in power generation and distribution. | Time of Day tariffs for larger consumers could be introduced in Fiji, as well as other potential measures for energy demand control such as a utility led demand-side management (DSM). |
| Environmental | **Limited availability of suitable land for RE and REI development**<br><br>Competing land resources such as agriculture, expanding settlements, and protected areas limit development of new RE and REI projects. | Integrate RE and REI technology with existing structures and promote small scale RE and REI development. |
| Financial | **Limited financial incentives and financing for maritime transport decarbonization**<br><br>Fiji has in place various tax incentives, the Shipping Franchise Scheme, and Community Service Obligations to | Revise tax structure for the import of efficient outboard motors with a lower duty and excise taxes on cleaner technology and higher values on high emission motors. |

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| | provide domestic shipping services. These incentives and mechanisms do not currently encourage the greater implementation of low-carbon technologies in the maritime transport sub-sector.<br><br>Maritime transport also suffers from a lack of access to commercial lending at affordable rates for the private sector and individuals to invest in new low-carbon technologies and vessels. Insurance is often not available, or not affordable, in Fiji leaving most vessel owners, including the government, to assume the risk of loss and damage of vessels which makes securing loans within the sub-sector even more challenging due to increased risk. | Create commercial and retail lending mechanisms tailored to support a more rapid transition to lower emissions maritime transport technologies.<br><br>Provide blended financing which provides for the specific needs of each stakeholder, recognizing that the financing needs for businesses operating inter-island ferries on uneconomic routes are different to those servicing the tourist sector which are different to the individual household using boats for personal use and fishing.<br><br>Encourage the development of an insurance market that offers products to underwrite risk for performance of commercial operations and loss and damage of vessels. |
| | **Limited financial incentives and financing for land transport decarbonization**<br><br>In order to decarbonize land transport, the market requires clear, cost-competitive alternatives to current practices. Almost all vehicles registered in Fiji run on unleaded petroleum (ULP) or automotive diesel (ADO), with a very small share of Liquid Petroleum Gas (LPG) vehicles.<br><br>The existing tax incentives for electric vehicle charging stations and for biofuels use are not compelling enough to motivate change at the individual or commercial level within the market in Fiji. | Create fiscal concessions at both registration and taxation levels for zero-emission transport, such as EVs and mass transit vehicles, for businesses in the form of commercial tax incentives.<br><br>Amend mass transit pricing methodologies (adjusting levies/fees collected on passenger fares) to support commercial business shifting to lower emission mass transit vehicles and EVs.<br><br>Develop incentives for the appropriate decommissioning of vehicles assets at the end of their lifecycle. |
| Social | **Limited awareness of the importance of decarbonizing key sectors, such as land and maritime transportation**<br><br>The human capacity to facilitate change within both the public and private sectors is limited in Fiji, as most people are not fully aware of the importance of reducing GHG emissions, and achieving decarbonization of key sectors, such as land and maritime transportation. | The education institutions in Fiji need to provide the courses and training relevant for a low-carbon shipping future. Raising the level of awareness in the public and private sector on transitioning from fossil fuels, and what options are available and appropriate, as well as available financial incentive are essential to encourage the low-carbon transition of this sub-sector in Fiji. |

**Lack of access to electricity in isolated and rural communities**

Although 95 percent of Fiji's population has access to electricity, a considerable portion remains disconnected from the grid due to the challenges of distributing power to small and isolated communities and rural villages not located on the main islands.

This means that efforts to increase the share of RE resources in the country's energy mix are unlikely to impact this part of the population. Additionally, given that a sizable number of the rural poor rely on standalone diesel generators for their energy needs, instead of solar rooftop solar or other renewable energy sources, they become especially vulnerable to price volatility in the international oil market.

The GoF should develop a rural electrification master plan that maps out the locations it must reach in order to achieve 100% electrification. It should then identify the best solution to bring electricity for each of these communities – whether by extension of the existing grid, new grid connections, or standalone solutions using renewable energy, such as mini-grid solar, or rooftop solar.

Regulations, subsidies, and tariff setting for off-grid areas should be revised through FCCC, and decentralized mini-grid and off-grid renewable energy solutions should be prioritized in cases where the connection to on-grid distribution is not feasible or cost-prohibitive.

The GoF should also provide a roadmap to phase out all villages' diesel generators and replace them with solar home systems and solar mini-grid hybrid projects in the near future.

## 2.4 SOCIAL EQUITY AND INCLUSION

**Fiji has made important progress on education indicators for both women and men.** Fiji has attained high levels of gender parity in school education with a net enrolment rate of 100 percent in primary education and 85 percent in secondary education.[14] and participation of almost 100 percent in primary and 80 percent secondary.[15] While boys initially have an advantage in primary education, as shown by a gender parity ratio (the ratio of girls to boys enrolled in education) of 0.93, as education levels progress, girls increasingly outperform boys.[16] In secondary school, 97 percent of girls successfully complete their education compared to 74 percent of boys. This trend continues into tertiary education, where women make up 60-65 percent of students and over 50 percent of graduates. Conversely, men outnumber women in technical and vocational education and training (TVET) programs at the tertiary level.[17] Societal norms and lack of encouragement also deter girls from pursuing STEM courses, resulting in less than a quarter of the STEM workforce being female.[18]

**Despite improvements in educational achievement, Fijian women do not have the same access to economic opportunities that men do.** In 2022, only 38.1 percent of women participated in the labor force[19] compared with 75.4 percent of men. This female labor force participation has remained roughly the same since 1990 indicating little improvement over time. In addition, when looking at labor force participation in the upper-middle income group, the gap between men and women is higher in Fiji.[20] A factor that contributes to women's low participation in the labor market is the disproportionate responsibility they have for household tasks and care work. Women spend an average of 2.9 times as much time on domestic work than men. Women spent 15.2 percent of their day and men spent 5.2 percent of their day on unpaid household work in Fiji in 2016. The socioeconomic impact of the extensive additional work that women take on is that it limits the amount of time they have available to earn income resulting in less wages earned compared to men. Furthermore, the limited amount of time that women can participate in the workforce is spent working at jobs that tend to be of lower quality and with lower pay. Table 2.3 describes national gender and social inclusion policies.

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[14] Ministry of Women, Children and Social Protection. (2023). "Fiji Country Gender Assessment." Government of Fiji. Available at https://www.mwcpa.gov.fj/wp-content/uploads/2023/04/FCGA_PolicyBriefs-FINAL-FOR-PRINTING-21-FEB-2023.pdf p. 1-A

[15] Asian Development Bank. Women's Resilience in Fiji: How Laws and Policies Promote Gender Equality in Climate Change and Disaster Risk Management. August 2022.

[16] Minister for Women, Children and Poverty Alleviation. (2023). "Fiji Country Gender Assessment." Government of Fiji. Available at *https://www.mwcpa.gov.fj/wp-content/uploads/2023/04/FCGA_PolicyBriefs-FINAL-FOR-PRINTING-21-FEB-2023.pdf* p.1-A

[17] Minister for Women, Children and Poverty Alleviation. (2023). "Fiji Country Gender Assessment." Government of Fiji. Available at *https://www.mwcpa.gov.fj/wp-content/uploads/2023/04/FCGA_PolicyBriefs-FINAL-FOR-PRINTING-21-FEB-2023.pdf* p.2-A

[18] Information obtained during interviews and focus group discussions led by Gender Specialist as part of this REI IP's Gender Equality and Social Impact Assessment

[19] The labor force participation rate is the proportion of the population ages 15 and older that is economically active.

[20] World Bank. "Fiji." World Bank Gender Data Portal. Accessed August 2, 2023. *https://genderdata.worldbank.org/countries/fiji*.

**Table 2.3: Key Policies Relating to Gender and Social Inclusion Policies**

| Policy | Overview |
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| National Gender Policy (2014) | Fiji's overarching national policy for gender equality and a framework for including gender perspectives in all activities of government and civil society. The policy takes a cross-cutting approach promoting visible active gender mainstreaming in all sectors and advocates the use of gender impact assessments, gender analysis, gender-aware approaches, gender-sensitive institutional arrangements, and continuous training and monitoring. It calls for sector-specific policies to integrate the interests of women into strategies and administrative and financial activities. It further calls for a policy of access to energy supplies to all persons in Fiji (1) to ensure that women in communities are consulted in any energy projects, (2) to recognize that women in rural communities have the most limited access to energy sources (including renewables), and (3) to monitor the effect of energy sources which may have a detrimental effect on the health of women. |
| National Energy Policy 2023-2030 | The NEP seeks to improve gender equality and a just transition in the energy sector, including efforts to ensure that women play a role in decision-making, responsibilities, and activities involved with securing safe and affordable energy access. It aims to reduce the burdens, barriers, and inequities that impact the way women interact with energy services, experience energy poverty, access employment opportunities within the energy sector, and take part in energy-related decision-making. It calls for increased access to alternative cooking fuels to reduce reliance on biomass and kerosene. |
| Ministry of Finance (formerly Ministry of Economy) Gender Equality and Social Inclusion (GESI) Policy (2021) | The Ministry of Finance recognizes that promoting equity and inclusion is both a moral imperative and an economic necessity. The goal of the policy is to ensure that GESI is fully mainstreamed in all Ministry of Finance plans, budgets, processes, and systems. It calls for the implementation of gender-based budgeting as a central part of the public financial management reform process. |

**In addition to the gender gaps described above, there is a challenge related to occupational segregation, particularly in the energy sector.** The DoE has 15.3 percent female staff, however out of the 40 technical staff, only one is female.[21] The utility's staff is 12.7 percent female.[22] However, there is currently no female representation among the seven board members. Out of the nine general managers, only one is female.

[21] Information obtained during interviews and focus group discussions led by Gender Specialist as part of this REI IP's Gender Equality and Social Impact Assessment

[22] Page 65, FESRIP, Volume 2: Issues and Background Papers

Furthermore, among the 24 middle managers, only six are women.[23] Although there is no data available on the energy sector's workforce composition, it is safe to assume that the sector is predominantly male dominated for several reasons: (i) women are not incentivized and thus do not typically participate in STEM fields that traditionally serve the energy sector; (ii) major institutions in the energy sector such as the DoE and EFL have minimal female staff particularly in technical roles, which are predominantly male-dominated, and (iii) other companies that serve the energy sector, such as infrastructure installation, operate as private entities which are not necessarily subject or accountable to gender and social inclusion policies.

The 2010–2011 Employment and Unemployment Survey indicates that in both formal and informal self-employed sectors, women make up 27% of the workforce, mainly working in market-oriented agricultural production or fishing, handicrafts, and sales-related jobs. Approximately 800 women, compared to 4,300 men, are self-employed in the formal sector, reflecting the limited participation of women as business owners. In addition, in the tourism industry, women make up a large portion of the sector in positions where wages are usually at minimum wage. Women occupy one-third of this workforce but only hold one-quarter of managerial and professional positions whereas men hold most of the technical and more highly paid jobs.[24] These numbers reflect disproportionate participation in important occupations such as energy, tourism, and technical positions.

**Although women in Fiji hold a slight advantage in secondary and tertiary education, they encounter substantial challenges when transitioning from school to the workforce.** Gender biases among parents, teachers, and family members discourage girls from pursuing interests and educational opportunities in STEM fields, while limited access to vocational training and the absence of a clear gender policy and institutional commitment from government authorities to address gender inequality further impedes women's progress. A major obstacle is the burden of unpaid care work, especially in rural areas where women shoulder most of this responsibility, dedicating up to 80 hours a week, in contrast to men who typically contribute as little as 30 hours to similar tasks.[25] This is exacerbated by deeply ingrained gender norms and discrimination which can result in criticism and even violence against women who choose to work outside the home, disrupting traditional cultural roles. In fact, gender-based violence is a significant threat, limiting women's mobility and their ability to engage in economic activities safely, as nearly two-thirds of Fijian women experience intimate partner violence (IPV), with 44% having experienced severe physical violence.[26] As a result, most women are discouraged from freely engaging with the job market in the face of safety concerns and the fear of being stigmatized by family members.

[23] Information obtained during interviews and focus group discussions led by Gender Specialist as part of this REI IP's Gender Equality and Social Impact Assessment

[24] Asian Development Bank. Accessed August 2, 2023. *https://www.adb.org/sites/default/files/institutional-document/210826/fiji-cga-2015.pdf*.

[25] Information obtained during interviews and focus group discussions led by Gender Specialist as part of this REI IP's Gender Equality and Social Impact Assessment

[26] Information obtained during interviews and focus group discussions led by Gender Specialist as part of this REI IP's Gender Equality and Social Impact Assessment

**Several difficulties also prevent women from fully participating in entrepreneurship.** The persistence of traditional gender roles often results in women who run their businesses still being expected to shoulder household responsibilities, including cooking, cleaning, child-rearing, and caring for their husbands. Women who engage in income-generating activities in rural environments, such as sewing and baking to support their families, face challenges related to the availability of power. This issue is exacerbated because the power supply relies on diesel generators, which are often unreliable due to irregular boat supply schedules. Conversely, women operating businesses in urban areas, like female vendors in Fiji's municipal markets (which account for 80 percent of total vendors), frequently encounter workplace violence. This includes harassment by customers, intimidation from rival vendors, physical and sexual harassment from men who are drinking or using drugs, as well as threats and violence from their husbands or partners attempting to restrict their work or control their earnings.[27] Women also face challenges related to the access to land, as a significant portion of land transfers takes place through inheritance, usually from fathers to sons, and a lack of access to market services, financing and credit due to a lack of collateral and financial advisory services.[28]

**Gender gaps in access to electricity in Fiji lead to disproportionate risks to women's health and unequal distribution of household and caregiving responsibilities.** Energy poverty, particularly prevalent in rural areas, disproportionately affects women. In addition to their increased engagement in unpaid care work, which limits their participation in the labor force, due to gender norms, women and children often bear the responsibility of collecting and transporting firewood, exposing them to health hazards linked to indoor smoke and traditional energy sources.[29] Moreover, women often lack the knowledge and opportunities to address electricity-related issues or undertake repairs, limiting their utilization of electricity to basic needs like lighting and hot water. This scarcity of power, confined to a few hours daily, further restricts women's access, making the operation of other appliances a luxury. Additionally, women frequently find themselves excluded from decision-making processes of when and where to use electricity, reflecting the unequal access to power perpetuated by these imbalances in labor division and opportunities.[30]

**There is also an important rural-urban divide in terms of energy access.** Access to energy in Fiji is lower in rural areas compared to urban areas. While in urban areas, access to electricity service covers 96% of the population, it decreases to 86% in dispersed rural areas;[31] thus 4% of urban residents and nearly 20% of

[27] Minister for Women, Children and Poverty Alleviation. (2023). "Fiji Country Gender Assessment." Government of Fiji. Available at *https://www.mwcpa.gov.fj/wp-content/uploads/2023/04/FCGA_PolicyBriefs-FINAL-FOR-PRINTING-21-FEB-2023.pdf* p.16-C

[28] Information obtained during interviews and focus group discussions led by Gender Specialist as part of this REI IP's Gender Equality and Social Impact Assessment

[29] Information obtained during interviews and focus group discussions led by Gender Specialist as part of this REI IP's Gender Equality and Social Impact Assessment

[30] Information obtained during interviews and focus group discussions led by Gender Specialist as part of this REI IP's Gender Equality and Social Impact Assessment

[31] "Access to Electricity, Rural (% of Rural Population) - Fiji." World Bank Open Data. Accessed August 2, 2023. https://data.worldbank.org/indicator/EG.ELC.ACCS.RU.ZSend=2021&locations=FJ&start=1996&view=chart.

people living in rural areas still lack electricity access as of 2021.[32] Although the divide between rural and urban is extensive, access to electricity in recent years has increased exponentially with the percentage of rural households in Fiji that have electricity increasing from 30.6 percent in 1986 to 81.4 percent in 2007. This grow was the result of rural electrification efforts, low population growth, and increasing urbanization. [33] Development in rural areas is frozen in Fiji due to this lack of electricity access. People in rural areas are forced to use high-cost, inefficient energy sources such as diesel for lighting and batteries for radios which takes up a large portion of their limited incomes. Women in these rural communities with low incomes are particularly affected since electricity would help them carry out household daily tasks such as food preparation, helping children with homework, agriculture and business activities, and fulfilling obligations in their communities.

**Fiji has been taking measures in recent years to expand disability rights.** Efforts have included creating a convention with the goal of advocacy, defining disabilities in the Constitution, and describing the rights of disabled peoples in the Constitution. Fiji recently ratified the Convention on the Rights of Persons with Disabilities in 2017. According to the passed resolution, the goal of this convention is to promote, protect and ensure the full enjoyment of all human rights and fundamental freedoms by all persons with disabilities and promote respect for their inherent dignity. In addition, the Fijian Constitution now explicitly defines the term "disability" which legally orders that a person cannot be discriminated against, prevented access, or denied equity because of an individual's disability. The Constitution also states that a person with any disability has the right to the following: reasonable access to all places, public transport, use sign language, Braille, or other appropriate means of communication, reasonable access to necessary materials, substances, and devices relating to the person's disability.[34] There are also public schools in Fiji offering primary education for persons with physical, intellectual, and sensory disabilities; however, cost and location limited access. Although there are options for people with disabilities to attend primary school, opportunities were extremely limited for secondary school or higher education for persons with disabilities.[35]

**Difficulties arising from gender, ethnicity, sexual orientation, and disability challenges may intersect to create a unique experience of discrimination resulting in tougher barriers.** Women's livelihoods are influenced by ethnicity, particularly regarding land rights, and employment. For example, iTaukei culture places a strong emphasis on communal values and male authority, limiting women's rights to inherit land or own property and participate in decision-making. However, these norms do not restrict women's mobility or most economic activities. On the other hand, Indo-Fijian communities often practice father-to-son land inheritance and may restrict women's mobility, especially in rural areas where traditional gender roles are

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[32] Fiji Renewables Readiness Assessment. Accessed August 2, 2023. *https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2015/IRENA_RRA_Fiji_2015.pdf*.

[33] "Energy Access Case Study 07 – The Pacific Response: Electrifying Isolated Islands." UNDP, July 27, 2015. *https://www.undp.org/asia-pacific/publications/energy-access-case-study-07-pacific-response-electrifying-isolated-islands*.

[34] "Disability Rights." FHRADC, December 8, 2021. https://www.fhradc.org.fj/disability-right/.

[35] Fiji 2020 Human Rights Report - U.S. Department of State. Accessed August 2, 2023. *https://www.state.gov/wp-content/uploads/2021/03/FIJI-2020-HUMAN-RIGHTS-REPORT.pdf*.

more prevalent.[36] This is evidenced by the difference between Indo-Fijian and iTaukei women in employment –53 percent of iTaukei women are in the labor force, compared to 37 percent of Indo-Fijian women.[37] It is also reflected in the levels of harassment – 70 percent of Indo-Fijian market vendors feel harassed and discriminated against because of their ethnicity and gender.[38]

**Living with disabilities in Fiji poses additional challenges of accessibility and learning, which intersect with gender and habitation.** Most of the schools for children with disabilities are located in urban areas, hindering the access of poorer children living in rural areas. Children with disabilities also suffer from low levels of foundational skills and widespread discrimination. Only 48.7 percent of children with disabilities aged 7–14 years successfully mastered reading, and 44.7 percent numeracy in Fiji.[39] Girls constitute one-half of the population of school-age Fijians with disabilities but make up only about one-third of students with disabilities. Discrimination against girls with disabilities is compounded by other forms of discrimination stemming from the subordinate position of women and girls in a patriarchal society, leading to bullying, and reluctance to attend school. Moreover, the lack of disability-accessible sanitation facilities poses challenges for girls with disabilities, particularly during puberty. Lastly, certain groups of women and girls, including those with disabilities, LGBTQI+ individuals, and older women, are at elevated risk of violence.[40]

[36] Australian AID – Market Development Facility (MDF). (2013). "Study on Poverty, Gender, and Ethnicity in Key Sectors of the Fijian Economy". Available at *https://www.repository.usp.ac.fj/7435/1/130808_Fiji-Poverty-Gender-Ethnicity_Final.pdf*, pp.21-22

[37] Asian Development Bank. (2016). "Fiji: Country Gender Assessment 2015." Available at *https://www.adb.org/sites/default/files/institutional-document/210826/fiji-cga-2015.pdf*, p.15

[38] Minister for Women, Children and Poverty Alleviation. (2023). "Fiji Country Gender Assessment." Government of Fiji. Available at *https://www.mwcpa.gov.fj/wp-content/uploads/2023/04/FCGA_PolicyBriefs-FINAL-FOR-PRINTING-21-FEB-2023.pdf* p.16-C

[39] Minister for Women, Children and Poverty Alleviation. (2023). "Fiji Country Gender Assessment." Government of Fiji. Available at *https://www.mwcpa.gov.fj/wp-content/uploads/2023/04/FCGA_PolicyBriefs-FINAL-FOR-PRINTING-21-FEB-2023.pdf* p.5-A

[40] Minister for Women, Children and Poverty Alleviation. (2023). "Fiji Country Gender Assessment." Government of Fiji. Available at *https://www.mwcpa.gov.fj/wp-content/uploads/2023/04/FCGA_PolicyBriefs-FINAL-FOR-PRINTING-21-FEB-2023.pdf* p.23

# SECTION 3 RENEWABLE ENERGY INTEGRATION (REI) IN FIJI

Renewable energy plays a critically important role in Fiji's electricity sector, and there is huge potential for continued growth. Section 3.1 describes the existing role of renewables in Fiji's electricity sector and opportunities for growth. Section 3.2 describes the policies and strategies in place to promote that growth. Section 3.3 describes the sector institutions implementing the policies and strategies. Section 3.4 and Section 3.5 describe the role of the private sector and the role of international development partners, in facilitating renewable energy integration.

## 3.1 RENEWABLE ENERGY IN THE ELECTRICITY SECTOR

Hydropower provided 58.5 percent of Fiji's electricity generation in 2021. There are also early solar and wind projects, each accounting for less than 0.5 percent of generation in 2021, as well as biomass generation projects, mostly operating as IPPs, which accounted for 6.5 percent of generation in that same year. There are, nevertheless, major challenges in bringing sufficient resources online, as evidenced by the sector's still high dependence on fossil fuels. Many of these challenges relate specifically to the inability of the grid to absorb additional generation, and additional load. The challenges are compounded by the volatility of hydropower generation over time, as climate change has made it more and more difficult to accurately predict and plan for dry years. The island of Viti Levu—home to three-quarters of Fiji's population—has an electricity network which is still largely a radial design. The Monasavu Hydropower Plant—the largest power plant on Viti Levu—is located at the geographical center of the island, but with too few "spokes" connecting from that central "hub", and few transmission connections to other areas that have good potential sites for renewable energy generation.

Access to electricity also remains a challenge for some. Ninety-five percent of Fiji's population has access to electricity, but a portion of the country's rural population remains without grid connections, relying predominantly on fossil fuels for electricity generation, and traditional fuels for cooking.

This section describes the existing of renewable energy generation in Fiji and identifies some of the principal challenges in bringing additional renewable energy generation online—challenges that CIF support is well placed to address under the REI Program.

### 3.1.1 Electricity Generation

As described in Section 2.1, more than 90 percent of electricity generation in Fiji is provided by EFL, with most electricity coming from renewable sources, primarily hydro (58 percent) and bioenergy (6.5 percent). Solar (1 percent) and wind (0.03 percent) currently account for minimal amounts of electricity generation.[41]

[41] Energy Fiji Limited. (2022). "2021 Annual Report." Available at https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf

Historically, renewable energy sources have been the primary source of electricity, despite growth in hydro generation being stagnant since 2012.[42] In the last 10 years, the combined share of hydro and wind generation in EFL's grid fell from 63 to 58 percent, while IPPs, which primary rely on biomass for electricity generation, saw their share increase by two percentage points. The share of thermal power in EFL's electricity matrix peaked at 52 percent in 2015 and has since experienced a gradual decline, reaching 35 percent in 2021.

Figure 3.1 provides an overview of electricity generation by source from 2012 to 2021, and Figure 3.2 shows Fiji's electricity generation mix in 2020.

**Figure 3.1: Electricity Generation by Source (Grid-Connected Only), 2012-2021**

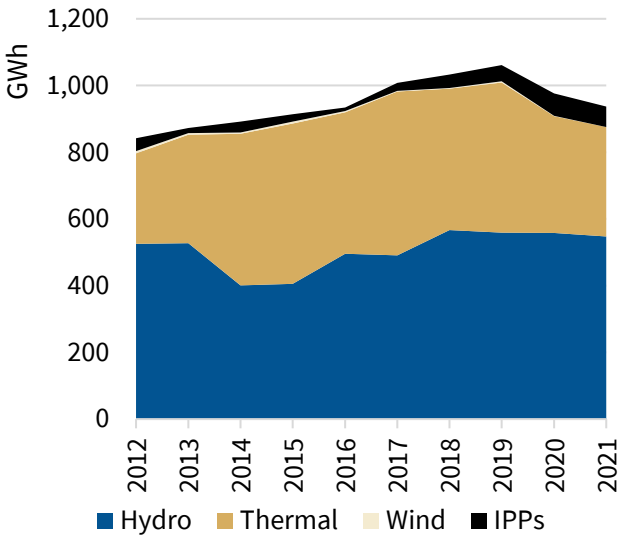
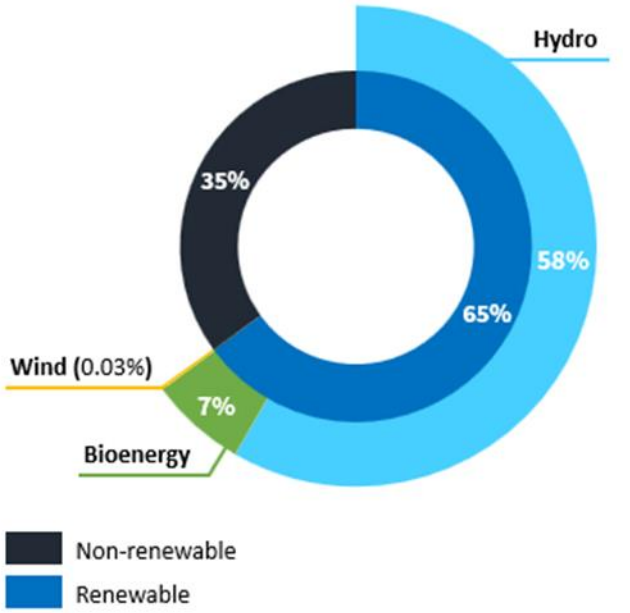



**Figure 3.2: Electricity Generation Mix, 2020**




Sources: Energy Fiji Limited. (2022). "2021 Annual Report."
International Renewable Energy Agency (IRENA). (2022). "Energy Profile – Fiji."

EFL's installed capacity totals 329 MW and is comprised of 182 MW of thermal and 147 MW of renewable energy (RE). Total available generation capacity stands at 267 MW, including 141 MW of thermal and 126 MW of RE.[43] In 2021, 58.5 percent of electricity generated came from hydro power plants (HPPs) supplied mainly by the Wailoa and Nadarivatu hydro power stations.[44] Thermal accounted for the second largest share

[42] Energy Fiji Limited. (2022). "2021 Annual Report." Available at https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf
[43] IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific." Available at https://www.developmentaid.org/api/frontend/cms/file/2022/07/IFCPoweringthePacificGuide-FINAL.pdf.
[44] Energy Fiji Limited. (2022). "2021 Annual Report." Available at https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf, p.87

at 35 percent, mostly from Kinoya & Vuda heavy fuel oil power station.[45] IPPs generated 6.5 percent of electricity from biomass and EFL's Butoni Wind Farm accounted for the remaining 0.03 percent.[46] Table 3.1 provides information on key generation assets in Fiji, including their type, ownership, installed capacity and generation in 2021.

**Table 3.1: Main Generation Assets in Fiji**

| Generator Asset | Type | Ownership | Installed Capacity (MW) | Electricity Generated in 2021 (GWh) |
|---|---|---|---|---|
| Wailoa/Monasavu Power Station | Hydro | EFL | 80 | 440 |
| Nadarivatu Power Station | Hydro | EFL | 44 | 85 |
| Wainikasou Power Station | Hydro | EFL | 6.6 | 19 |
| Nagado Power Station | Hydro | EFL | 2.8 | 0 |
| Kinoya & Vuda Power Stations | Thermal | EFL | 115 | 274 |
| Labasa & Ovalau Power Stations | Thermal | EFL | 16.8 | 53 |
| Butoni Wind Farm | Wind | EFL | 9.8 | 0.2 |
| Tropik Wood Power Station | Biomass | Tropik Wood | 9 | 61 |
| Lautoka Fiji Sugar Corporation Power Station | Biomass | Fiji Sugar Corporation | 5 | |
| Labasa FSC Power Station | Biomass | Fiji Sugar Corporation | 20 | |
| **PV Projects for Self-Consumption** | | | | |
| Coca-Cola Amatil | Solar | Private | 1.1 | Grid-connected rooftop solar for self-consumption |
| Mark One textile factory | Solar | Private | 0.2 | |
| Radisson Blu resort, Denarau | Solar | Private | 0.4 | |

[45] Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*, p.87

[46] Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*, p.87

| | | | | |
|---|---|---|---|---|
| Smaller Commercial or Household Solar PV | Solar | Private | ~1.5 | |

Sources: IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific." Available at *https://www.developmentaid.org/api/frontend/cms/file/2022/07/IFCPoweringthePacificGuide-FINAL.pdf*; and

Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*

Around 150 rooftop solar PV installations are also operating in Fiji, accounting for about 580 MWh per year, although the majority are very small projects. EFL expects generation to increase to 1,000 MWh in the coming years. Sunergise, an energy service company, operates at least four large installations—ranging from 200 kW to 1.5 MW—on behalf of electricity consumers. The operation is under a net billing arrangement (with a fixed tariff for electricity exported back to the grid) with EFL. EFL has standard technical and commercial terms that it offers to interested parties, but the terms are only available upon request.

### 3.1.2 Transmission and Distribution

Fiji's transmission and distribution grid is owned and maintained by EFL and consists of more than 11,000 km of total power lines.[47] The transmission network comprises 147 kilometers of 132 kilovolt (kV) transmission lines, 451 km of 33 kV overhead sub-transmission lines, and 84 km of 33 kV underground sub-transmission cables coupled with 37 zone substations that make the conversion to adequate distribution voltage.[48]

The distribution network consists of 4,388 km of overhead high-voltage distribution lines, 636 km of underground high-voltage distribution cables, 5,395 km of overhead low-voltage distribution lines, and 245 km of low-voltage distribution underground cables coupled with 6,210 distribution substations.[49] Figure 3.3 shows the transmission and distribution grid across Fiji's main islands.

Most Fijians have access to electricity, but there is a substantial rural-urban disparity. Roughly 96 percent of the population has access to electricity, either via a connection to the state grid (80 percent), home solar systems (11 percent), or diesel generators (4.5 percent).[50]

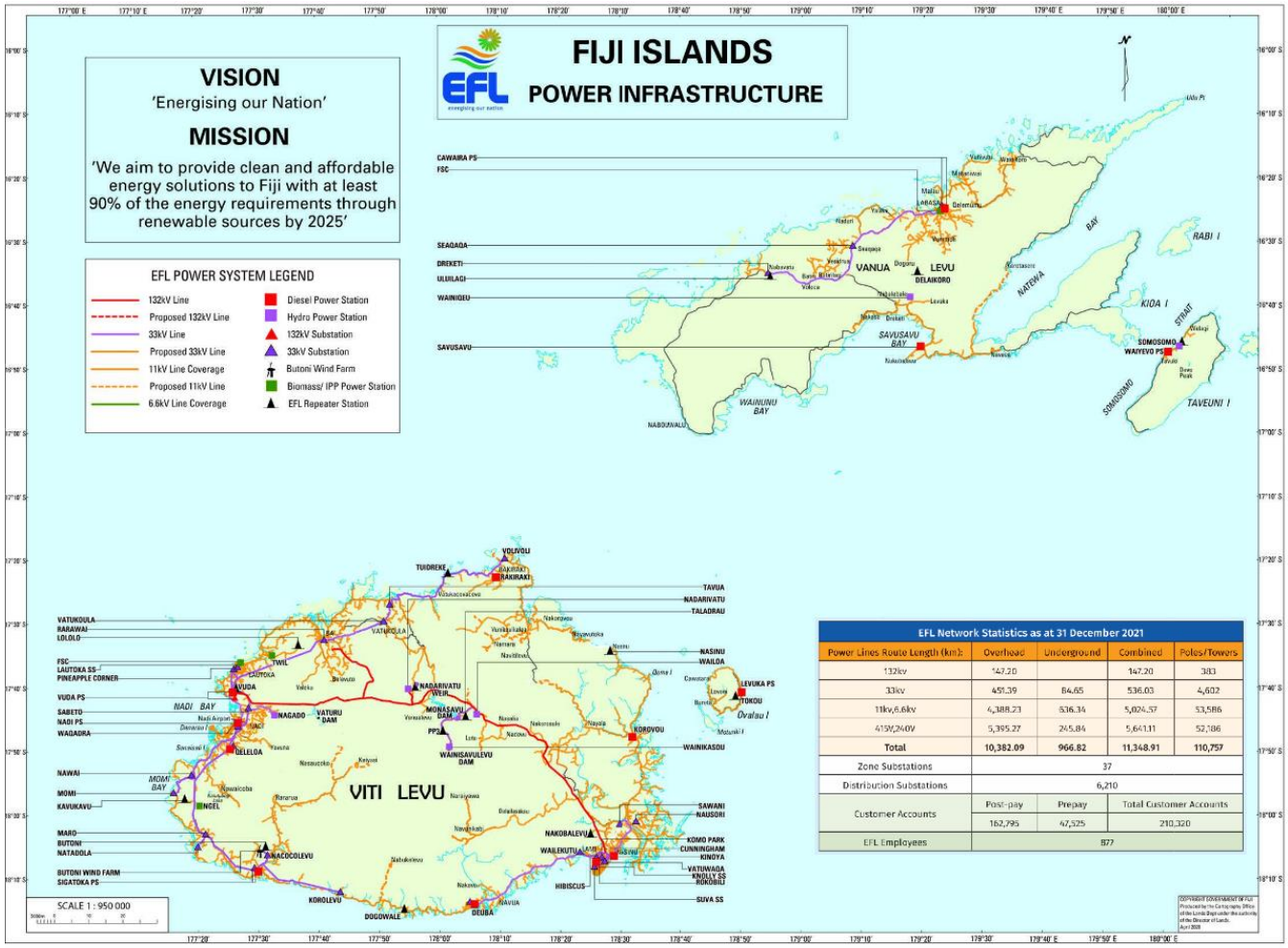
[47] Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*

[48] Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*

[49] Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*

[50] Fiji Bureau of Statistics, "2019-20 HIES."

**Figure 3.3: Fiji's Transmission and Distribution Grid Infrastructure, 2021**




Source: Energy Fiji Limited, "2021 Annual Report."

EFL has targets for System Average Interruption Frequency Index (SAIFI)[51] and System Average Interruption Duration Index (SAIDI)[52] to ensure reliability of electricity distribution to its consumers. In 2022, EFL achieved a SAIFI of 4.23 times (well within its target of six times per year or less), and a SAIDI of 239 minutes (within its target of less than 255 minutes).[53]

[51] SAIFI refers to the average number of interruptions that a customer experiences over the period of one year.
[52] SAIDI refers to the average outage duration for each customer served, over the period of one year. It is measured in units of time, usually minutes or hours.
[53] Energy Fiji Limited. (2023). "2022 Annual Report." Available at https://efl.com.fj/wp-content/uploads/2022/08/EFL-2022-Annual-Report.pdf

The company has been able to expand its transmission and distribution grid by 1,700 km (19 percent increase) over the last 10 years,[54] with plans of further investment in the development of a 132kV Transmission Network from Virara Settlement to Rarawai, Ba.[55]

### 3.1.3 Demand

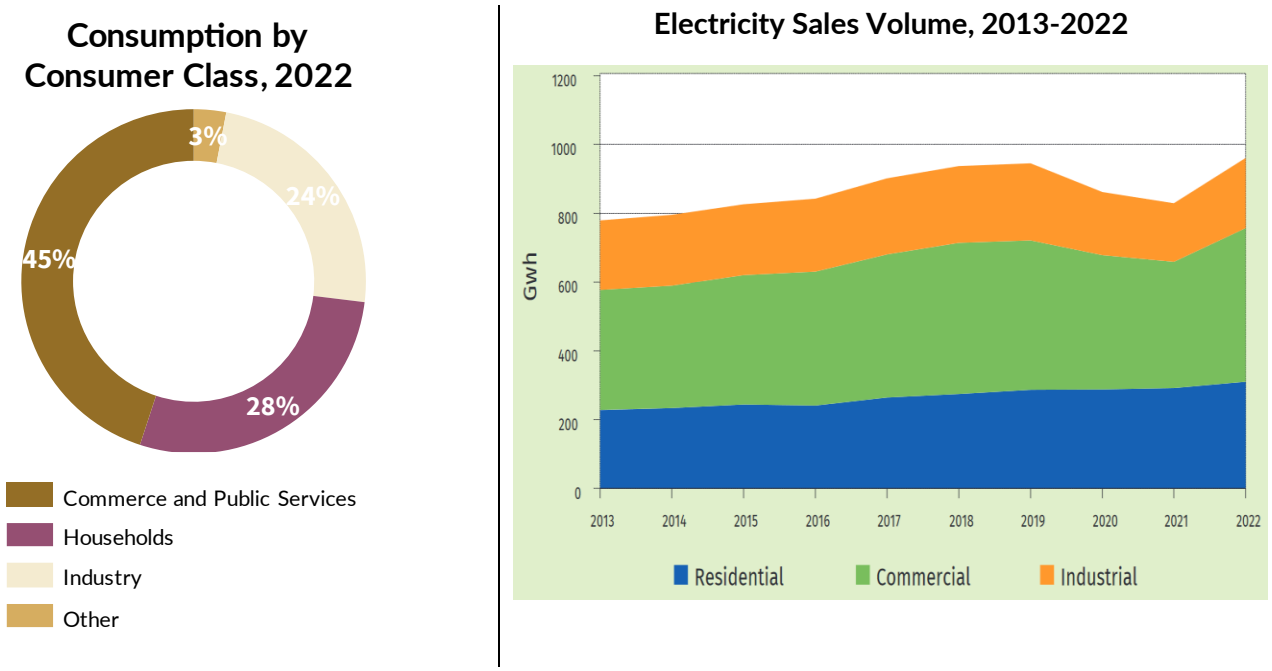
Fiji's electricity demand is driven primarily by the commerce and public services sector, which accounts for 45 percent of consumption from grid-connected electricity. Households account for another 28 percent of consumption, followed closely by the industrial sector, which makes up 24 percent of demand.[56]

Electricity sales grew steadily between 2013 and 2019, but experienced a sizeable decline between 2020 and 2021, as a result of the COVID-19 pandemic.[57] The effects of the pandemic, however, have been uneven across consumer classes: while the residential sector was spared from the decline in demand, industry and commerce electricity sales have been heavily impacted, as these sectors were most vulnerable to the economic slowdown caused by COVID. As of 2022, however, demand from the commercial and industrial sector has rebounded, bringing electricity sales back to pre-pandemic levels. Demand is forecast to continue to grow at a rapid pace with the growth of Fiji's economy.

Figure 3.4 below shows an overview of electricity demand by consumer class.

[54] Own calculation considering a total network grid of 9,234 km in 2012, according to EFL's 2012 Annual Report available at *https://efl.com.fj/wp-content/uploads/2014/02/FEA-ANNUAL-REPORT-2012-1.pdf*.
[55] Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*
[56] United Nations Statistics Division. (2022) "Energy Balance Visualization – Fiji." Available at *https://unstats.un.org/unsd/energystats/dataPortal/*.
[57] Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*, p.27

**Figure 3.4: Electricity Demand by Consumer Class**




Source: United Nations Statistics Division. (2022) "Energy Balance Visualization – Fiji." Available at https://unstats.un.org/unsd/energystats/dataPortal/.

Energy Fiji Limited. (2023). "2022 Annual Report." Available at *https://efl.com.fj/wp-content/uploads/2022/08/EFL-2022-Annual-Report.pdf*, p.27

## 3.2 NATIONAL LOW OR ZERO CARBON ENERGY STRATEGIES

In addition to the national and international climate strategies described in Section 2.2, Fiji has a number of policies aimed specifically at reducing carbon emissions. These are described below.

**Fiji's NCCP 2018–2030 established Fiji's national climate change response and NDC under the Paris Agreement.** The policy outlined the overarching objectives to address the specific climate vulnerabilities faced by Fiji through evidence-based policy and legislation. The NCCP established a mandate for the creation of the LEDS and underpinned the basis for the development of the Climate Change Act.

**The Climate Change Act, Fiji's main piece of legislation governing low emission strategies, was enacted in 2021.** The Act recognizes that Fiji and the entire world are facing a climate emergency, and that Fiji is especially vulnerable to the effects of climate change due to its position as an island state and its consequent exposure to the damages of rising sea levels, climate disasters such as cyclones and flooding, as well as the destruction of marine ecosystems from which the country heavily relies for food security and economic stability.

**The Climate Change Act legally-binds Fiji to achieve net zero carbon emissions by 2050.** It establishes a robust legal framework for transforming Fiji into a carbon-neutral nation and enhancing the climate resilience of its economy. It does so by incorporating various provisions, such as carbon budgets, the establishment of

a carbon market, addressing climate-induced human mobility, implementing nature-based solutions, legally recognizing maritime boundaries considering sea level rise, securing climate finance, and fostering intergovernmental resilience building.

**The Act empowers the Minister responsible for Climate Change to implement measures to limit Fiji's GHG emissions.** This includes issuing guidelines for state entities to align their decisions and policies with the Act's objectives, imposing fees on emissions exceeding a certain level, and introducing fiscal incentives. It also mandates the creation of the Fijian GHG Inventory and its public availability online, for improved measurement, reporting and verification of emissions and emissions reductions.

**Fiji's Low Emission Development Strategy (LEDS) 2018-2050 outlines the pathways for Fiji to reach its goal of net zero carbon emissions by 2050.** The strategy lays down four different low emission scenarios that Fiji may achieve depending on the extent and ambition of the policies adopted. The strategy evaluates the potential impact of current policies at the sector level and proposes additional key policies and actions necessary to further reduce emissions.

**At the most ambitious scenario under LEDS, Fiji reaches net zero emissions by 2041.** This would be achieved through a complete transformation of Fiji's energy sector to one based on a wide variety of on-grid and off-grid renewable energy generation. Specific policy actions include capacity building for renewable energy and smart grid technology; complete transition of Fiji's land transport system to hybrid-electric and electric vehicles; full methane capture and utilization for organic waste reduction and recycling programs; and extensive afforestation measures to offset the increase in emissions caused by population and economic growth.

## 3.3 INSTITUTIONAL FRAMEWORK AND CAPACITY

Fiji's government and energy sector institutions are extremely well placed to implement REI IP projects financed by CIF. It has 5- and 20-year **National Development Plans (NDP)** that it updates regularly and more recently, a **National Infrastructure Investment Plan (NIIP)** approved by Cabinet in early 2023. EFL has similarly developed a 10-year **Power Development Plan (PDP)**, with nearly US $1 billion in investment foreseen in the next decade.

**Fiji's 20-Year NDP (2017-2036)** provides a vision for "Transforming Fiji" toward an even more progressive, vibrant, and inclusive society. It outlines a framework that encompasses strategic policy maneuvers, new approaches to development and the aspirations of all Fijians. The Plan consists of two prongs or approaches, which are designated as: "Inclusive Socio-economic Development" and "Transformational Strategic Thrusts".[58] The plan aims to achieve 100 percent renewable electricity generation by 2036.[59] In order to achieve this

[58] Government of Fiji. (2017). "5-Year & 20-Year Development Plan." Available at *https://www.adb.org/sites/default/files/linked-documents/LD4%205yr%20and%2020yr%20DP%20Transforming%20Fiji.pdf*, p.2

[59] Government of Fiji. (2017). "5-Year & 20-Year Development Plan." Available at *https://www.adb.org/sites/default/files/linked-documents/LD4%205yr%20and%2020yr%20DP%20Transforming%20Fiji.pdf*, p.3

goal, the GoF plans on developing a variety of renewable energy sources, including hydropower, wind, solar, biomass, geothermal and wave and tidal energy, where they are viable and affordable.[60]

Additional goals outlined in the plan include further grid extensions in Viti Levu, Vanua Levu, Ovalau and Taveuni, continued GoF funding for rural electrification projects, and decentralized renewable energy sources (solar, mini hydro, hybrid biofuel/diesel operated generators and wind systems) for the rural and outer islands where grid connections are not feasible. In addition, the plan also highlights the importance of ensuring that future electricity projects are climate-resilient (including possibly adopting underground cables for electricity distribution) and emphasizes the use of carbon credits under the Clean Development Mechanism as of future infrastructure financing arrangements. Finally, the plan also states that IPPs of both small- and large-scale electricity production will be supported with fair pricing for the sale of electricity, and that the ongoing regulatory reforms in the electricity sector – which include the partial divestment of EFL – will promote private sector participation and raise efficiency and service delivery.

More recently, GoF approved the **NIIP (2023-2034).**[61] The NIIP serves as a strategic guide for screening and prioritizing infrastructure investments in Fiji over the next 5-10 years. It is the result of a comprehensive assessment of infrastructure needs across all sectors, drawing from the NDP objectives and sectoral plans. By consolidating a list of more than 570 potential projects, the NIIP employs a systematic and transparent process to prioritize investments across sectors, considering economic viability and the government's funding capacity. Box 3.1 provides additional description of the NIIP.

**Box 3.1: Fiji's National Infrastructure Investment Plan (NIIP)**

Fiji's NIIP plan encompasses a wide array of infrastructure investments, focusing on capital construction projects and programs with a value exceeding $100,000. Spanning nine key sectors (roads and jetties; aviation; maritime; water and sanitation; energy; public buildings; telecommunications; waterways; and urban development), these projects are aligned with Fiji's long-term vision for development as outlined in the NDP.

Beyond prioritization, the NIIP aims to strengthen government planning processes at its various stages, including during the development of project concepts, inclusion in the Public Sector Investment Plan, preparation of priority projects, project appraisal, selection criteria, implementation, and monitoring. By enhancing these processes, the NIIP seeks to ensure that the projects selected align with Fiji's strategic development objectives. The NIIP also aims to consolidate infrastructure capital investment projects into a single register across all sectors. To achieve this, the plan collaborates with both "on-budget" government-funded agencies and statutory authorities, as well as "off-budget" state-owned enterprises.

The NIIP provides a roadmap for the next decade, enabling the GoF to flexibly respond to challenges like climate change and health issues. It also provides guidance for the assessment of costs and benefits of the projects in

[60] Government of Fiji. (2017). "5-Year & 20-Year Development Plan." Available at *https://www.adb.org/sites/default/files/linked-documents/LD4%205yr%20and%2020yr%20DP%20Transforming%20Fiji.pdf*, p.3

[61] Available online at *https://theprif.org/document/fiji/national-infrastructure-investment-plans/fiji-national-infrastructure-investment-plan*

the pipeline and allow for the prioritization of projects to be developed and incorporation of such priority investments in the GoF's medium-term expenditure framework.

The NIIP database contains several energy projects that could benefit from CIF financing, including projects to expand energy accessibility through new renewable energy generation and the installation of solar hybrid systems; feasibility studies for new hydro- and wind-powered generation; expansion of access through extension of the grid; and expansion of electric vehicle infrastructure, including charging stations and rooftop solar for EV chargers. The table below summarizes the main energy sector projects included in the NIIP.

Table 3.2 summarizes projects under the NIIP that Government have determined could be eligible for CIF Financing under the REI Program. It is important to note that, while some of these projects are VRE generation projects, which would not be eligible for CIF financing under the REI program, their eventual implementation will require VRE integration infrastructure, which would be eligible for CIF financing.

**Table 3.2: Projects under the NIIP that Could be Eligible for CIF Financing**

| Project Reference | Program Name | Project Description |
|---|---|---|
| **E11** | Renewable Energy - Hydro | Feasibility study, detail designing, and implementation of potential micro and small hydro plants. Around 20 potential sites. The project will be able to assist the DoE in meeting its renewable energy target of 100% by 2036, which will contribute to reducing Fiji carbon emissions. This will assist Fiji in reducing the use of fossil fuels. |
| **E12** | Accessibility to All - Renewable source | Upgrading of 50 Diesel Generators to 50 Solar Hybrid Systems. The project will be able to assist the DoE in meeting its renewable energy target of 100% by 2036, which will contribute to reducing Fiji carbon emissions. This will assist Fiji in reducing the use of fossil fuels. |
| **E15** | Accessibility to All - Renewable source | Installation of 15,000 Solar Home Systems within 10 years - 1500 systems per year. The project will be able to assist the DoE in meeting its renewable energy target of 100% by 2036, which will contribute to reducing Fiji carbon emissions. |
| **E18** | Renewable Energy - Wind | The project is for DoE to develop P90 bankable report of the 15 identified wind sites to inform investors and development partners to make available funding for electricity power generation from wind sources. |
| **E19** | Accessibility to All - LAKARO | Expansion of grid of the Kadavu, Lakeba and Rotuma government stations. The project will include the grid extension from: Kadavu - Namalta to Nasalia, Vunisea to Kavala Lakeba - Tubou - Nasaqalau, Tubou - Waitabu Rotuma - Round the Island. |
| **E20** | Accessibility to All - Hybrid | Nabouwalu government Stations - Upgrade and expand. Upgrade of generation plant and extension of grid. |
| **E21** | Renewable Energy - Solar | Nabouwalu Government Stations - Installation of a Solar Hybrid System. The project will be able to assist the DoE in meeting its renewable energy target of 100% by 2036, which will contribute to reducing Fiji carbon emissions. This will assist Fiji in reducing the use of fossil fuels. |

| Project Reference | Program Name | Project Description |
|---|---|---|
| **E22** | Accessibility to All - Nationwide Grid Expansion | The project will be able to assist the DoE in meeting its energy access goal by 2026. |
| **E23** | Accessibility to All - Upgrade House Wiring | The project will be able to assist the DoE in meeting its energy access goal by 2026. |
| **E24** | Energy Efficiency - EV Charging Stations | This project will support EV integration for the land transport sector and enable the DoE to achieve its targets of reductions in Energy intensity (consumption of imported fuel per unit of GDP in MJ/FJD) and GHG emissions from 2013 baseline NDC target. |
| **E105** | National Charging Station Network | To construct and install charging centers for EV around the country. |
| **E106** | N/A | To install roof top solar for all Land Transport Authority (LTA) owned properties Fiji wide and accommodated EV vehicle chargers. |

EFL's Board of Directors recently approved a 10-year **PDP (2019-2028)**, which includes projects in the NIIP as well as additional capital expenditure foreseen by EFL. EFL assesses its PDP every 2-3 years. The PDP was revised in late 2019 and subsequently in 2022. It encompasses projections for electricity demand and strategies for generating and delivering electricity until 2028 across its service areas in Viti Levu, Vanua Levu, Ovalau, and Taveuni Power Systems. The PDP estimates a total investment of FJD1.97 billion (US$900 million) needed for the development and commission of renewable energy projects over the next three years. These projects include strengthening the distribution network, expanding electricity access in urban and rural areas, acquiring new electricity meters and vehicles, improving the Monasavu Hydro-Electric Scheme, upgrading the 33 kV sub-transmission network from Vuda to Naikabula, replacing three 132 kV towers, enhancing equipment and systems for more reliable power supply through automation, and building a new 132 kV transmission network from Virara, Ba to Koronubu, Ba. These projects will increase capacity to meet future electricity demand from renewable sources and improve the security and reliability of power supply.[62]

The following subsections summarize the institutional, legal, and regulatory framework in the energy sector. Section 3.3.1 provides information on important institutions in the energy sector, including those responsible for policy, regulation, generation, transmission, distribution, and electrification. Section 3.3.2 summarizes key energy sector policies, legislation, and regulations in the energy sector of Fiji.

### 3.3.1 Institutional Framework

The **Ministry of Finance, Strategic Planning, National Development & Statistics (MoF)** has oversight over national budgeting, and thresholds for lending between government-owned entities. The Ministry plays a key role in creating an enabling environment and determining Fijian Government fiscal policy and incentives. It also has a central role in the prioritization and allocation of the government budget and leveraging global public finance for climate action. The MoF has led the development of the LEDS and NDC Roadmap, which

[62] Republic of Fiji. (2023). "National Infrastructure Investment Plan," p. 51.

are now being implemented through its investment plan and program pipeline. It also has purview over FDB and is responsible for data collection and statistics via the FBoS, which is housed within the Ministry.

The **Department of Energy** (DoE), which resides within the Ministry for Public Works, Transport, and Meteorological Services, is responsible for developing energy policies and sector strategy, including government policies on renewable energy.[63] The DoE is also responsible for rural electrification in Fiji, which it implements by subsidizing EFL to build grid-compatible mini-grids. The rural electrification strategy is currently demand-driven. While there is some self-generation as well as supply provided by nongovernmental organizations, rural electrification efforts principally consist of EFL grid extension and electrification provided by the DoE. Since its inception, the DoE has installed more than 400 generators and some 100 kilometers of low-voltage distribution in order to expand electricity access to rural areas.[64] In most cases, the DoE transfers the operation of the systems to rural communities. The government and other development partners support rural electrification programs implemented by the DoE.

**Energy Fiji Limited** (formerly Fiji Electricity Authority or FEA) is responsible for the generation, transmission, distribution, and retail of electricity throughout Fiji. As part of the new Electricity Act of 2017, FEA was corporatized as EFL, and divesture has been undertaken.[65] In April 2018, the GoF transferred 5 percent of EFL shares to eligible EFL customers.[66] In 2019, the Fiji National Provident Fund acquired a 20 percent stake in EFL. In 2021, Seven Pacific Pte Ltd acquired the fund's share along with an additional 24 percent share from the Fiji government. As of 2021, the Fiji government holds a 51 percent share against Seven Pacific's 44 percent share, with the remaining 5 percent distributed among EFL customers.[67]

In addition to corporatizing EFL, the Electricity Act has removed many of EFL's regulatory functions, which have been gradually transferred to the FCCC, as the latter builds internal capacity. EFL, under agreement with FCCC, has retained a few regulatory functions, including licensing qualified electricians.[68] Finally, EFL is also responsible for undertaking grid extensions for the purpose of rural electrification on behalf of the GoF and the DoE.

The **Ministry of Waterways and Environment** (MoWE) is responsible for the formulation, coordination and monitoring of the implementation of Fiji's national environmental policies, programs, and legislation to ensure a sustainable development and utilization of Fiji's natural resources. Through its Department of Environment, the Ministry is responsible for the protection of natural resources and for the control and management of developments, waste management, and pollution. Through its Department of Waterways, the Ministry is also responsible for the provision of flood mitigation measures, improved drainage, riverbank protection, smart irrigation technologies and coastal protection throughout the country. MoWE is also in charge of Environmental Impact Assessments (EIAs), examining and processing development proposals, monitoring

[63] IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific," p. 83
[64] IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific," p. 83
[65] IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific," p. 77
[66] IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific," p. 77
[67] IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific," p. 77
[68] IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific," p. 77

development and ensuring environmental compliance of large-scale projects, including renewable energy projects.

The **Ministry of Trade, Co-operatives, Small and Medium Enterprises,** formerly known as the Ministry of Commerce, Trade, Tourism and Transport is responsible for formulating and implementing policies and strategies that create and facilitate growth in industry, investment, trade, tourism, transport, co-operative businesses, micro and small enterprises and enhance metrology, standards, and consumer protection, including potentially facilitating investment in renewable energy and renewable energy integration projects.

The **Ministry for Public Works, Transport, and Meteorological Services** houses a **Transport Division**, which is responsible for coordination, planning, and enactment of policies and monitoring of the land and maritime transport sector in Fiji. The Transport Division runs multiple programs to improve sustainable transportation in Fiji, including *MTCC Pacific- Retrofitting of Government Vessel with Energy Efficient Technology*, which seeks to identify energy efficiency technologies that can be retrofitted in select government vessels to reduce GHG emissions, and the *Pacific Blue Shipping Partnership (PBSP)*, a partnership of Pacific Island Countries for the decarbonization of the shipping transport sector at a domestic level, including through the progressive renewal of Fiji's domestic shipping fleet to green ships, alongside the promotion of a sustainable maritime logistic supply chain.[69]

The **Land Transport Authority (LTA)** is responsible, among other duties, for establishing standards for registration and licensing of vehicles, as well as developing and implementing enforcement strategies consistent with road safety and protection of the environment.[70] As such, the LTA is the party responsible for the registration and licensing of electric and hybrid vehicles, and for developing the standards which they must meet in order to circulate in the country.

The **Maritime Safety Authority of Fiji (MSAF)** is the maritime transport regulator for Fiji. As part of its responsibility, MSAF is responsible for vessel registration, inspections, and surveys;[71] it is also in charge of issuing safety certificates for all vessels, including any vessel powered by renewable energy, including those equipped with electric motors running on solar power and wind.

The **Fiji Roads Authority (FRA)** is responsible for managing nearly all of Fiji's roads (with a few exceptions, including farm roads and cane access roads), bridges, and jetties, in addition to their associated infrastructure, such as drainage. streetlights, and traffic signals.[72] Furthermore, FRA is in charge of planning and developing the road network to meet the country's immediate and long-term needs. As a result, FRA has put together the *Greater Suva Transportation Strategy 2015-2030*, which serves as the transport blueprint for the Greater

[69] Ministry of Commerce, Trade, Tourism & Transport of Fiji. (2022). "Sustainable Transportation." Available at https://www.mcttt.gov.fj/division/transport/sustainable-transportation/
[70] Land Transport Authority of Fiji. (2022). "About Us." Available at https://www.lta.com.fj/about-us
[71] Maritime Safety Authority of Fiji. (2022). "Services." Available at https://www.msaf.com.fj/services/
[72] Fiji Roads Authority. "Assets." Available at https://www.fijiroads.org/what-we-do/assets/

Suva Area (GSA) through 2030, and includes measures to promote environmental sustainability, including increasing the use of environmentally friendly transport, such as electric vehicles and green buses.[73]

**International Oil Companies**, namely Mobil, Pacific and Total, import petroleum products into Fiji, distribute their products at wholesale and retail levels, and re-export to other Pacific countries. Supply is provided by medium-range tankers from refineries in Australia, Singapore, and New Zealand.[74]

**Investment Fiji** is the national economic development agency in charge of ensuring increased sustainable levels of investment and exports in Fiji. The GoF actively encourages foreign investment in a range of sectors, including RE and REI, and offers services and assistance to foreign and local investors through Investment Fiji. Furthermore, Investment Fiji acts as a regulatory authority for foreign investments and advises the government on matters of investment and exports.

The **Fijian Competition and Consumer Commission** (FCCC) is the competition authority and essential industrials regulator for Fiji. It was established as an independent regulator in 2010, with the objective of encouraging fair competition in the sectors falling under its jurisdiction, while protecting the interests of consumers. The commission determines the regulated prices of Unleaded Petrol, Premix, Kerosene, Diesel, and LPG fuels. The fuel price in Fiji is impacted by the movement in Means of Platts Singapore, the international freight rate and the exchange rate. Fuel and LPG price reviews are carried out quarterly.[75]

FCCC has also been responsible for controlling retail electricity prices since 2010. In September 2019, it issued its first tariff methodology. As a result of the Electricity Act 2017, FCCC has also become the electricity regulator. A summary of the main changes implemented by the Electricity Act in the allocation of regulatory functions is provided in Table 3.3 below.

[73] Fiji Roads Authority. (2015). "Greater Suva Transportation Strategy 2015-2030." Available at *https://www.fijiroads.org/wp-content/uploads/2018/11/GSTS-REPORT-2015-2030.pdf*

[74] World Food Programme. (2022). "Logistics Capacity Assessment: Fiji." Available at *https://dlca.logcluster.org/display/public/DLCA/3.1+Fiji+Fuel*

[75] World Food Programme. (2022). "Logistics Capacity Assessment: Fiji." Available at *https://dlca.logcluster.org/display/public/DLCA/3.1+Fiji+Fuel*

**Table 3.3. Changes to Regulatory Functions Resulting from the Electricity Act of 2017**

| Regulatory Function | Current | Electricity Act (2017) | Additional Information |
|---|---|---|---|
| Tariff setting | FCCC/EFL | FCCC | FCCC previously regulated retail tariffs and offered guidance on wholesale prices. The wholesale prices of EFL's current PPAs are below FCCC's guidance price. Under the new Act, FCCC will review all PPAs and will have the power to intervene and mediate in PPA negotiations. |
| Promoting competition | FCCC | FCCC | FCCC is responsible for encouraging competition in all sectors in which it operates. Under the 2017 Electricity Act, one of the main responsibilities of the regulator will be to ensure active competition for the benefit of residents. |
| Preparation of technical codes and standards | EFL | FCCC | Under the 2017 Act, responsibilities for technical codes and standards will fall under FCCC. However, as FCCC has insufficient capacity, EFL's codes and standards will largely be carried over. |
| Licensing | EFL | FCCC/EFL | Licensing of IPPs has been transferred to FCCC under the 2017 Act. This will avoid the current situation of EFL granting licenses to competitors. EFL will continue to issue licenses to qualified electricians. |
| Dispute resolution | FCCC | FCCC | FCCC acts as arbiter whenever disagreements arise between IPPs and EFL or during PPA negotiations. |

Source: IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific," p. 83; and Electricity Act (2017)

### 3.3.2 Key Energy Sector Laws and Regulations

The overarching law that governs Fiji's energy sector is the Electricity Act of 2017. The Act lays out the institutional arrangement in which EFL has exclusivity in the provision of transmission and supply of electricity, acting as a single buyer for generators. The Electricity Act also sets important incentives to private investment in electricity through the assignment of an independent regulatory body for the sector, and partial divestment of EFL to private investors. The issuance of licenses for generators wanting to operate in Fiji's electricity market is also governed by the Electricity Act.

There are also various other laws that affect the energy sector, despite not being sector-specific, including: (i) the Public Enterprises Act, which regulates management and accountability of public enterprises such as EFL to ensure adequate efficiency in its administration; (ii) the Environment Management Act, which enacts policy on preservation of natural resources and sets the requirements for conducting Environmental Impact

Assessments for certain projects; (iii) the Climate Change Act (2021), which creates a legal basis to support Fiji's sustainable development objectives, long-term climate ambition, net zero emissions target, and commitment to protecting Fiji's environment; and (iv) the Companies Act (2015) and the Foreign Investment Act (1999) which together provide the legislative framework for the establishment and operation of businesses and regulations for foreign investors in Fiji.

Land acquisition, alienation and use procedures vary by the type of land. The most abundant iTaukei land (native land) is governed by the iTaukei Land Trust Act (1940), which restricts transfers only to the state, with private investors only having the option to lease for up to 99 years with approval from the iTaukei Land Trust Board. State land can also be leased under the provisions of the Land Use Act (2010). Lastly, freehold land is subject to the Land Sales Act (1974) and thus can be bought and sold freely by non-residents for industrial and commercial purposes. Table 3.4 provides an overview of important energy sector laws in Fiji.

**Table 3.4: Key Sector Legislation**

| Legislation | Overview |
|---|---|
| **Energy Sector-Specific Laws** | |
| Electricity Act (1966) | Establishes EFL as the entity responsible for supplying, transmitting, and distributing electricity with exclusivity in Fiji. The Act also vested EFL with regulatory power within the domestic electricity market. *This Act was later superseded by the new Electricity Act of 2017*. |
| Electricity Act (2017) | Allows the government to make the partial divestment of EFL to private investors and transferred most of EFL's regulatory functions to the FCCC. |
| **General Laws** | |
| Public Enterprises Act (2019) | Sets the legal basis for the regulation of public enterprises. Governs the reporting, accountability, employment, and finance of government entities. |
| Climate Change Act (2021) | Provides the basis for the regulation and governance of the national response to climate change and the introduction of a system for the measurement, reporting and verification of GHG emissions. |
| Environment Management Act (2005) | Governs the implementation of environment sustainability practices in the use and development of natural resources. |
| Foreign Investment Act (1999) | Establishes the legal procedures and requirements for foreign investors and companies to invest in Fiji. |
| Companies Act (2015) | Provides the legal basis for the regulation of all companies in Fiji, including registration and operation of companies and responsibility of shareholders. |
| **Land Use and Acquirement Laws** | |
| Land Development Act (1961) | Establishes the Land Development Authority vested with power to approve land development, improvement and |

| | |
|---|---|
| | settlement schemes and schemes for the processing and marketing of produce proposed by any public or private body or person. |
| iTaukei Land Trust Act (1940) | Establishes the iTaukei Land Trust Board, vested with control over all iTaukei (native) land. Sets the provisions over sale and transfer of iTaukei land to the state, and alienation by lease or license to interested parties. |
| Land Sales Act (1974) | Sets provisions regarding the purchase and disposition of (non-native) land by non-residents. |
| Land Use Act (2010) | Provides for a longer tenure of leases (up to 99 years) for native land and designates a Land Use Unit responsible for the issuance and renewal of land leases. |

Note: Acts listed are subject to amendment.

**Regulatory Framework**

Before the approval of the Electricity Act (2017), it was EFL's[76] responsibility to provide technical regulation for the electricity sector, which created potential conflicts of interest, as the service provider was put in charge of devising regulations for competitors in the sector. In order to eliminate potential conflicts, the Electricity Act transferred regulation responsibility to the FCCC, which was already responsible for tariff regulation in the sector.

The Land Transport Act (1998) is another important piece of regulation affecting the energy sector, as it establishes the LTA, responsible for determining the requirements and standards for vehicles, including those pertaining to safety, the environment and fuel standards. Table 3.5 provides an overview of key regulations in the energy sector.

**Table 3.5: Key Regulations**

| Regulation | Overview |
|---|---|
| EFL Grid Code (2011) | Sets out the operation and connection requirements for all generators connected to EFL's grid and is in line with standard international practices. *This regulation was later superseded by the FCCC Electricity Regulations of 2019.* |
| FCCC Electricity Tariff Methodology (2019) | Sets out the approach to be applied by the FCCC in regulating electricity tariffs. |
| FCCC Electricity Regulations (2019) | Sets out the technical regulation in the electricity sector in terms of connection and operation requirements for generators supplying electricity to the national grid. |

[76] Formerly known as the "Fiji Electricity Authority" (FEA).

| | |
|---|---|
| Land Transport Act (1998) | Establishes the LTA, to regulate the registration and use of vehicles, the licensing of drivers and the enforcement of traffic laws. |

## 3.4 ROLE OF PRIVATE SECTOR, INNOVATION, AND LEVERAGE OF RESOURCES

EFL has outlined major investments over the next three years, including refurbishing existing plants, such as the Monasavu Hydro-Electric Scheme, and investing in rural electrification projects, but substantial private investment will be essential for the country to achieve future energy demand targets, including its goal of 100 percent RE generation by 2036. With the divestment of EFL and sector regulation improvements, private operators have begun developing RE IPP projects in Fiji, which are at different stages of implementation, as shown in Table 3.6.

**Table 3.6: Planned Renewable Energy IPPs**

| Power Station | Operator | Type | Capacity (MW) | Status |
|---|---|---|---|---|
| Ovalau Agro-PV | Ovalau Agrosolar Pte Limited (OAS) | Solar APV with storage | 4 | Funding secured from GCF, FDB, and Korea International Cooperation Agency (KOICA). Private developer and project agreements have been signed. |
| Wainikovu | Hydro VL Pty Ltd | Hydropower | 13 | PPA negotiations under way. |
| Wainakoroiluva | Hydro VL Pty Ltd | Hydropower | 15 | PPA negotiations under way. |
| Waivaka | Hydro VL Pty Ltd | Hydropower | 4 | PPA negotiations under way. |
| Naboro | TBC | Waste to Energy | 5-10 | Solicited IPP, with procurement first started in 2017 and later halted. New tenders began in Feb 2021. |
| Rarawai | Fiji Sugar Corporation | Biomass | 40 | FSC currently conducting feasibility studies. |
| Lautoka (Expansion) | Fiji Sugar Corporation | Biomass | N/A | N/A |
| Qeleloa Solar | Sunergise | Solar PV | 5 | Solicited IPP tendered out by EFL. |
| Mua, Taveuni | TBC | Solar PV with storage | 1.55 | MOU signed between KOICA and EFL. Commissioning expected in 2023. |
| Viti Levu solar farms | TBC | Solar PV with storage | 3 X 5 | Three projects will be tendered out by EFL. IFC providing financing. |

Source: IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific," p. 76

The subsections that follow describe Fiji's experience with commercial and public financing of energy sector projects.

### 3.4.1 Role of Commercial Lenders[77]

Availability of financing is an essential component of private sector investment. In addition to funding from development partners and the public sector, commercial lenders can also play an important role in supporting the private sector and fostering innovation. Fiji's financial sector has the highest level of experience in the Pacific Island countries (PICs) with both structuring and operating financial instruments and in supporting economic sectors in Fiji, including RE and REI.[78] This experience exists in both the public and private entities operating in the financial sector, and the private financial sector is strengthened in Fiji due to the depth of public experience with commercial (e.g., business) and retail (e.g. household) financing. A list of the major commercial banks currently operating in Fiji is provided below.

**ANZ**. Fiji's largest bank has been active in providing loans to RE projects. It is managing the World Bank's Sustainable Energy Finance Project pool. In addition, given its extensive experience in the energy sector, it may be best positioned to finance REI projects.

**BRED Bank**. The bank has been active in RE lending since opening its first branch in 2013 and could be a potential financing partner in REI projects.

**Westpac**. Westpac has been active in providing loans for RE projects. Westpac's Pacific business (including its Fiji operations) has been up for sale since 2020, although an acquisition offer by Kina Bank has been rejected by competition regulators in Papua New-Guinea.

**Bank of Baroda**. The bank has shown willingness to fund RE projects and offers microfinance to small and medium enterprises.

**BSP.** The bank is interested in providing loans for RE projects. It also offers business loans, overdraft, and other services.

**HFC Bank.** HFC has also shown interest in providing loans for RE and possibly REI projects.

### 3.4.2 Role of the Public Sector

The public sector could also play a role in the financing of eligible projects via the FDB. FDB provides lending under a variety of financial products which have been used for financing the implementation of renewable energy and low-carbon technology in Fiji in the past. Furthermore, the bank may be able to operate facilities focused on-lending to commercial entities to finance the implementation of low-carbon technologies. FDB

[77] Section based on IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific," p. 84

[78] Ministry of Economy of Fiji. (2022). "NDC Investment Plan: 2022 Investment Planning for the Transport and Energy Efficiency Sectors," p.72

also serves as an accredited entity of the Green Climate Fund (GCF) for direct access to project funds and may contribute to blended financing arrangements in project implementation.[79]

## 3.5 DEVELOPMENT PARTNER ACTIVITIES

There are currently many bilateral and multilateral development partners providing financing to development projects, including RE and REI, in Fiji. Table 3.7 summarizes ongoing development partner projects, as well as pipeline projects expected to be launched in the near future, including their level of funding.

[79] Ministry of Economy of Fiji. (2022). "NDC Investment Plan: 2022 Investment Planning for the Transport and Energy Efficiency Sectors," p.36

**Table 3.7: Summary of Ongoing and Planned Development Partner Projects in Fiji**

| Development Partner | Project | Objectives/Description | Funding |
|---|---|---|---|
| **Ongoing Projects** | | | |
| ADB/World Bank (WB) | Transport Infrastructure Investment Sector Project | The objective of the project is to improve the resilience and safety of land and maritime transport infrastructure for users of project roads, bridges and rural jetties and wharves.<br>The project seeks to prioritize investments in high poverty areas, including the poorer northern islands of Vanua Levu and Taveuni.<br>As of 4 May 2023, all outstanding contracts have been awarded and the project has achieved 66.03% of disbursements. | $100 million Ordinary Capital Resources (OCR)<br>$50 million co-financing from World Bank |
| ADB (Co-financing from GCF and European Investment Bank (EIB) | Urban Water Supply and Wastewater Management Investment Program | The project, approved in 2016, will improve access to sustainable water supply in the GSA. As of December 2022, the overall progress (including design, procurement, and construction progress) was approximately 76.3% for the Design Build Operate (DBO) contract, while the overall progress was approximately 85.1% for the GM contract. Works under both the contracts are now projected to be completed by October 2023 and likely commissioning of the new water intake and distribution mains by end of 2023. | Multi-tranche financing facility<br>Tranche 1: $42.1 million OCR<br>Co-financing of $31.0 million from GCF and $26.6 million from the EIB |
| ADB (Funding from Japan Fund for Prosperous and Resilient Asia and the Pacific) | Enhancing COVID-19 Preparedness for Tourism Recovery Project | The project will strengthen the capacity of Fiji to safely reopen to tourists and rebuild the country's economy, through investments in (i) the reopening of Nadi International Airport with COVID-19 measures, and (ii) enhanced testing capacity for the tourism industry. | $3 million grant funded by the Japan Fund for Prosperous and Resilient Asia and the Pacific |

| Development Partner | Project | Objectives/Description | Funding |
|---|---|---|---|
| **Ongoing Projects** | | | |
| AIFFP | Airports Fiji (AFL)[80] | The loan, signed in June 2021, will fund essential maintenance and capital works at Nadi International Airport and several outer islands' airports, refinances existing debt and supports the infrastructure priorities of AFL. | FJD10.0 million ($4.6 million) in addition to a guarantee of FJD96.0 million ($43.8 million) |
| AIFFP | Fiji Transport Infrastructure Restoration Project[81] | This financing package, approved in 2022, will support the renewal or resealing of more than 1.5 million square meters of road surface throughout Fiji, as well as replacement of nine bridges that are crucial to the Fijian economy. Importantly, the financing package includes a three-year grace period during which repayments will not be required. | $40.0 million in addition to a grant of $10.3 million |
| IFC | 15 MW Solar Power Public-Private Partnership (PPP) project[82] | The project, approved in 2020, involves the selection of a private sector partner to deliver at least 15 megawatts (MW) of solar power to the national grid. IFC will also assist EFL in exploring potential renewable energy sources in Vanua Levu. | $15 million |
| WB | Fiji Recovery and Resilience Second Development Policy Operation | The project has multiple objectives, including: (i) promote private sector-led economic recovery; (ii) enhance climate, disaster, and social resilience; and (iii) strengthen debt, public financial and fiscal management. | $100 million |

[80] Source: AIFFP. (2021). "Airports Fiji (AFL)" Available at https://www.aiffp.gov.au/investments/investment-list/airports-fiji-afl

[81] Source: AIFFP. (2022). "Fiji Transport Infrastructure Restoration Project" Available at https://www.aiffp.gov.au/investments/investment-list/fiji-transport-infrastructure-restoration-project

[82] Source: IFC. (2020). "EFL and IFC sign agreement for Pacific's largest solar project" Available at https://pressroom.ifc.org/all/pages/PressDetail.aspx?ID=17784

| Development Partner | Project | Objectives/Description | Funding |
|---|---|---|---|
| **Ongoing Projects** | | | |
| WB | Fiji Recovery and Resilience First Development Policy Operation with a Catastrophe - Deferred Drawdown Option | The project's objectives include: (i) promote private sector-led economic recovery; (ii) enhance climate, disaster, and social resilience; and (iii) strengthen debt and public financial management. | $145 million |
| WB | Fiji Social Protection COVID-19 Response and System Development Project | The project seeks to mitigate the impact of the COVID-19 crisis on the income of the unemployed and underemployed, and to increase efficiency and adaptability of Fiji's social protection system. | $50 million |
| WB | Fiji Social Protection COVID-19 Response and System Development Project - Additional Financing | The project seeks to mitigate the impact of the COVID-19 crisis on the income of the unemployed and underemployed, and to increase efficiency and adaptability of Fiji's social protection system. | $48.9 million |
| WB | Fiji Carbon Fund Emission Reduction (ER) Program | The objective of the project is to make payments to the program entity for measured, reported, and verified ERs from reduced deforestation and forest degradation, and enhancement of forest carbon stocks (REDD+) at the national level in the Republic of Fiji and to ensure that paid amounts are distributed according to an agreed benefit sharing plan. | $12.5 million |
| WB | Fiji COVID-19 Emergency Response Project | The project seeks to prevent, detect, and respond to the threat posed by COVID-19 and strengthen national systems for public health preparedness in the Republic of Fiji. | $7.35 million |

| Development Partner | Project | Objectives/Description | Funding |
|---|---|---|---|
| **Ongoing Projects** | | | |
| **Pipeline Projects** | | | |
| ADB | Nadi Flood Alleviation Project **(Suspended)** | A technical assistance grant of US$2 million to prepare the project is ongoing. Subject to agreement on the design for ADB financing, the government would finance the detailed engineering design through its own resources in parallel with ADB's loan processing.<br>Government feedback on design has been pending since August 2021. In addition, it has been decided that pipeline support to the project is no longer to proceed due in part to assessed adverse environmental effects. | $100 million OCR (2022 Standby) **(Suspended)**<br>ADB was coordinating closely with potential co-financing partners, including JICA, and potentially AIFFP, European Union (EU), and *Agence Française de Développement* (AFD), before support was suspended due in part to adverse environmental effects. |
| ADB (Funding from Japan Fund for Prosperous and Resilient Asia and the Pacific) | Rural Electrification Project | A proposed grant is primarily intended to support physical investment in the government's rural electrification program. The project is also expected to come up with innovative funding and operating models which may have potential to be replicated under a larger investment project in the future. | $3 million grant funded by the Japan Fund for Prosperous and Resilient Asia and the Pacific (2022 Standby) |
| ADB | Suva Port Project – Project Readiness Financing | ADB has engaged a firm through regional technical assistance (TA) to undertake a strategic review of development options for the Suva Port, including multi-criteria analysis of project site options, which is expected to be completed in Q4 2022. Project Readiness Financing (PRF) of up to $10 million is proposed for detailed design of the proposed Suva Port Project. The government and ADB agreed to review the timing of the proposed PRF when the site selection study is completed. | $10 million OCR (2023 Standby) |

| Development Partner | Project | Objectives/Description | Funding |
|---|---|---|---|
| **Ongoing Projects** | | | |
| ADB | Urban Water Supply and Wastewater Management Investment Program | Project scope, cost and safeguard compliance are under review. An ongoing EIB TA is supporting the preparation of several environmental studies required as part of due diligence for tranche 2. Potential ADB TA support toward the rescoping of tranche 2 is under discussion. The financing availability period ends on 31 July 2026, indicating timely completion is challenging without an extension. | Multi-tranche financing facility<br>Tranche 2: $111.1 million OCR and $44.2 million of co-financing from EIB. (2023 Standby) |
| ADB | Suva Port Project | Proposed investment in the relocation of the Suva container terminal and redevelopment of the vicinity. The proposed project may need to be deferred due to limited available fiscal space. | $200 million OCR (2024 Standby) |
| JICA | The Project for the Reconstruction of Tamavua-i-wai Bridge[83] | The objective of the project is to improve the resilience of Queens Road, which is the most important road connecting to the capital city of Suva located on the island of Viti Levu. | ¥2.931 billion ($21.8 million) |
| JICA | Standby Loan for Disaster Recovery and Rehabilitation[84] | This loan aims to ensure reserve funds to respond to the immediate financial demands of a post-disaster recovery and the rehabilitation phase, together with mainstreaming policies related to disaster risk reduction in Fiji. | ¥5 billion ($37 million) |

[83] Source: JICA. (2022). "Signing of Grant Agreement with Fiji: Supporting the reconstruction of a bridge to overcome vulnerability to natural disasters" Available at https://www.jica.go.jp/english/news/press/2021/20220329_10e.html

[84] Source: JICA. (2020). "Signing of Japanese ODA Loan with Fiji: Contributing to immediate recovery from natural disasters, together with mainstreaming disaster risk reduction" Available at https://www.jica.go.jp/english/news/press/2019/20200221_11_en.html

| Development Partner | Project | Objectives/Description | Funding |
|---|---|---|---|
| **Ongoing Projects** | | | |
| KOICA | Taveuni Solar Power Plant | The project will develop a 1.55MW solar PV project on the island of Taveuni. The project aims to increase renewable energy generation on the island with benefits for green tourism development and increased energy security, as well as contributing to GHG emissions reduction.<br><br>This will complement and enhance the current hydropower plant and ensure that electricity generation on Taveuni island remains 100 per cent renewable for many years to come.<br><br>The project on Taveuni is part of Fiji's NDC Implementation Roadmap and its recently launched Low Emission Development Strategy.<br><br>KOICA signed a deal on the PV project construction with EFL and builder Clay Energy in 2021. | $3.5 million |
| WB | Fiji Tourism Development Program in Vanua Levu | The project aims to address urgent infrastructure and essential service gaps in Vanua Levu, increase private sector participation in tourism, and reduce negative environmental externalities of tourism. | $40 million |

# SECTION 4 PROGRAM DESCRIPTION

Fiji's REI Investment Plan is based on project concepts developed in three recent policy documents: the NIIP, the NDC Implementation Roadmap, and EFL's 10-year PDP. These documents have lists and—in many cases—detailed descriptions of priority clean energy and climate investments and are the result of extensive analysis and consultation with a wide range of stakeholders.

Projects in these documents were grouped to match the categories of investments typically funded by CIF's REI Program. These projects were then ranked against 12 REI criteria. This ranking exercise is described in Appendix B. The highest-ranked groups were (i) transmission & distribution investments for renewable energy projects; (ii) rural electrification, and (iii) energy storage & grid management technologies. It was ultimately decided that the focus of Fiji's REI IP should be on (i) and (ii) because of the priority these types of investments for Fiji, and because such investments are necessary precursors to eventual, expanded investment in (iii).

Both types of investments align well with CIF's REI IP criteria and are urgent priorities for Fiji to decarbonize its electricity sector. Each of the proposed interventions or program "components" are described in the sections below. More detailed descriptions of the proposed interventions are contained in Appendix A.

## 4.1 A GREEN ENERGY CIRCUIT FOR VITI LEVU

Key to the development of potential RE for the Viti Levu Interconnected System is a secure, reliable transmission system at 132 kV that links the potential RE sites to critical areas of demand. A well-designed transmission grid will also take into consideration the risk of VRE on the operational stability of the system (See Figure 4.1).

### 4.1.1 Overview of Proposed Intervention

The proposed Green Energy Circuit for Fiji will upgrade and improve climate resilience of the existing transmission network to enable evacuation of existing and planned solar, hydropower, and wind. This component combines:

- Investment in upgrades of existing and construction of new 132 kV transmission lines and substations in Central and Western Viti Levu, areas with existing and substantial potential renewable energy resources.
- Transaction advisory support for 40 MW of new solar IPPs at preferred renewable energy locations on Viti Levu (including the Western side of the island).
- Private sector investment in approximately 40 MW of solar (or other RE) IPPs, including investment from IFC.
- Technical assistance studies for putting in place systems to (a) ensure a periodic assessment and agreement on an appropriate capacity reserve margin and balancing needs given Viti Levu's demand growth, resource mix, future development plans for generation and transmission as well as learnings from the first renewable projects, (b) update generation dispatch operational plans to incorporate variable renewable energy, (c) evaluate storage and demand response to increase firm capacity and improve flexibility over the medium-term as the share of renewables increase, (d) review and update the grid code and (e) support utility and regulator dialogue on supporting system security while improving the share of clean energy.

- Guarantees[85] to mitigate risk perceptions (addressing expected risks around solar generation preceding transmission availability, concerns around curtailment of dispatch for operational reasons over the term of the power purchase agreement, timely payment security) that could result in wider bid participation from reputed developers and better pricing commensurate to Fiji's scale and potential in the Pacific.
- Investment in climate resilience of the transmission network through a number of potential managerial, operational, and structural measures.
    - **Managerial and operational** measures may include: (a) preparation of climate and disaster preparedness and response plans to handle transmission infrastructure damage; (b) investment in early warning systems or purchasing of insurance to address financial consequences of climate disaster events; (c) enhancing the monitoring of current assets to mitigate the risk of failure amid changing climate conditions; (d) instituting a comprehensive program for tree trimming and vegetation management around transmission and distribution lines; (e) training EFL staff and emergency response teams to enable swift repair of damaged infrastructure.
    - **Structural measures** may include: (a) building new assets in areas that are less exposed to climate hazards (e.g., avoiding new construction in flood plains); (b) building seawalls next to coastal power infrastructure; (c) increasing transmission tower heights; (d) burying distribution lines in major cities; and (e) using stainless steel material whenever feasible to reduce corrosion from water damage.

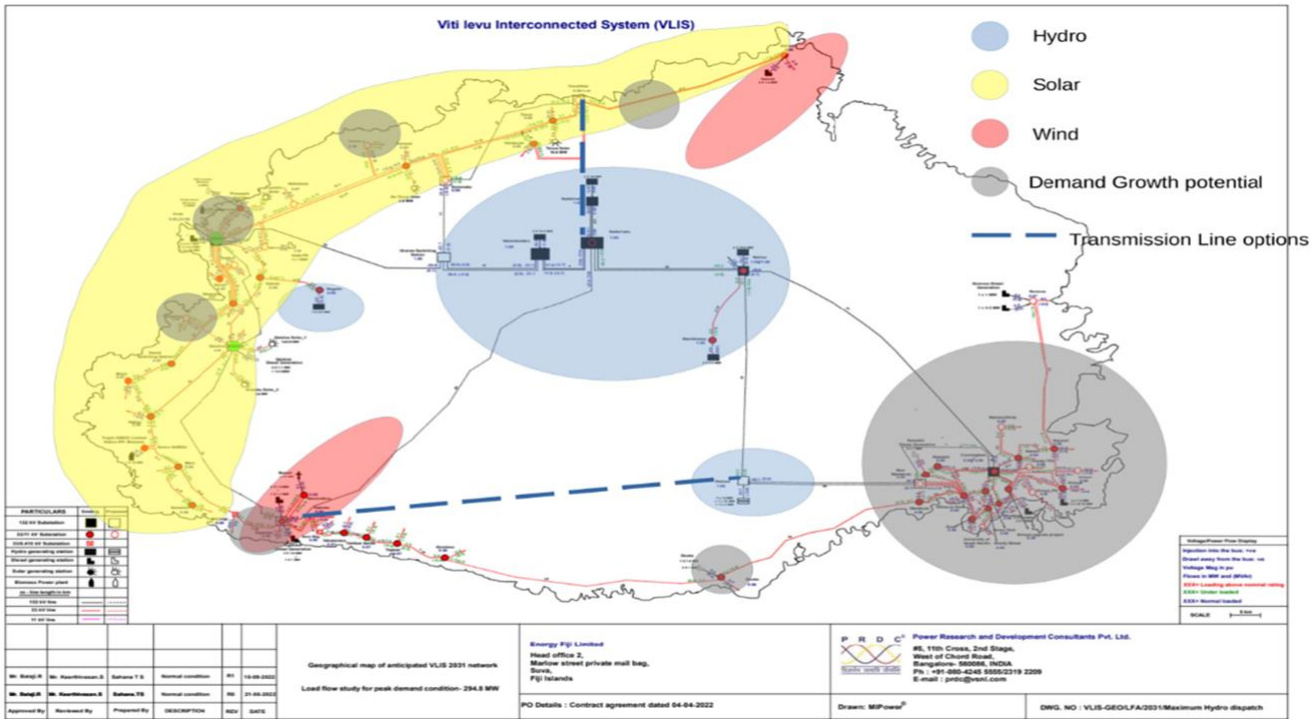
Under a BAU scenario where system security is prioritized in a small island context (without access to inter-island interconnections)- diesel generation is expected to provide dispatchable power to customers while EFL expects hydropower to be developed over the next 5-10 years. VRE penetration is limited to a small fraction of the daily requirement. There is an opportunity to support a significant scale up of renewables in Viti Levu to provide adequate energy to reduce diesel generation during the daytime of a typical day. The interplay of variable renewable energy (solar PV), other generation sources and transmission plans as well as the need for limited storage would need to be assessed and suitably scaled over the medium-term.

The envisaged renewable energy generation plants are expected to be delivered by private sector IPPs. Given the lack of large-scale renewable deployment in the Pacific in general and Fiji specifically, ADB will support project development with transaction advisory services. ADB will draw on its experience assisting the government of Cambodia with a 100 MW solar park project which utilized a public-private partnership approach that successfully crowded in IPPs, resulting in the lowest offtake prices in the Association of Southeast Asian Nations (ASEAN) region. ADB will also consider providing stapled guarantees, as necessary, to mitigate offtake risks for IPPs.[86]

[85] CIF guarantees can be used to address a few different challenges, including: (i) 6-9 months of payments in case of default events, termination to address timely debt service; (ii) climate change related first loss; (iii) transmission connectivity upfront or during the life of the project; (iv) currency risk; (v) help local banks get comfortable to extend tenors.

[86] ADB will draw on its prior experience using blended finance for grid expansions to accommodate gigawatt scale VRE growth in India using CTF cofinancing, as well as experience with viability gap financing for grid connected IPP solar projects in Nepal using SREP cofinancing. ADB will also draw on more recent experience with transaction support for large scale IPP solar and wind projects in Central Asia as well as transactions in the Pacific where the Pacific Renewable Energy Program provides guarantee support to private sector projects to mitigate specific risks. ADB has funded multiple projects which incorporate grid enhancing technologies including high-performance conductors in Nepal and Bangladesh for upgrading existing lines as

**Figure 4.1: Renewable Energy Resource Potential and Transmission Infrastructure on Viti Levu**




### 4.1.2 Investment Preparation Activities

Preparation of this investment component will require technical studies as well as legal and regulatory reforms in the sector, and the promotion of activities targeting women and other vulnerable groups in order to ensure that these groups equally benefit from the economic opportunities generated by the investment.

**Technical Studies**

Several technical studies will be important to identify and evaluate specific options for augmenting the current 132 kV transmission grid to secure and strengthen the connections from potential RE sources to the load centers on Viti Levu. These include the development of:

well as maximizing capacity and efficiency for new high-voltage line, and utility-scale energy storage systems in Mongolia and the Maldives.

- **Reliability and risk assessment tools for generation resource adequacy.** Traditional resource adequacy methods are inadequate to guarantee reliability in a swiftly evolving electrical power system. Power grids are undergoing rapid transformations, shifting from a structure supported by resources that can be dispatched as needed to a structure that depends on intermittent energy sources and storage with limited duration. Typical resource planning models frequently overlook aspects such as weather data, the influence of climate, resources located behind the meter, transmission considerations, or comprehensive data regarding the availability of energy storage. In order to guarantee that resource adequacy models are capable of offering accurate risk assessments, Fiji should undertake probabilistic modeling that simulates random variables in a weather-dependent manner, compares simulations with historical data for benchmarking, models generator outages as being influenced by weather conditions, adjusts simulations to align with future expectations, and incorporate the impacts of climate change into the simulations.
- **Generation and transmission expansion tools.** Generation and transmission expansion tools are critical for long-term planning and optimization of the electricity grid. These tools help utilities, grid operators, and policymakers make informed decisions about the development of new generation capacity and the expansion of the transmission infrastructure. Specialized transmission expansion tools and considerations for systems with high renewable energy penetration include:
    - Grid interconnection and integration tools: Tools to facilitate the connection of renewable projects to the grid and ensure seamless integration
    - Energy storage sizing and optimization software: Tools to assess and optimize the size and operation of energy storage systems, including batteries
    - Generation and Transmission Planning Integration: Generation expansion tools should consider the impact of new generation projects on the transmission infrastructure, including the need for transmission upgrades
    - Power Flow Analysis: Power flow analysis tools evaluate the steady-state performance of the transmission grid under different operating conditions and generation scenarios.
- **Generation dispatch and network operation tools.** Generation dispatch and network operation tools for systems with high renewable energy penetration are essential for utility engineers to effectively manage and operate the grid. These tools help ensure grid reliability, stability, and efficiency in the presence of variable and intermittent renewable generation. Important tools and considerations for utility engineers in such systems are:
    - Energy Management Systems (EMS): EMS software is the core tool for generation dispatch. It provides real-time monitoring, control, and optimization of power generation and transmission. EMS includes components such as:
        - State Estimation: Calculates the real-time state of the power system
        - Load Forecasting: Provides short-term load forecasts to guide generation dispatch decisions
        - Renewable Energy Forecasting Tools: Software and models for predicting renewable energy generation, such as wind and solar forecasts
        - Optimization Algorithms: Determine the optimal generation schedule considering generation costs, constraints, and reliability requirements
        - Economic Dispatch Models: Economic dispatch models optimize the operation of existing and planned generation assets to minimize production costs while meeting demand and environmental constraints

    - Unit Commitment: Decides which generation units to start or stop based on predicted load and available generation resources
- Renewable Integration Models: These models assess the integration of variable renewable energy sources into the grid. They consider factors like variability, intermittency, and grid reliability
- Demand Response Management Systems: Software to manage demand response programs and optimize load flexibility
- Dynamic security assessment is one of the critical aspects of power system studies that are used to identify critical contingencies in the grid by analyzing their corresponding dynamic security constraint violations on the grid
- Grid Frequency Control Tools: Tools for monitoring and controlling grid frequency are critical for maintaining system stability. These tools include frequency measurement, load shedding, and Automated Generation Control (AGC) functions
- Voltage and Reactive Power Control Tools: Tools for managing voltage and reactive power in the grid, critical for renewable energy integration
- SCADA (Supervisory Control and Data Acquisition) Systems: Systems for monitoring and controlling grid assets, including renewable generation
- Advanced Metering Infrastructure Systems: Systems for collecting and managing data from smart meters and sensors for better grid management
- Distribution Management Systems: Software for managing the distribution grid, including integrating renewable distributed energy resources
- Stability Analysis: Stability analysis tools assess the dynamic behavior of the grid under transient conditions, ensuring that the transmission system remains stable during disturbances.

**Legal and Regulatory Reforms**

The Government of Fiji is committed to the substantial legal and regulatory reforms required to bring more renewable energy into electricity generation. These reforms could include:

- The introduction of competitive auctions for renewable energy generation, especially from solar facilities, possibly including mandates for the purchase of renewable energy by utilities or large consumers
- Expansion of the use of net metering and/or net billing to spur investment in rooftop solar
- Legal recognition of storage as a distinct activity and regulatory reforms to promote investment in storage.

Box 3.1 includes a preliminary analysis of some of the shortcomings of the Electricity Act, specifically, and identifies areas of needed reform that could be supported as part of project preparation and implementation.

**Box 4.1: Analysis of Fiji's Electricity Act**

Fiji's Electricity Act of 2017 did much to modernize the legislative and regulatory framework of Fiji's electricity sector, which was then operating under legislating dating from 1966. The Act made fundamental changes aimed at improving competition and efficiency, and EFL's financial capability, including the corporatization and partial privatization of EFL, and transferring regulatory functions from EFL to the FCCC.

The Electricity Act cemented EFL's position as the exclusive provider of transmission and electricity services in Fiji and the exclusive licensed retail seller.

The Electricity Act also opened the possibility of IPPs entering the market. However, it did not establish a structure or mechanisms to actually encourage or facilitate private sector investment in generation or competition in generation. Any new generation must sell its output to EFL as the single buyer, and so long as EFL is also the main generator and only retail supplier, the incentive for EFL to enter into long-term PPAs with competitors is not strong.

Further, the Act is silent on renewable energy and investment in RE generation, such as solar IPPs, rooftop solar, as well as other means of enabling utilization of RE, such as off-grid and microgrid technologies, and the use of energy storage systems. If the policy imperatives described in section 3.3.2 are to be met, updating and further modernizing Fiji's legislative framework is probably required: by introducing mandates for the purchase of RE or perhaps restructuring Fiji's electricity sector by creating a single buyer separate from EFL coupled with mandates to procure RE. Competitive auctions for RE from, especially solar farms, could be conducted.

The significant decreases in the cost of solar photovoltaics in recent years, the popularity and rapid adoption of net metering (or billing) models around the world, and advances in technologies that have popularized off-grid solutions and microgrids should all work to Fiji's advantage as the country seeks to increase the share of renewables in generation, reduce reliance on imported fuel and reduce emissions. Legislative authorization and the establishment of an enabling framework, coupled with the imposition of duties on incumbent service providers, often provide impetus for change in thinking and new investment. In the case of net metering, experience shows that for consumers to become prosumers, legislative duties need to be imposed on incumbent utilities. Legislation does not need to be comprehensive, but can provide an overarching framework, with a requirement for implementing regulations to be designed and promulgated.

Additionally, the rapid advances in, and decreasing costs of, battery energy storage solutions offer potential benefits for Fiji's electricity sector – principally, the ability of the delivery infrastructure to handle greater variable renewable energy generation. Storage offers many uses that are rapidly being implemented around the world under newly designed regulatory systems. Again, legislative impetus coupled with regulatory design that enables investment in storage is necessary.

All of these matters should be brought under the Electricity Act with defined duties on the relevant sector participants to take the actions necessary to ensure policy is achieved.

That the reforms in the 2017 Electricity Act went only partially toward some of the Act's objectives, can be seen by the fact that the term "independent power producers" is defined but only used once (in section 4(d)), as a statement of an objective to create opportunities for IPPs to provide electricity (and then limited to "if economical and, from a system integrity perspective, more beneficial to Fiji and consumers").

The term "renewables" only appears once throughout the Act – the Minister and regulator being required under section 6(2)(c) to exercise their functions to keep tariffs low by (among other imperatives) requiring "possible generation from renewable sources". A stronger, clearer mandate is required.

"Storage" does not appear in the Act. If investigation and possible facilitation of investment in storage is desired, specific legislative provision is necessary. Licensing of storage as a distinct activity appears the best way of enabling its introduction; it can be both part of a RE generating facility, but also an activity operating as part of the transmission or distribution infrastructure. Section 6(3) does require the Minister and regulator to promote research into, and the development and use of, new technology, but only by or on behalf of, persons who already hold a license to generate, transmit or supply electricity.

The Electricity Act contains provisions authorizing the public electricity supplier, EFL, to compulsorily acquire "public installations," not just on license expiry but at any time during the term of a license. "Installation" has a standard meaning (plant, apparatus, buildings, etc.) but "public" is not defined. Compensation must be paid, and the State Acquisition of Lands Act 1940 applies, but this must present an issue for sector investors.

**Activities Empowering Women and Vulnerable Groups**

In order to ensure that women and other vulnerable groups equally benefit from economic opportunities generated by the project, several activities will be considered prior and during the implementation of the proposed program:

- Establishment of a gender working group involving the MoF's gender focal point, the Department of Women, DoE and EFL with support from SPC, PPA and WB to oversee the development of a Gender Action Plan for the project.
- Direct support for increased female representation in renewable energy decision-making through quotas.
- Fostering of female and vulnerable group participation during the consultation and decision-making process especially on land acquisition, compensation, and livelihood support packages.
- Introduction of gender and social inclusion criteria into bidding documents for subcontractor companies (e.g., specification of percent of women to be employed for the project).
- Introduction of targeted trainings on STEM and measures to attract (internships; bursaries; and scholarships) and retain (mentorship schemes) female talent.
- Support for vocational training for all women and vulnerable groups, including, for example, those in rural areas and women of Indian descent, in order to empower them to become solar engineers.
- Provision of training for women and vulnerable groups interested in operation and maintenance of solar equipment, including those interested in regular cleaning of panels and replacement of electric equipment, as well as training for women and vulnerable groups interested in other income-generating opportunities associated with the project, such as collecting tariffs, sale of tokens, and low-risk troubleshooting.

## 4.2 ELECTRIFICATION OF OUTER ISLANDS

Most Fijians have access to electricity, but a portion of the country's population remains without, relying predominantly off-grid and traditional fuels. The majority of the unelectrified households are in the rural and maritime areas as well as in informal settlements. There is, therefore, a substantial rural-urban disparity: 96 percent of the country's population has access to electricity, but access is skewed toward urban and some rural areas because of the challenges of distributing power to small and isolated communities and rural villages in the outer islands.[87] Roughly five percent of the population rely on standalone diesel generators for electricity, making them vulnerable to price volatility in the international oil market. Women in rural communities with low incomes are particularly affected since without electricity they face challenges carrying out household daily tasks such as food preparation, helping children with homework, agriculture and business activities.

Achieving universal access to electricity is a priority for the GoF. Through the implementation of the *National Electrification Policy* and the development of an updated electrification master plan, the DoE has been working with national energy utilities, renewable energy suppliers, financing schemes, and relevant stakeholders to add both off-grid and on-grid energy capacity to fill all electrification access gaps and support as close to universal access to electricity as much as possible. The NEP 2023-2030 has "Energy Access and Equity" as one of its five policy pillars, alongside Energy Security and Resilience, Energy Sustainability, Energy Efficiency, and Energy Governance. In its 2017 National Development Plan[88] the GoF stated its intent to deliver 100 percent access to electricity by 2021, but this objective was indefinitely postponed given delays associated with the global COVID-19 pandemic. With CIF's assistance proposed, the goal could conceivably be achieved in the near future.

### 4.2.1 Overview of Proposed Intervention

CIF financing would be blended with World Bank financing to support the DoE and EFL in efforts to electrify and improve the quality and reliability of supply in rural areas and increase the percentage of renewable energy generation available to customers in outer islands. These investments would expand the reach of the electricity grid of the Lakeba, Kadavu, Rotuma, Taveuni, Vanua Levu, and other priority outer islands to be identified to reach those with no or limited electricity access in rural communities; and would upgrade existing grid technologies and infrastructure to allow the shift from diesel-only generators to hybrid renewable energy systems.

Fiji's NIIP includes electrification investments planned by DoE for Lakeba, Kadavu, and Rotuma. DoE also has plans to invest in Taveuni. These islands collectively include roughly 30,000 people, nearly 100 villages, airstrips, government buildings, post offices, health centers and schools. The investments include:

- In Kadavu, grid extensions from the Vunisea mini-grid via Nasali to Nabukavesi ira
- In Lakeba, grid extensions from Tubou to Nasaqalau, and from Tubou to Waitabu

[87] "Access to Electricity, Rural (% of Rural Population) - Fiji." World Bank Open Data. Accessed August 2, 2023. https://data.worldbank.org/indicator/EG.ELC.ACCS.RU.ZSend=2021&locations=FJ&start=1996&view=chart.
[88] Republic of Fiji: Ministry of Economy. (2017). "5-Year & 20-Year National Development Plan," Available at *https://www.fiji.gov.fj/getattachment/15b0ba03-825e-47f7-bf69-094ad33004dd/5-Year-20-Year-NATIONAL-DEVELOPMENT-PLAN.aspx*.

- In Rotuma, construction of a distribution line around the entire island
- In Taveuni, grid extension, from Naselesele to Lavena, Wairiki to Navakawau, Salialevu Tee to Off, Soqulu Est. Tee to Off and Nacogai Tee to Off
- In Vanua Levu, support to DoE and/or EFL in further line extensions, to complement plans in the NIIP to upgrade and expand connections to government stations and install solar hybrid systems.

These investments will help expand energy access and allow the country to reach its universal electricity access goal. It will help improve the quality of energy services, increase access for households from tier one to higher tiers of access[89], and improve reliability for business and commercial enterprises who rely on diesel generators. They will also provide the basis for the transition from polluting and inefficient diesel generators to decentralized, hybrid renewable energy systems for rural households.

Other possible investments could include contribution and collaboration with the Fiji Rural Electrification Fund (FREF) for co-financing/financial risk mitigations, technical assistance, and knowledge exchange with other PICs.[90]

### 4.2.2 Investment Preparation Activities

Project preparation would include consultations with communities on the selected islands to assess households' affordability, productive uses of energy, land ownership, environmental and social risks and mitigation measures, and technical/engineering aspects of the investments. The team will also assess the institutional, policy and regulatory framework that would allow sustainable operation of outer island electrification schemes. Based on these findings, preliminary feasibility studies will be carried out that will inform the project design, economic and financial feasibility, and implementation arrangements. These studies will, among other things, thoroughly evaluate the cost effectiveness of transmission lines in comparison to alternative investments, such as off-grid or mini-grid solutions. The intent will be to ensure optimal investment allocation and determine the most technically viable option for each area. For instance, while in outer islands the grid approach may be preferred, as the area size is small and the centralized generation source is easier to manage and maintain compared to isolated grids, the reverse may be true in other places, such as Viti Levu, where communities might benefit from an alternative solution, such as the one being studied by USTDA, in collaboration with GGGI and XENDEE Corporation, which aims to support up to 75 solar-powered mini-grids with energy storage, as discussed in Section 6.

Project preparation would also include the development of several activities targeting women and other vulnerable groups in order to ensure that they benefit equally from the economic opportunities generated by the electrification schemes. These activities would include fostering female and vulnerable group participation in the renewable energy sector, which could be facilitated by the introduction of targeted bursaries and scholarships, focused outreach to female and vulnerable group students and upskilling training on hybrid renewable energy systems maintenance. It could also include direct support for increased female and vulnerable group representation in electrification decision-making through quotas.

[89] See the Multi-Tier Framework for energy access: *https://mtfenergyaccess.esmap.org/*.
[90] As of 2023, FREF is administered by the Department of Energy.

# SECTION 5 FINANCING PLAN AND INSTRUMENTS

Table 5.1 shows the financing requested for each of the components describe in Section 4. The financing

**Table 5.1: Financing Plan for Fiji's REI IP**

| Financing Source | CIF | | | | Others | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Program** | **CIF Financing** | **CIF Guarantee** | **Project Preparation (Grant)** | **Total CIF** | **ADB** | **World Bank** | **IFC** | **Private Sector** | **Total** |
| | (US$ Million) | | | | | | | | |
| Viti Levu Green Circuit | 25 | 8 | 2 | 35 | 60 | | 15 | 35 | **145** |
| Electrification of Outer Islands | 33 | | 2 | 35 | | 15 | | | **50** |
| **Total** | **58** | **8** | **4** | **70** | **60** | **15** | **15** | **35** | **195** |

**Viti Levu Green Circuit**

The Viti Levu Green Circuit component includes:

- CIF concessional financing for transmission investments under EFL's PDP of $25 million (public sector).
- Technical assistance grants from CIF and ADB on the identified studies and preparatory work described in Section 4.
- ADB financing of about $60 million for 132 kW transmission investment related to EFL's PDP; ADB will help facilitate public sector terms (loans, guarantees, and TA funds) to facilitate private sector investment in VRE.
- 40 MW of solar developed by the private sector, procured through reverse auctions to ensure lowest cost and highest compliance with bid terms (at roughly $1000/kW); roughly $15 million of this is anticipated to be financed by IFC.
- ADB Private Sector debt financing of about US$20 million for new renewable energy generation developed by the private sector and co-financed with other partners inside and outside Fiji.
- CIF-financed public sector offtake guarantees (for renewable energy project developers) that could be stapled to the tenders to address some of the distinct risk perceptions with scaling up intermittent renewables and improve risk perception of projects.
- Possible counterpart financing from EFL, typically to cover applicable taxes and duties as well as overhead costs.

The combined investments result in a leverage ratio of approximately 1:1.8 of CIF funds (in other words, the total investment package provided from other resources is 1.8 times the financing provided by CIF).

Fiji's MoF, will act as the borrower. MoF will serve as intermediary to allocate CIF REI resources effectively by on-lending to EFL, who in turn, will act as the Implementing Entity.

**Electrification of Outer Islands**

The electrification component includes CIF financing of $35 million, blended with World Bank financing of $15 million. US$2 million is proposed for project preparation, to support the investment preparation activities described in Section 4.1.2.

# SECTION 6 ADDITIONAL DEVELOPMENT ACTIVITIES

Bilateral and multilateral development partners are extremely active in Fiji's energy sector, on Viti Levu as well as in the outer islands. Section 3.5 described some of these.

**Asian Development Bank (ADB)**. In addition to its current support in the preparation of the CIF REI Investment Plan, ADB has shown interest in supporting transmission investment and RE generation in Fiji and has supported various investment studies and investment workshops in the country. This grant is intended to support physical investments in the government's rural electrification program for all islands, and to devise innovative funding and operating models for electrification.

**Australia's Department of Foreign Affairs and Trade (DFAT).** DFAT has been supporting various advisory and capacity building projects of the World Bank Group and other development partners in the RE sector. DFAT has also been focusing on education and health issues in Fiji but is increasing its involvement with private sector development and good governance. Australia is one of Fiji's most important bilateral development partners, with a budgeted bilateral assistance program equivalent to $28.7 million (A$40.0 million), and total ODA equivalent to $58.3 million (A$81.2 million) in FY2021. The country focuses on health, security, governance, and economic recovery. Significant supplementary support has been provided in FY2021 and FY2022, including direct budget support. In December 2021, Australia announced an additional $61 million (A$85 million) budget support grant, as co-financing for a proposed ADB policy-based loan.

**Australian Infrastructure Financing Facility for the Pacific (AIFFP).** Starting in 2021, the AIFFP began providing infrastructure financing in Fiji, with a focus on several sectors such as energy, education, health, communications, and roads. The program has already authorized three transactions, including a FJD106 million facility for Fiji Airports to fund maintenance and capital projects at Nadi International Airport and outer island airports, an AU$5m grant to support the Nadi Flood Alleviation Program, and a loan of US$50.3 million to support the Fiji Transport Infrastructure Restoration Project. AIFFP has the ability to offer aid in the form of grants, loans, or blended finance to both the GoF and its institutions, as well as the private sector.

**European Investment Bank (EIB).** EIB, together with ADB, is one of most significant lenders for hard infrastructure financing in Fiji. EIB has been supporting EFL by offering technical assistance, capacity building, and financial and project management assistance with the development of the Ba River hydropower project. Relevant pipeline projects under development, but not yet confirmed, include a US$300 million hydropower plant at Natiwana/Nadarivatu, and an additional hydropower plant on Taveuni Island to be developed by EFL and possibly co-financed by ADB. In March 2023, EIB Global also signed a letter of intent with EFL to support two major renewable energy projects, namely the Qaliwana and Vatutokotoko hydropower plants. The projects will help increase the share of renewable energy in Fiji's generation capacity bringing it to 75% once completed.[91]

[91] European Investment Bank. (2023). "EIB Global opens office in Fiji." Available at https://www.eib.org/en/press/all/2023-094-eib-global-opens-office-in-fiji

**European Union (EU).** The EU is exploring the possibility of supporting EFL in the development of two hydropower projects (29MW and 28 MW), including, possibly, the hydro plant planned for Taveuni.

**Fiji Rural Electrification Fund (FREF).** FREF Launched during Fiji's COP23 Presidency with support from the Leonardo DiCaprio Foundation (LDF), the fund provides renewable energy to Fiji's outlying islands and villages. Together with Sunergise (Fiji) Limited, the Fiji Locally Managed Marine Area Network and EFL, FREF seeks to bring solar power to communities with no electricity or that rely on pollution-emitting diesel generators. LDF has provided a grant as seed funding to electrify the first village, while also helping mobilize funding for additional communities. The financing program provides clean energy to communities at the same or a lower price than diesel generators, which rely on a supply chain that is easily disrupted by extreme weather events. The goal of the program is for the communities served to receive round-the-clock electricity services from solar and battery hybrid systems for the same or less money than they would spend on fossil fuels to run diesel generators for only three to four hours a day. It is expected that once a sufficient number of communities are operational, the revenues from the electricity sales will be used to finance further communities, creating a self-funding system that will expand the program throughout rural Fiji. FREF has successfully electrified the community of Vio Island, on the coast of Lautoka. Currently, five rural communities have been identified for electrification, three of which have undergone a site survey. FREF is actively seeking donor support for Phases 3 and 4, which will electrify all five communities. FREF was overseen by FDB until 2023; responsibility for it has since moved to DoE.

**Japan International Cooperation Agency (JICA).** JICA has been active in Fiji's infrastructure sector, providing training and capacity building with the Pacific Power Association. In addition, Japan is collaborating with ADB on the proposed Nadi Flood Alleviation Project and has provided standby loans for disaster recovery and rehabilitation, and COVID-19 emergency loans as budget support in 2021 ($94.8 million) and 2022 ($87.2 million) as co-financing for ADB policy-based loan programs.

**New Zealand's Ministry of Foreign Affairs and Trade (MFAT).** MFAT has been supporting various advisory and capacity building projects of the World Bank Group and other development partners in the RE sector. It has also prioritized governance issues, improving economic governance, and education. ODA has been provided for the development of RE as technical assistance to ADB in the development of Taveuni Hydropower Project. New Zealand is expected to provide Fiji with assistance equivalent to $99.5 million (NZ$148.4 million) over three years (FY2021–FY2024), a significant increase on prior years, focused on strengthening governance and institutions, and supporting Fiji's economic resilience, community well-being, and security.

**The Korea International Cooperation Agency (KOICA).** KOICA is providing a US$ 3.5 million grant for the development of a 1.55MW solar PV project on the island of Taveuni. The project aims to increase renewable energy generation on the island, which will have several benefits, including supporting green tourism development, enhancing energy security, and contributing to the reduction of GHG emissions. The Global Green Growth Institute (GGGI) is providing support for the project by conducting a full feasibility study for the implementation of the power plant, with the ultimate objective of helping the GoF achieve 100 percent

renewable generation in Taveuni by 2030.[92] In 2021, KOICA also approved funding for the batteries for a 4MW solar IPP in Ovalau, known as the Ovalau Agro-PV project (see more information in Table 3.6). The developer has signed a PPA with EFL, but project construction is yet to start. The developer also intends to develop additional solar projects in the country. KOICA is also considering developing new rooftop solar projects in Suva.

**United Arab Emirates (UAE)**. The UAE has committed to support the development of solar hybrid mini-grids and utility-scale RE projects in Fiji. A US$ 5 million grant from the UAE Pacific Partnership Fund was approved in 2013 for the development of a Joint Renewable Energy Project.[93] The project's main objective was to facilitate the development of solar-powered electrification in the islands of Kadavu, Rotuma, and Lakeba. It was initiated through a bilateral agreement between Fiji and the United Arab Emirates, enabling the UAE Government's renewable energy arm, Masdar, to commence the tendering process in early 2014. By 2015, the project had been successfully concluded, resulting in the implementation of three solar PV microgrids: a 150 kW plant on Lakeba Island, a 225 kW plant on Kadavu Island, and another 150 kW plant on Rotuma Island.[94]

**United States Trade and Development Agency (USTDA).** USTDA is providing support to Fiji's Ministry of Finance, Strategic Planning, National Development and Statistics (MoF) for a feasibility study that will advance the country's dual goals of 100% rural electrification and renewable power generation by 2036.[95] The study will be conducted by Arizona State University's Laboratory for Energy and Power Solutions in collaboration with the international intergovernmental GGGI and California-based XENDEE Corporation. The study aims to support the development of up to 75 solar-powered mini-grids with energy storage.

**World Bank and IFC.** The WB and IFC are supporting RE generation through projects with the DoE, advisory and transaction support to develop RE IPPs, direct equity investment, supporting local finance institutions with partial guarantees and other instruments. ADB is overseeing the implementation of a US$3 million grant from the Japan Fund for Prosperous and Resilient Asia and the Pacific. IFC is currently working with EFL to identify sites for 15 MW of solar on Vanua Levu, to be tendered as an IPP.

[92] Source: GGGI. (2017). "Fiji Solar Project on Taveuni island." Available at *https://gggi.org/project/fiji-solar-project-on-taveuni-island/*

[93] Source: PACNEWS. (2013). "Solar Powered Electrification for Kadavu, Rotuma and Lakeba." Available at *https://prdrse4all.spc.int/system/files/pacnews_-_fiji_uae_pacific_partnership_fund.pdf*

[94] Source: Mubadala. (2015). "The UAE Inaugurates Three Micro Grid Solar Plants in Fiji." Press Release. Available at *https://www.mubadala.com/en/news/uae-inaugurates-three-micro-grid-solar-plants-fiji*

[95] U.S. Trade and Development Agency. (2023). "USTDA Advances Rural Electrification in Fiji." Press Release. Available at *https://ustda.gov/ustda-advances-rural-electrification-in-fiji/*

# SECTION 7 IMPLEMENTATION POTENTIAL WITH RISK ASSESSMENT

There are tremendous opportunities to scale up renewable energy integration in Fiji. At the same time, it is also important to identify potential risks associated with increased investments in REI in Fiji and outline effective risk mitigation strategies in order to ensure the success of REI projects implemented in the country. Section 7.1 describes risks specific to Fiji; Section 7.2 describes Fiji's absorptive capacity to take on financing and implement the proposed investments.

## 7.1 COUNTRY/REGIONAL RISKS

Table 7.1 describes the main risks, and risk mitigation strategies associated with the investment in REI in Fiji across several dimensions, namely: institutional; social; gender; environmental; technical and technological; economic and financial; and disaster and climate change.

**Table 7.1: Risks to Fiji's REI IP**

| Dimension | Risk Rating before mitigation | Risk Rating after mitigation | Risks | Risk mitigation strategies |
|---|---|---|---|---|
| Institutional | Moderate | Low | ▪ Delay in revising the Electricity Act could discourage private sector investment in VRE, which in turn would reduce the potential benefits of the proposed *Green Energy Circuit for Viti Levu* intervention. The proposed program component seeks to upgrade and improve climate resilience of the existing transmission network in Viti Levu in order to enable evacuation of existing and planned solar, hydropower, and wind generation. The intervention therefore only makes financial sense if the planned VRE is in fact introduced into the Viti Levu Interconnected System, which will in turn depend on private sector investment.<br>▪ Lack of coordination may lead to competition between different projects being implemented over the coming years. For instance, there is a possibility that mini-grids may compete with new transmission lines and vice versa, if implementation of these projects is not closely coordinated. | ▪ A high commitment by Fiji's sectoral authorities must be required in order to speed up the process of revising the Electricity Act. Ideally, a revised Act would include:<br>  ▪ Clarification of the competitive procurement process and licensing parameters for IPPs.<br>  ▪ Further development of the legal framework for PPAs.<br>  ▪ Inclusion of an obligation for the utility to accept renewable electricity from IPPs, at a reasonable price regulated by the FCCC (on basis of costs and fair profit under a competitive bidding process).<br>  ▪ Introduction of a transparent process of direct tendering, reverse auctioning, or direct private sector initiatives for renewable energy generation.<br>▪ There need to be close coordination between this proposed IP and its associated studies and all other studies being undertaken as part of project preparation with DoE and EFL. |

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| Social | Moderate | Low | ▪ The rapid integration of new technologies could lead to the destruction of jobs related to redundant maintenance and operation tasks and old technology no longer being used. At the same time, a decline in jobs within the fuel supply chain as oil becomes less prominent in the energy mix is to be expected.<br>▪ Customers in rural areas who are slated to receive electricity access may not be able to afford the connections and/or cost of electricity consumption. Collections have historically also been a challenge in some rural systems operated by local communities.<br>▪ The implantation of the proposed interventions may create tension with communities, particularly if projects rely heavily on subcontractors which are not subject to the same social and gender compliance requirements as EFL.<br>▪ In addition, reliance on vendor and subcontractors may lead to other issues, such as problems with hiring and management of local community members, and other work-related issues, including potentially fair compensation issues. | ▪ Training and relocation assistance could be provided whenever possible to better prepare workers in the electricity sector for performing tasks related to the adoption of the new processes, systems and technologies brought by the scaling up of REI.<br>▪ Access in rural areas (financing of an electricity connection) will likely require government to absorb some or all of the cost of the initial capital expenditure, as has been the case with previous DoE projects.<br>▪ Provide training for subcontractors on the importance of social and gender targets during project implementation.<br>▪ Create a complaints and grievances mechanism for communities in order for them to express their concerns not only as consumers and local residents, but as workers and stakeholders of these interventions. Particular attention should be paid to the creation of an accessible mechanism for grievances relating to gender and vulnerable group issues.<br>▪ Project designs should consider the inclusion of a subcontractor/vendor management mechanism in order to ensure that local community members and local workers are treated and compensated fairly for their role in project implementation. |

| | | | | |
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| Gender | High | Moderate | ▪ The existence of barriers for female participation in the energy and electricity industry can prevent them from taking advantage of opportunities created by new investments. These could include bias and behavioral barriers that negatively affect women in job interviews or promotions, and the lack of incentives for training and education of women in STEM fields.<br>▪ Insufficient gender inclusivity in education can have detrimental effects on the training of women, resulting in sub-optimal outcomes. As a consequence, women may not be adequately prepared to seize employment opportunities arising from investments in REI projects.<br>▪ Many women may be unable to travel in order to attend a training center located far from their home due to household responsibilities or resistance from their husbands. | ▪ REI projects can be implemented with a gender perspective, prioritizing and incorporating requirements for gender equality. This can contribute to greater inclusion and participation of women in the sector.<br>▪ Investments in REI projects can involve training programs and capacity building initiatives. These programs can be designed to include women, providing them with the necessary skills and knowledge to actively participate in the sector and take on leadership roles.<br>▪ Government can evaluate if the approach to women's education prioritizes gender inclusiveness and provides a welcoming environment that creates a level playing field for women pursuing careers in traditionally male-dominated sectors.<br>▪ In order to reach more women, vocational training centers should, to the extent possible, have small satellite training centers close to rural communities and small settlements. They could also consider offering a "travelling center" that travels to isolated and hard-to-reach communities to train women and vulnerable groups unable to attend a traditional training center. |

| | | | | |
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| | | | ▪ The development of new renewable energy generation plants in Viti Levu, which would be facilitated by the investments in REI outlined in this IP, may have unintended consequences for women. While new RE plants can provide job opportunities for women in local communities and increase women's economic empowerment, it may lead to a higher incidence of domestic violence (DV). In many Fijian households, societal norms render Fijian women economically dependent on men. Under this arrangement, women are expected to assume unpaid domestic roles in exchange for financial protection and are at risk of DV if they are perceived to be lacking in their duties. As a result, women that gain employment in one of the new renewable energy generation plants in Viti Levu may be exposed to physical and emotional violence, as some men may rebuke their wives if their newly found employment interfere with domestic responsibilities. Additionally, women may be subject to economic abuse, as their husbands may demand and/or control the money they earn. This is a serious risk, given that two-thirds (64 percent) of Fijian women experience intimate partner violence (IPV), compared to a 35 percent global average. Women in Fiji are particularly vulnerable to physical violence (61 percent), emotional violence (58 percent), and economic abuse (28 percent).<br>▪ More broadly, there could be a sizeable resistance toward equality, given current social norms in the country. These normative barriers may reduce the impact of the proposed interventions if they manage to preclude effective program implementation and prevent women from fully partaking in the opportunities generated by the investments outlined in this IP. | ▪ Government can develop specific programs to empower men to understand the importance of sharing tasks with women and also to prioritize the education of their children, including daughters, and to understand the importance of women's role toward the family welfare.<br>▪ Government can develop campaigns to raise awareness of the issue of DV and how it impacts not only the welfare of women, but also entire families. The program should also include mention of economic abuse and how to seek help in case a woman is a victim of said abuse.<br>▪ The Government should develop and strengthen protocols and Standard Operating Procedures (SOPs) for the National Domestic Violence Helpline in order to better support victims of all types of domestic violence, include those suffering from economic abuse. |

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| | | | | ▪ The GoF should adopt a sensitive approach to program implementation in order to tackle normative barriers to equality. This approach should focus on promoting the benefits associated with the program, and how women empowerment may benefit all members of a household, including men. In areas characterized by traditional patriarchal settings and chiefly hierarchy, such as Lakeba, the approach should be particularly sensitive. In these areas, enlisting the support of chiefly women or those married into the chiefly line is essential, as they hold a respected standing in the community and can effectively advocate for change and promote the benefits associated with the proposed interventions. |
| Environmental | Moderate | Low | ▪ Without proper planning, dams and reservoirs built for HPPs can have adverse environmental and social impacts as a result of flooding, displacement of plants and animal species, loss of biodiversity and displacement of communities living in the project areas. Solar and wind projects also have possible consequences in terms of land use, deforestation, and disruption of natural habitats. | ▪ All project preparation under the REI IP will include comprehensive Environmental Impact Assessments before the construction of hydro projects to assess potential environmental impacts and identify mitigation strategies. This includes biodiversity conservation, water quality management and involvement of local communities in the planning and decision-making processes. |

| | | | | |
|---|---|---|---|---|
| Technical & Technological | Moderate | Low | ▪ Implementation of REI projects naturally create job opportunities in areas related to the project's development. However, brain drain and high levels of emigration in Fiji can lead to a situation where there is a lack of skilled workers to occupy newly created job opportunities in the energy sector.<br>▪ The lack of specific training, including certification and accreditation of workers, may negatively impact the operation and maintenance of both on- and off-grid RE systems in many areas, particularly poor and rural areas. This in turn may reduce the expected positive impact of the REI projects proposed in this IP.<br>▪ Given that current societal norms and socialization discourage girls from taking STEM courses, they may be unable to benefit from the job opportunities generated by the proposed projects.<br>▪ VRE poses challenges to grid infrastructure and energy supply management because of to the intermittent nature of these sources. In particular, the grid may not be fully suitable for large-scale integration of VRE resources due to a lack of sophisticated forecasting, power flow management and energy storage solutions. | ▪ Project designs can include the training of skilled professionals in the energy sector. This could include apprenticeship schemes, increasing scholarships for energy-related courses, and offering regular trainings for operating and maintaining renewable energy technologies.<br>▪ The GoF should consider offering certification and accreditation opportunities for interested workers, in partnership with sector organizations who have an inherent interest in supporting the development of the renewable energy industry in the country.<br>▪ Project designs can include a number of focused interventions for women and girls, including quotas, targeted bursaries and scholarships for women interested in pursuing a career in renewable energy sector. Designs can also include a focused outreach to female students and upskilling training on solar systems maintenance.<br>▪ The GoF should also expand its support to vocational training for all women, including, for example, those in rural areas, and women of Indian descent.<br>▪ Project designs will come with appropriate asset management plans for upgrading electric grid infrastructure to better accommodate intermittent energy supply. |

| | | | | |
|---|---|---|---|---|
| Economic & Financial | Moderate | Low | ▪ The 2017 Electricity Act says little about utility-scale renewable energy generation or distributed generation (e.g., rooftop solar). EFL is chiefly responsible for planning, procuring, and interconnecting such resources.<br>▪ Solar IPPs interested in Fiji have previously proposed tariffs close to the cost of diesel generation, offering little savings for EFL and its customers. | ▪ The GoF is committed to overhauling the Energy Act to facilitate procurement of utility-scale renewable energy generation and distributed generation.<br>▪ Reverse auctions, facilitated by the development partners show evidence of achieving much lower levelized costs than non-competitive tenders and unsolicited proposals for solar energy generation. |
| Disaster & Climate Change | High | Moderate | ▪ Fiji's energy infrastructure is susceptible to climate and disaster-related risks, resulting in reduced energy reliability. Many of the substations and transformers are situated in coastal areas, and a significant portion of distribution lines are above-ground and reliant on a single transmission line. Additionally, thermal generation stations are frequently located along the coast. These factors expose Fiji's electricity grid to the damaging effects of cyclones and floods. | ▪ Climate resilience will be incorporated into each project design. Asset management plans will also incorporate resilience<br>▪ The use of risk-sharing instruments such as blue bonds and catastrophe bonds could be considered as a way of helping increase resilience to disaster and climate-related risks. |

## 7.2 ABSORPTIVE CAPACITY

This section analyses the financial absorptive capacity of the GoF and EFL to implement the proposed program.

**Government of Fiji**

Following the 2008 financial crisis, Fiji embarked on a period of sustained growth supported by its flourishing tourism sector. The growth was further fueled by the adoption of expansionary fiscal policies beginning in 2014, which helped enable investments in infrastructure and human capital.[96] This resulted in the country's economy expanding at an average annual pace of 6.7 percent, and its GDP per capita nearly doubling between 2009 and 2019. The economic expansion, however, was accompanied by a significant increase in public debt. As a response to rising debt levels, the GoF announced the implementation of stricter spending controls in 2019 as part of a medium-term fiscal consolidation program.

After a 17 percent GDP contraction in 2020 and a further 5.1% decline in 2021, Fiji's economy experienced a strong recovery in 2022 with an estimated 16 percent growth in 2022 attributed to a robust resurgence in tourist arrivals.[97] The International Monetary Fund (IMF) projects a 7 percent real GDP growth for Fiji in 2023, accompanied by a decrease to 3.5 percent in inflation.[98] The fiscal deficit is also expected to improve, declining from 12.2 percent of GDP in FY2022 to a projected 7.7 percent for FY2023. Furthermore, Fiji's foreign exchange reserves remain comfortable at 6.2 months of prospective imports, supported by concessional financing and remittances.[99] Moreover, GoF has acknowledged the need for a fiscal consolidation plan as a way of dealing with the longer-term structural risks associated with an economy with still high levels of public debt, heavily dependent on tourism, and susceptible to natural disasters.[100]

ADB and the World Bank both have a longstanding relationship with Fiji's MoF, which will act as the borrower. MoF will serve as intermediary to allocate CIF REI resources effectively by on-lending to both the DoE and EFL, who in turn will act as the Implementing Entities. MoF has excellent implementation readiness, as it works extensively with bilateral and multilateral donors.

**Financial Standing of EFL**

EFL has stated in its 2021 annual report that the new FCCC regulatory framework – which includes tariffs – allows the company to recover all cost related to the production, distribution, and retail of electricity,[101] while also providing the company and other key stakeholders a greater degree of certainty and transparency with the application of the tariff methodology.[102]

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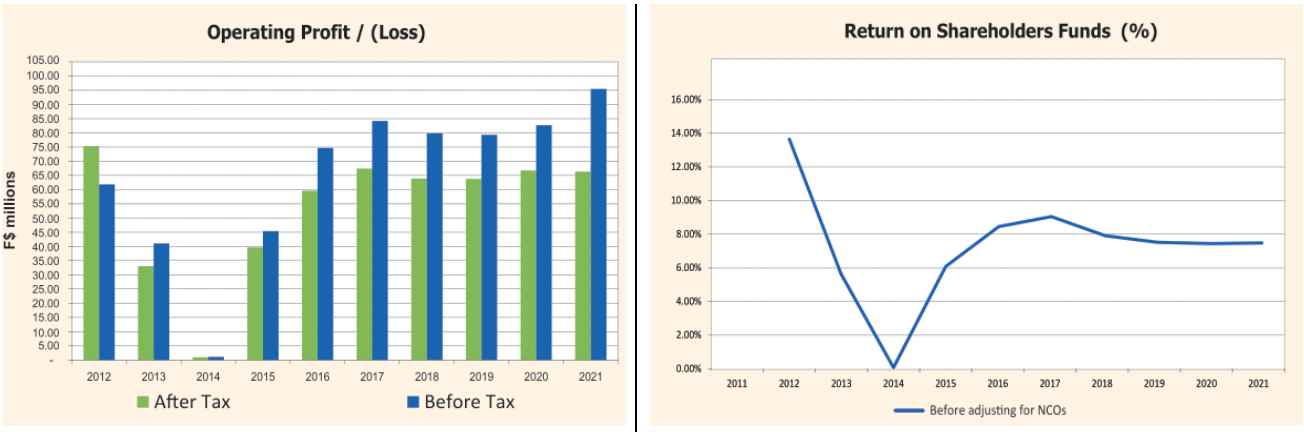
[96] World Bank. (2023). "Fiji Public Expenditure Review" p.2
[97] International Monetary Fund. (2023). "IMF Staff Completes 2023 Article IV Mission to Fiji." Available at https://www.imf.org/en/News/Articles/2023/03/21/pr2386-fiji-imf-staff-completes-2023-article-iv-mission-to-fiji
[98] International Monetary Fund. (2023). "Republic of Fiji." Available at https://www.imf.org/en/Countries/FJI#whatsnew
[99] International Monetary Fund. (2023). "IMF Staff Completes 2023 Article IV Mission to Fiji." Available at https://www.imf.org/en/News/Articles/2023/03/21/pr2386-fiji-imf-staff-completes-2023-article-iv-mission-to-fiji
[100] World Bank. (2023). "Fiji Public Expenditure Review" p.3
[101] Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*, p.23
[102] Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*, p.28

Even before the current tariff methodology came into effect, EFL was able to achieve sustained profitability: with the exception of 2014, when below-average rainfall negatively affected the company's two largest HPPs, EFL has enjoyed healthy and sustained profit margins over the past ten years.[103] EFL's reliance on low-cost RE sources for electricity generation has been both a competitive advantage and a challenge: while low-cost RE generation allows the company to enjoy high profit margins in most years, it also leaves EFL exposed to risks associated with weather events, primarily droughts, which can negatively impact the operations of its hydropower plants, and consequently its financial performance in any given year.

**Figure 7.1: EFL Profitability, 2012-2021**




Source: Energy Fiji Limited. (2022). "2021 Annual Report." Available at *https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf*

The strength of EFL's financial standing is bolstered by the strong regulatory regime for tariffs. Tariffs in the electricity sector are set by the FCCC, which published its latest methodology on 16 September 2019. There are five objectives that must be met during the tariff elaboration process, namely the final tariff must: (i) cover the costs of supply of electricity; (ii) encourage efficiency in providing electricity; (iii) promote efficient consumption; (iv) address affordability for poor households; and (v) ensure environmental sustainability. The FCCC recognizes that some of these objectives are often conflicting as each can represent the interest of a different stakeholder.

One of the key principles that the FCCC considers in electricity tariff regulation is the revenue that utilities are allowed to recover to cover incurred costs plus a fair return to investors. The formula for determining allowable revenue requirements takes into account fuel costs, operating expenditures, depreciation, assets employed in electricity supply and the rate of return of the utility, based in its calculated weighted average

[103] Fiji Electricity Authority. (2015). "2014 Annual Report." Available at *https://efl.com.fj/wp-content/uploads/2015/09/FEA-Annual-Report-2014-1.pdf*, p.2

cost of capital.[104] The tariff is to be reviewed every 4 years under the new regulatory cycle, with the next review scheduled for October 2023.

[104] The WACC is an estimate of the investors' required rate of return for a given risk level associated with an investment made in an entity.

# SECTION 8 INTEGRATIVE APPROACH TO MONITORING, EVALUATION AND LEARNING

The Monitoring, Evaluation, and Learning strategy for Fiji's IP is based on CIF REI's Integrated Results Framework (IRF). It is collaboratively established by the GoF, national Implementing Entities, and Multilateral Development Banks (MDBs). Its primary purpose is to facilitate the continuous tracking and reporting of progress toward achieving the outcomes and objectives outlined in this investment plan.

In this comprehensive approach, various dimensions of monitoring, evaluation, and learning are utilized to capture the impacts of programs and projects. Additionally, important elements, such as gender inclusion, are integrated to provide a nuanced and holistic understanding of the program's advancement and thematic specifics and ensure the long-term achievement of the goals outlined in this plan.

## 8.1 THEORY OF CHANGE

If Fiji manages to (i) develop a road map for renewable energy integration, including upgrading existing grid infrastructure to support future VRE integration; (ii) expand the electricity grid in the various islands; and (iii) support power sector reforms; then the country will accelerate transformational change. By achieving these three objectives, Fiji will also accelerate climate financing that enable progress toward net zero emissions and adaptive, climate-resilient development pathways, in a just and socially inclusive manner.

This will result in reduced carbon emissions and increased private sector investments in future renewable electric grid infrastructure projects. In addition, rural residents will become more integrated in Fijian society with improved quality of life, a more resilient and efficient transmission and distribution system and increased integration of renewable energy sources.

The IP is, therefore, designed with clear impact pathways to achieve this transformational change. ADB's Viti Levu's Green Energy Circuit will upgrade and improve the climate resilience of existing transmission networks in the Western and Centra Levu areas while providing transaction advisory support to increase solar generation from the private sector. This initiative is supported by ADB's past experience in using blended finance to support grid expansions to support VRE growth in India and Nepal with the CIF in addition to other similar projects in Central Asia and Nepal.

The World Bank Outer Islands Electrification Project will work to provide reliable electricity from renewable energy sources to approximately 30,000 rural residents in addition to other public institutions, enabling them to switch away from diesel-based generators. Activities include grid extensions to smaller islands, construction of a distribution line and installation of solar hybrid systems. These efforts are bolstered by the World Bank's extensive experience working with the DoE, the main institution responsible for rural electrification.

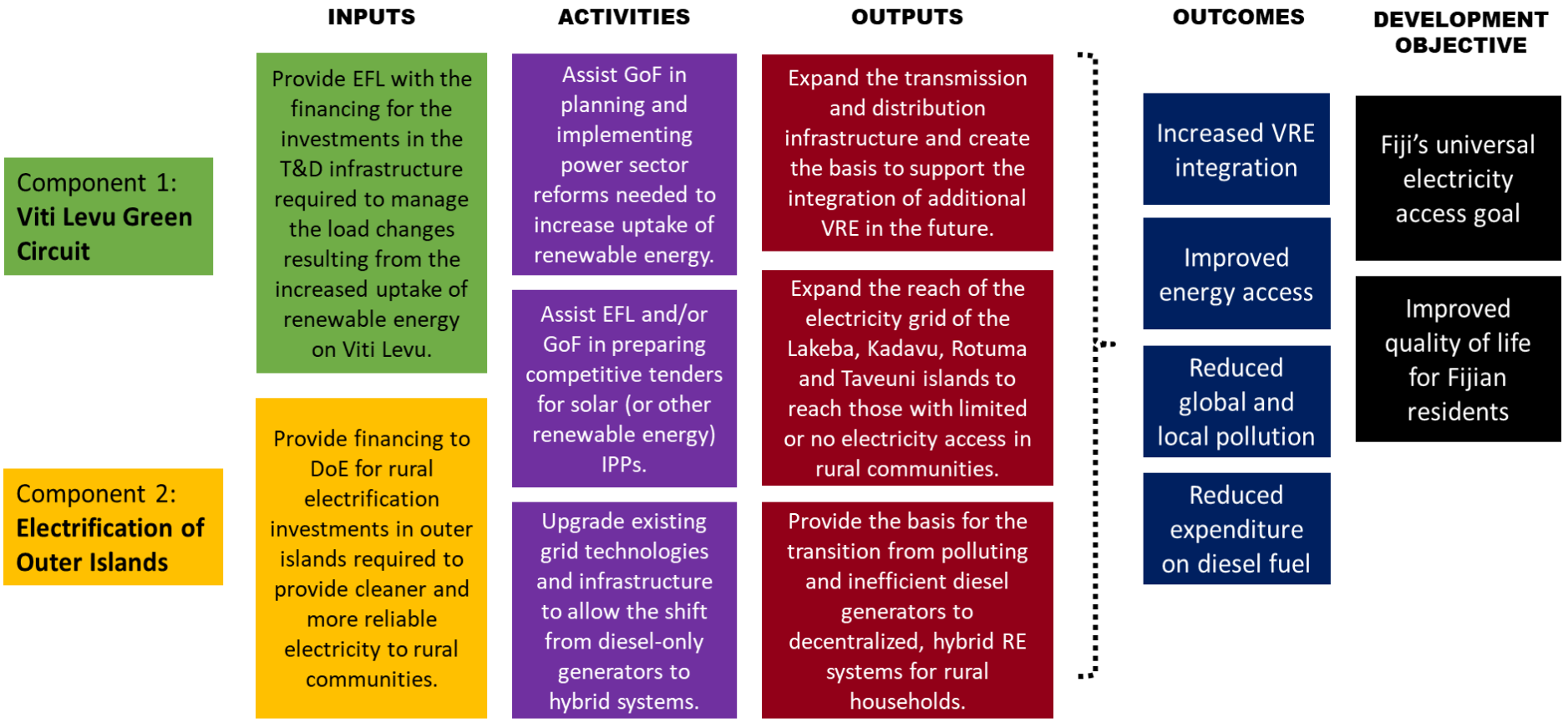
Furthermore, each support activity included in this REI IP is designed to tackle specific barriers that hinder the broader integration of renewable energy in Fiji. These barriers, which serve as a point of departure from which we have developed the Theory of Change for this program, are outlined in Table 8.1 below.

**Table 8.1. Key Barriers to Renewable Energy Integration in Fiji**

| | | |
|---|---|---|
| **Barriers** | • **Affordability constraints for low-income Fijians.** Despite the increasing accessibility of decentralized RE systems like solar PV, low-income households in isolated rural communities may still lack sufficient disposable income or savings to afford home energy systems and switch from existing diesel generators.<br>• **Geographical and economical challenges of distributing power to small and isolated communities.** The rugged terrain and lack of infrastructure make establishment costly, while low population density raises and absence of economies of scale makes the investment unattractive for the private sector.<br>• **Electric grid infrastructure that is inadequate for the integration of RE technologies.** Substituting currently used diesel generators for intermittent renewable energy resources, such as solar and wind, would require a grid capable of managing real-time fluctuations in supply and demand caused by these technologies. This necessitates advanced technologies and communication systems like smart grids, which are currently not fully implemented. | • **Low availability and retention of skilled and technical employees.** Brain drain and high levels of emigration in Fiji can lead to a situation where there is a lack of skilled workers to occupy newly created job opportunities in the energy sector.<br>• **Susceptibility of the energy infrastructure to climate and disaster-related risks.** The positioning of many substations and transformers in coastal areas, along with above-ground distribution lines heavily reliant on a single transmission line, exposes Fiji's electricity grid to the impacts of cyclones and floods.<br>• **Lack of coordination and fragmentation of responsibilities across stakeholders.** The lack of proper coordination among different energy sector stakeholders poses a challenge for implementing cohesive policies, strategies, and regulations. Responsibilities are fragmented across multiple ministries, departments, agencies, and authorities, leading to complications and difficulties in executing broad sector actions, including the approval and implementation of renewable energy projects. |

Using the barriers listed above, a conceptual map of the Theory of Change of this program was developed and is provided in Table 8.2.

Table 8.2. Conceptual Map of Theory of Change



**Relevance:** Both activities supported by this IP are highly relevant to Fiji's development goals and long-term sustainability. Expanding and enhancing Fiji's transmission and distribution network is a top priority as it reduces the country's dependence on imported diesel and hydro resources, which make it vulnerable to external price shocks and droughts. By upgrading this infrastructure, Fiji can seamlessly integrate large-scale renewable energy generation without facing technical or reliability issues. Furthermore, CIF financing for rural electrification programs plays a crucial role in achieving Fiji's goal of 100 percent electricity access by 2026, given that, without donor funding, the rate of return on these projects would most likely not be sufficient to attract private sector investment.

**Systemic change:** The expansion of the transmission and distribution network in Fiji would enable the adoption of significant new VRE sources, addressing the country's current limited utilization of VRE and reliance on imported petrol. This transformative step holds the potential to propel Fiji toward its goal of achieving 100% electrification. Beyond that, it would also have a life-changing impact on unserved or underserved rural areas, providing them with more affordable and reliable energy delivery solutions.

**Scale:** The REI activities supported by this IP hold the potential for substantial decrease in GHG emissions in Fiji as currently roughly 40 percent of electricity currently comes from non-renewable sources. Specifically, electricity and other energy generation were responsible for emitting an estimated 237,124 metric tonnes of CO2e in 2020. Additionally, household emissions in the same year reached 28,751 metric tonnes of CO2e for both urban and rural households in Fiji, with a significant portion attributed to the use of wood for cooking and diesel generators for electricity, which are more prevalent in rural households.

**Speed:** Both of the supported activities can be implemented swiftly and efficiently upon approval, as the construction of transmission and distribution lines follows a quick and straightforward process, particularly when there is sufficient generation capacity. The process of building these lines is well-established, involving standardized engineering practices and established protocols. Moreover, transmission and distribution lines are typically constructed using readily available materials and technologies, which further streamlines the development process. Moreover, EFL has already planned the initiation of numerous new lines within the next 1-2 years, aligning with the government's objective of achieving universal energy access by 2026.

**Resilience:** A nationwide grid expansion is paramount to increasing the overall redundancy of the interconnected T&D system. By having redundant pathways for electricity transmission, the grid becomes more robust and resilient, reducing the impact of cyclones and other extreme weather events on the continuity of energy supply. Similarly, improved energy access in remote areas, which are often the most vulnerable to the effects of climate change, enhances overall resilience in these communities. Access to reliable and sustainable energy sources enables them to maintain essential services, communication networks, and access to critical resources, therefore minimizing the adverse impacts of climate-related events, such as storms, floods, or heatwaves.

Throughout the program's execution, other signals indicating transformational changes can be effectively addressed and analyzed through impact assessments, just transition studies, co-benefit evaluations, and social and gender inclusion studies. Additionally, specific learning-oriented activities will contribute to this process. These evaluations and studies, driven by the CIF, the country, and the MDBs, will be carried out as necessary based on the activities that receive financial support from the program. By combining systematic monitoring with research and evaluation, employing mixed methods and diverse forms of evidence, a comprehensive

understanding of the program's achievements and lessons learned will be gained, enabling an informed perspective on its implementation.

## 8.2 INTEGRATED RESULTS FRAMWORK

The Fiji IP responds to CIF's integrated approach to results measurement, as presented within the REI IP's Integrated Results Framework in Table 8.3 below. CIF's integrated approach combines essential monitoring and accountability functions with a holistic multi-level and multi-dimensional approach, including a complex systems orientation, and emergent learning opportunities. Within this integrated approach, measurement of program and project impacts are captured via the multiple dimensions of monitoring, evaluation, learning, gender, and other key cross-cutting approaches, coalesced within the objective of delivering a nuanced and complete understanding of the program's progression, and thematic specificities, in delivering a complex and multifaceted program goal.

The left-side columns of the REI IRF, tracking the key performance indicators of program and project performance, are captured within the Fiji IRF below, wherein the program's performance is tracked via targeted, core indicators defined within the REI IRF, in response to the REI Theory of Change and its constituent objectives. The right-side columns of the REI IRFs, focused on evaluation of learning approaches (encompassing transformational change signals across dimensions, co-benefits/development impact evaluations, gender and social inclusion analytics, and other targeted evaluations and learning activities) are captured via CIF, country, and MDB-driven evaluations and studies responsive to the program's evidence needs and priorities, as outlined below. In sum, the approaches allow for a duality between systemized tracking and responsive research and evaluation, designed to complement each other, and leverage mixed methods approaches utilizing different tools, methods, and forms of evidence, but strategically combining them when applicable.

The Fiji IP is therefore also structured to outline the program's results chain—from program-level activities, outputs, outcomes, and impacts (based on the anticipated investment pipeline and the related activities to be funded within the program, the overall program design, and the Theory of Change) and incorporates elements related to (I) evaluation and learning, (ii) transformational change, (iii) gender and social inclusion, (iv) just transition, (v) SDGs, and (vi) development impacts/co-benefits in addition to the fundamental program results and corresponding indicators.

The indicators outlined in Fiji's IP IRF will enable the monitoring and assessment of progress based on the program's envisioned outcomes. However, it is important to note that the targets set for these indicators are somewhat tentative and indicative, as they depend on assumptions about the type of investments sub-borrowers will ultimately undertake and the projects that will meet eligibility criteria. The final results will heavily rely on the preferences of sub-borrowers and the financing assessment decisions of Implementing Entities.

**Table 8.3. Fiji's IP IRF[105]**

| CIF INTEGRATED RESULTS FRAMEWORK – RENEWABLE ENERGY INTEGRATION PROGRAM FIJI | | | | | | |
|---|---|---|---|---|---|---|
| CIF IMPACT Accelerated transformational change toward net zero emissions and inclusive, climate-resilient development pathways | | | | | | |
| RESULT STATEMENT | MONITORING APPROACH | | | | | EVALUATION AND LEARNING APPROACH |
| | INDICATORS | DESCRIPTION | BASE LINE | MEANS OF VERIFI CATION | TARGET | KEY AREAS |
| CIF-LEVEL IMPACTS | | | | | | |
| Accelerated transformational change toward net zero emissions and inclusive, climate-resilient development pathways | **CIF 1. Mitigation: GHG emissions reduced or avoided (mt CO2 eq)** | CO2 emissions reduced as a result of solar displacing diesel generation | 0 as based on BAU assumed scenario (without CIF REI IP contributions) | Annual reporting by projects | Refer to CORE 1 target indicator below. | **Transformational Change:** CIF aims to drive transformational change[106] across all funded programs and activities. Broadly defined, transformational change is a deep and fundamental change in a system's form, function, or processes. In the context of the climate crisis, this refers to the many profound, rapid changes in social, economic, and technical systems needed to achieve net zero greenhouse gas emissions, increase social inclusion, manage distributional impacts, enhance resilience and adaptation to climate change, and reduce stress on finite natural systems.<br><br>**Signals** of transformational change will be assessed through both evaluative and learning-based approaches |

[105] Proposed targets are indicative, as final results will depend on final sub-borrowers' decisions. This table is also provided in Excel format as a reading aid.

[106] Transformational change is defined as "fundamental change in systems relevant to climate action with large-scale positive impacts that shift and accelerate the trajectory of progress towards climate neutral, inclusive, resilient, and sustainable development pathways (Transformational Change Concepts, May 2021, https://www.climateinvestmentfunds.org/sites/cif_enc/files/knowledge-documents/tclp_workshop_updated_tc_concepts_may2021.pdf).

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|---|---|---|---|---|---|---|
| | **CIF 2. Adaptation: Strengthened climate resilience of land (ha), people (#), and physical assets ($) through a CIF supported adaptation mechanism** | Based on resiliency features incorporated within the design and construction of financed infrastructure and installation of technology assets. Also based on users accessing climate change resilient RE solutions. | Already implemented or programmed and financed resiliency measures, and users benefited from solutions similar to those to be financed with CIF-REI funding. | Reporting from projects on built and deployed infrastructure and technology assets, same as on number of benefited users. | To be derived from CORE Indicators #2, #4, and #7, below to accommodate higher shares of VRE. | across **dimensions.**[107] Unlike indicators, signals mark multiple levels of complex systems dynamics based on mixed methods data collection and analysis of CIF contributions toward transformational change in-situ. As these signals are highly context-specific, they will be proposed, defined, tracked, and reported on according to each IP's unique context analysis and Theory of Change, and using a range of methodological approaches. Disaggregated data collection to capture impacts on women, youth, migrants, Indigenous Peoples, and local communities, as well as persons with disabilities is encouraged. Ongoing learning and adaptive approaches, including the identification and tracking of new and emerging signals as programs and contexts evolve, is also encouraged.<br><br>**This impact area will be measured through CIF-driven evaluation and learning activities, which will not be the direct responsibility of MDBs for annual reporting.** |
| | **CIF 3. Beneficiaries: Number of women and men benefiting from CIF investments** | The number of customers benefiting from the Green Circuit transmission investments on Viti Levu and grid extensions on the outer islands, disaggregated by gender, income, and other descriptive characteristics available. | 0 as based on BAU assumed scenario (without CIF REI IP contributions) | DoE and utility reporting | Refer to CORE 7 target indicator below. | **Gender-Transformative Impacts:** The CIF Gender Program outlines (I) improved asset position, (ii) voice, and (iii) resilient livelihoods of women through gender-responsive institutions and markets as its key impact objective. These aspects are to be assessed through evaluative and learning-based approaches, as relevant to the REI program, and in combination with other monitoring data.<br><br>**Areas for further analysis include: mechanisms through which women and their organizations are represented in decision-making on renewable energy generation; share of women working in the energy sector; and the impact of off-grid access on women's labor/time use.**<br><br>**New and additional climate finance mobilized:** Beyond the immediate co-financing CIF leverages, CIF aims to plays a role as a market catalyst by contributing to the creation of markets and driving non-concessional financing through |

[107] The five dimensions of transformational change include relevance, systemic change, scale, speed, and adaptive sustainability. Signals – which can be advanced or emerging – offer an alternative conceptual framework for recognizing and capturing transformational change through the programmatic lifecycle (*https://www.climateinvestmentfunds.org/sites/cif_enc/files/knowledge-documents/tclp_workshop_signalsenergy_framework_may2021.pdf*)

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| | **CIF 4. Co-Finance: Volume of co-finance leveraged (USD)** | The volume of co-financing leveraged through CIF investments. | 0 as based on BAU assumed scenario (without CIF REI IP contributions) | Annual reporting by projects | Refer to CORE 6 indicator below. | replication of CIF investments, technologies and innovations, regulatory improvements, and other areas. Evaluation and/or learning approaches may be employed to better understand CIF's contributing role in market systems transformation and volumes of follow-on green financing in CIF-supported markets. Data might also be sourced through national/local market reports and other third-party data aggregators (e.g., IRENA, BNEF, etc.) |

**Program Theory of Change:** If CIF improves market design and system operations, provides enabling technologies and infrastructure, and develops new business models, countries will increase renewable energy penetration in their energy mix, achieve a more flexible and decentralized energy system, improve policies and capabilities, mobilize capital, increase renewable energy access, reduce systems costs, and foster renewable energy innovation, which will all contribute toward CIF's transformative impact.

| RESULT STATEMENT | MONITORING APPROACH | | | | | EVALUATION AND LEARNING APPROACH |
|---|---|---|---|---|---|---|
| | INDICATORS | DESCRIPTION | BASE LINE | MEANS OF VERIFI CATION | TARGET (DATE) | KEY AREAS |
| **REI PROGRAM-LEVEL IMPACTS** | | | | | | |
| Flexibility of energy systems for smooth integration of higher shares of variable renewable energy generation into the grid and increase in off-grid access to renewable energy is enabled | REI Proxy Indicator #1: Installed capacity utility-scale solar | Renewables based electricity generation delivered through the grid, as a percentage of total generation | 0 | Government and utility reports | 40 (2026) | **Signals of transformational change:** Signals of transformational change at the program level will focus on more narrowly bounded aspects of energy systems transformation than in the section above (i.e., CIF-level impact). They might cover dimensions of systems transformation that are more closely tied to individual REI recipient countries, Investment Plans and/or project-level impacts. Specific definitions and methodologies are to be determined.<br><br>**Gender and just transition elements:** The program impact-level allows space for further evaluations, assessments, and other approaches to take place as the program evolves in these areas. These activities may be tailored to specific recipient countries or applied more broadly across the program. |
| | REI Proxy Indicator #2: Access to electricity (%) | % of customers having access to grid supplied electricity, nationally | 96% | Government and utility reports | 100% (2030) | |
| | MONITORING APPROACH | | | | | EVALUATION AND LEARNING APPROACH |

| RESULT STATEMENT | INDICATORS | DESCRIPTION | BASE LINE | MEANS OF VERIFI CATION | TARGET (DATE) | KEY AREAS |
|---|---|---|---|---|---|---|
| **REI PROGRAM-LEVEL OUTCOMES** | | | | | | |
| A. Increased penetration of variable renewable energy into power systems and maximized renewable energy potential of countries | **REI CORE 1. Mitigation:** GHG emissions reduced or avoided (t CO2 eq) – direct/indirect | Emissions avoided as the result of diesel generation being displaced by carbon-free renewable energy | 0<br><br>(with reference scenario established) | Annual estimates by projects | 50,000 t/year CO2 (2026) | It is assumed solar has a 26% capacity factor, and diesel emissions are avoided at a rate of 550 g/kWh. Assumptions about avoided diesel usage are conservative in that they are limited to the 40 MW foreseen in the financing plan that will be possible to connect after the grid upgrades. Viti Levu could potentially accommodate substantially more solar by 2030. Assumptions about avoided diesel usage are also conservative in that they are limited to the Component 1 investments on Viti Levu. Customers in the outer islands will also have access to cleaner energy as a result of grid extensions but the extent of diesel avoidance will depend heavily on the exact location of the investments and can consequently not be accurately estimated until project preparation has begun. |
| | **REI CORE 2. Installed Capacity:** Installed capacity of variable renewable energy available to the grid (MW) – direct/indirect | Based on installed capacity of new solar connecting to Viti Levu Green Circuit | 0 | MDB project results data | 40 MW (2026-) | |
| | **REI CORE 3. Renewable Energy Production:** Annual renewable energy output (MWh) | Based on installed capacity of new solar connecting to Viti Levu Green Circuit | 0 | MDB project results/ utilities data | 91,104 MWh/year (2026-) | |
| | **REI CORE 4. Grid Services:** Increase in available grid services and improvements (#) (#) | # of customers connected to Viti Levu Green Circuit | 0 | MDB project results/ utilities data | ~200,000 customers connected to EFL's grid on Viti Levu plus ~7,000 customers added under Component 2 Grid connections (2026-) | |
| B. Improved policies, plans, and institutional capabilities | **REI CORE 5. Policies:** Number of policies, regulations, codes, or standards related to renewable energy integration that have been amended or adopted (#) | # of policies, laws, regulations or codes | 0 | MDB project results/ country data | 5 (2026) | Government foresees substantial revisions to the Electricity Act and regulations under the Act as well as the creation of centralized procurement of renewable energy generation. |

| | | | | | | |
|---|---|---|---|---|---|---|
| C. Mobilized public and private capital | **REI CORE 6 (= CIF 4). Co-Finance:** Volume of co-finance leveraged (USD) | Actual co-finance resources entering into CIF-REI benefited projects<br><br>Disaggregation: Source of co-financing (MDB, Government, Private Sector, Bilateral, and Other) | 0 | MDB project financial data | US$125 million (2026) | This is the amount foreseen to be leveraged under the financing plan, but as noted above, Viti Levu could potentially accommodate substantially more solar by 2030. |
| D. Increased renewable energy access | **REI CORE 7. Renewable Energy Access:** Number of women and men, businesses, and community services benefiting from improved access to electricity and/or other modern energy services – direct/indirect (# of people) | # of customers having access to renewable energy generation | 0 | MDB project results, World Bank MTF data (ESMAP), SE4All Global Tracking Framework (GTF), and/or other national energy statistics | ~200,000 customers connected to EFL's grid on Viti Levu plus ~7,000 customers added under Component 2 Grid connections (2026-) with approximately 51% being men and 49% women. | **Gender-responsive aspects of energy access** can be studied in more detail through targeted research, evaluations, and/or case studies. Examples of relevant issues include: impact on women-owned businesses/firm users; impact on community services specifically catering to women; and women's awareness and ability to use electricity access for productive purposes. |
| E. Reduced total system cost | **REI CORE 8. System Costs:** Reduced total energy system cost (USD) | Savings resulting from displacement of diesel generation with solar | 0 | MDB project results/utility data | US$1.0 million (2026) | This is based on the differential between the average cost of generation in Fiji and the levelized cost of competitively procured solar in the region, multiplied by the generation anticipated from renewable energy under this investment plan. |

| RESULT STATEMENT | | MONITORING APPROACH | | | | EVALUATION AND LEARNING APPROACH |
|---|---|---|---|---|---|---|
| | INDICATORS | DESCRIPTION | BASE LINE | MEANS OF VERIFI CATION | TARGET (DATE) | KEY AREAS |
| **REI PROGRAM-LEVEL CO-BENEFITS** | | | | | | |
| Social and Economic Development Co-Benefits | **CO-BENEFIT 1. Employment and Livelihoods: Jobs created – direct and indirect** | # of permanent jobs created as result of expanded electricity network and operation of RE plants<br># of temporary jobs resulting from construction of new assets | 0 | MDB project results data / CIF modeling | 10 permanent and 100 temporary (2026) | **Quality and distribution of jobs:** Permanent jobs will be created at EFL and DoE with expansion of the transmission network and the need to serve additional customers. Temporary jobs will directly be created as a result of construction of the new transmission and distribution infrastructure. Permanent and temporary jobs will also be indirectly created, associated with the development of new renewable energy generation facilities. |

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| | **CO-BENEFIT 2. Just Transition: Social Inclusion and Distributional Impacts** | # of people trained to carry a more skillful and better paid job | N/A | N/A | | **Just Transition Framed Analysis** will include:<br>•Establishment of a gender working group involving the MoF's gender focal point, the Department of Women, DoE and EFL with support from SPC, PPA and WB to oversee the development of a Gender Action Plan for the project.<br>•Introduction of gender and social inclusion criteria into bidding documents for subcontractor companies (e.g., specification of percent of women to be employed for the project).<br>•Introduction of targeted trainings on STEM and measures to attract (internships; bursaries; and scholarships) and retain (mentorship schemes) female talent.<br>•Support for vocational training for all women and vulnerable groups, including, for example, those in rural areas and women of Indian descent, in order to empower them to become solar engineers.<br>•Provision of training for women and vulnerable groups interested in operation and maintenance of solar equipment. |
| | **CO-BENEFIT 3. Policy and Planning:** Coherence across sectors | | N/A | N/A | | Policy and planning in the sector will be improved by the development of a comprehensive power sector plan, led by the Ministry of Infrastructure and Meteorological services, which covers not just EFL's but also DOEs service areas.<br><br>Reforms (to the Electricity Act) will also include creation of a centralized procurement entity for renewable energy, allowing for competitive bidding on a least cost basis. |
| **RESULT STATEMENT** | **MONITORING APPROACH** | | | | | **EVALUATION AND LEARNING APPROACH** |
| | **INDICATORS** | **DESCRIPTION** | **BASE LINE** | **MEANS OF VERIFI CATION** | **TARGET (DATE)** | **KEY AREAS** |
| **REI PROGRAM-LEVEL OUTPUTS** | | | | | | |
| A. Improved market design and systems | OPTIONAL: Number of policies, regulations, codes, or standards supported to enhance the enabling environment for renewable energy uptake (#) | Publication of new or revised policies, acts, and regulations | 0 | MDB project results / country data | 5 (2026) | **Reform-related:** Revised Electricity Act (and, as necessary, regulations under the Act)<br>**Technical studies:** Reliability and risk assessment tools for resource adequacy, generation and transmission expansion tools, generation dispatch and network operation tools, feasibility studies for transmission extensions or mini-grids (in outer islands)<br>**Gender-related:** Upskilling training on hybrid renewable |

| | | | | | | |
|---|---|---|---|---|---|---|
| | OPTIONAL: Number of technical/financial analyses completed to enhance the enabling environment for RE uptake (#) | Publication of technical studies foreseen under components 1 and 2 | 0 | MDB project results/ operations data | 10 (2027) | energy systems maintenance, targeted trainings on STEM and measures to attract (internships; bursaries; and scholarships) and retain (mentorship schemes) female talent |
| D. End-Use Electrification Solutions | OPTIONAL: Number of women and men reached with new end-use electrification solutions | If reported, this indicator should feed into CIF 3 (Beneficiaries) and/or REI CORE 7 (energy access).<br><br><u>Disaggregation:</u> By gender (mandatory)<br><br>Type of social/community infrastructure reached | 0 | Annual reporting by projects | 30,000 customers with new or improved connections; beneficiaries would be approximately 51% male, 49% female as consistent with population in outer islands. | Grid connections under component 1 |
| | OPTIONAL: Reduction in number of outages due to new end-use electrification solutions | If reported, this indicator should be a corollary to outages reported for Outcome A.<br><br><u>Disaggregation:</u> Type of social/community infrastructure reached | 0 | Annual reporting by projects | | |

**System-wide Analysis**

The IP's Integrated Results Framework serves as a fundamental instrument that grounds the country program's high-level goal statement on measurable national indicators and targets, and thereafter links the program's theoretical objectives with the measurable outcome-level results anticipated via its constituent project pipeline. As the IP is developed collaboratively among the Government, implementing MDB partners, and other stakeholders, the process of defining project objectives, and aggregating the related results via the IRF, constitutes a consistent and system-wide approach on the coherence of and between interventions, and on accountability between proposed goal statements and pragmatic results estimations.

Activities defined to be supported based on CIF-REI program objectives have been defined based on thorough examination of the country's context in terms of NIIP development and barriers to achieve expected and further integration of renewable energy into the system.

**Anticipated Program Impacts**

The Fiji IP currently expects to deliver on eight of the nine REI core objectives of the REI Investment Program, and the country's IRF therefore tracks core indicators as relate to each of these outcomes, with the expected target values collating the fractional outcomes expected from each of the two individual projects within the program pipeline. Each target value delineates the share of results anticipated from each discrete project, allowing for a differentiated analyses of the varying levels of impacts, vis-à-vis investment volumes and targeted approaches. As such, the IRF will be responsive to any changing dynamics within individual projects, and under- or over-achievement of program-level results will allow for learning and adaptation based on challenging or opportune investment environments.

As relevant outcomes, the IP will help the Government's NDC commitments by achieving the following:

1. Increased renewable energy generation capacity by 40 MW, and an additional 91,104 MWh/year of renewable energy output by 2026.
2. 200,000 customers connected to EFL's grid on Viti Levu (Component 1: Viti Levu Green Circuit) and 7,000 customers in the outer islands benefit from more affordable, reliable, and clean energy (Component 2: Electrification of Outer Islands) by 2026.
3. 30,000 people with new or improved connections, of which 49 percent are expected to be female, resulting in universal access to electricity by 2030.
4. A consequent reduction in the volume of global ($CO_2$) emissions of 50,000 t/year by 2026.
5. Improved policies and institutional capabilities, including substantial revisions to the Electricity Act and regulations under the Act as well as the creation of centralized procurement of renewable energy generation.
6. US$125 million leveraged under the financing plan, leading to the creation of ten permanent and one hundred temporary jobs by 2026.
7. Better electricity reliability, resulting from a more diverse portfolio of domestically available renewable fuels and enhanced energy storage and grid management technologies and techniques.
8. Better resilience—especially of the transmission and distribution network—to climate-induced disasters and damage to infrastructure.

9. More than US$ 1 million reduction in total system costs, annually, resulting from the use of lower cost renewable energy generation, and the use of competitive tenders for the private sector to provide such generation on a least cost basis.
10. Savings to Fiji's consumers and overall economy, resulting from a reduction in imported diesel used for electricity generation.

**Protocols for Tracking**

The monitoring and reporting of outcomes will involve collaboration among all stakeholders, namely collaborating and implementing agencies, CIF, and MDBs. Implementing agencies will work together with the CIF AU Monitoring and Reporting team to track the country-level IP impact indicators established during IP approval. The implementing MDBs will be responsible for monitoring and annually reporting all relevant outcome-level core indicators for each approved project to the CIF AU. This will be done in accordance with the methodologies, reporting requirements, and timelines specified in the REI IRF and the REI Monitoring & Reporting (M&R) Toolkit. MDBs will also incorporate these outcome-level indicators into the monitoring and reporting frameworks for each project they implement. Throughout the project lifecycle, country-level IP M&R workshops will be held, including at the inception, midterm, and IP-conclusion stages, along with any necessary interim country M&R workshops. These workshops will facilitate multi-stakeholder agreement on indicators, targets, methodologies, and address any identified gaps, lessons learned, or areas for improvement.

Fiji's MoF will act as the borrower. It will serve as intermediary to allocate CIF-REI resources effectively by on-lending to both the DoE and EFL, who in turn will act as the Implementing Entities (IEs). The MoF will have the responsibility to report annually to MDBs on IRF indicators. DoE and EFL will provide the necessary information required to meet monitoring and reporting requirements. This information is based on the commitments outlined in the sub-lending contracts.

As part of the finance eligibility criteria, DoE and EFL must periodically report on various indicators related to project performance and achievements, inclusion aspects, GEI emission reductions, and the distribution of benefits among users, including gender distribution and applied inclusion principles. Additionally, core achievement progress and other relevant co-benefits will be considered, tailored to the specific context of each project. The overall monitoring of the program will involve periodic Project Monitoring Reports (PMRs) prepared based on the reports from IEs and sub-borrowers. To further support and assess the program's execution, MDBs will conduct regular evaluations.

The program's financial statements will undergo auditing according to the agreed procedure within the MDBs. The IEs will present the audited financial statements of the program, duly signed, and endorsed by an independent auditing firm acceptable to the MDBs, within 120 days after the end of each fiscal year of the project, during the original disbursement period, or any extensions.

**Tracking and Evaluation of Transformational Change, Just Transition, and Inclusivity Aspects**

The execution of the proposed IP aims to bring about transformational change, promote a just transition, and ensure inclusivity. These outcomes will be evidenced by the equitable creation of new jobs and opportunities, the adoption of gender-responsive approaches in the execution of the program, and a reduction in emissions and contamination. The rural electrification component of the IP will have a particularly high social impact, with the potential for generating social transformation by providing new opportunities to improve the quality

of life of Fijians who today still rely on a limited, unreliable, or polluting source of power. The program will closely monitor and evaluate just transition activities, with a particular focus on tracking progress in three key areas:

i) Ensuring that women and minority community members receive training and employment opportunities in the servicing and maintenance of the implemented projects/solutions within their communities.
ii) Assessing the development of productive activities and local economic growth resulting from rural electrification.
iii) Keeping track of the number of individuals who lose their jobs but are then trained and employed to participate in economic diversification.

The degree of social inclusion achieved, considering ethnic, religious, and racial minorities, female-headed households, rural and poor residents, local communities, migrants, youth, and persons with disabilities, will depend on the specific projects that receive support. Nonetheless, it is essential that this dimension of the IP be monitored and assessed, in order to identify the true extent of positive transformational change achieved by the program.

Gender-responsive policies adopted within the program will be verified through reporting, and safeguards monitoring will also be in place to continuously evaluate the potential for sexual exploitation and gender-based violence. The execution of the IP will be made visible to all impacted communities, and communication channels will be established to facilitate queries and feedback. Additionally, other means of obtaining information will be explored to measure transformational change, just transition, and inclusivity aspects through these communities.

# APPENDIX A. INVESTMENT CONCEPT BRIEFS

## A.1 VITI LEVU'S GREEN ENERGY CIRCUIT

### Problem Statement

Fiji relies on expensive oil imports for more than two-thirds of existing energy needs, with transport applications alone accounting for more than forty percent of total energy consumption. Despite the country's vast renewable energy potential and historical investment in hydropower, thirty-five percent of electricity generation still comes from fossil fuels. High and volatile imported diesel prices have contributed to large trade deficits, which have taken a toll on Fiji's economy and consumed funds that could otherwise be available for other socially beneficial development of the country. The expansion of renewable energy generation has historically been limited by network infrastructure constraints which restrict the ability of Fiji's electrical network to accommodate an increasing share of variable renewable energy on the grid.

Renewable energy generation plays a critically important role in the energy mix, but there is substantial room for additional capacity. Hydropower provided 58.5 percent of Fiji's electricity generation in 2021, and bioenergy accounted for another 6.5 percent. There are also early solar (1 percent) and wind generation projects (0.03 percent). Nevertheless, there are still major challenges in bringing sufficient resources online, as evidenced by the persistently high dependence on diesel generation. Many of these challenges relate specifically to the inability of the grid to absorb additional energy flow and power loading. The challenges are compounded by the volatility of hydropower generation over time, as climate change has made it more and more difficult to accurately predict and plan for dry years. The island of Viti Levu—home to ¾ of Fiji's population—has an electricity network which is still largely a radial design. The Monasavu Hydropower Plant—the largest power plant on Viti Levu—is located at the geographical center of the island, but with too few "spokes" connecting from that central "hub", and few transmission connections to other areas that have good potential sites for renewable energy generation. The figure on page 93 below shows the existing transmission network on Viti Levu, with an overlay of the areas with existing or unexploited potential for renewable energy generation.

### Proposed Contribution to Initiating Transformation

The proposed Green Energy Circuit for Fiji will upgrade and improve climate resilience of the existing transmission network to enable evacuation of existing and planned solar, hydropower, and wind. This component combines:

- Investment in upgrades of existing and construction of new 132 kV transmission lines and substations in Central and Western Viti Levu, areas with existing and substantial potential renewable energy resources.
- Transaction advisory support for 40 MW of new solar IPPs at preferred renewable energy locations on Viti Levu (including the Western side of the island).
- Private sector investment in approximately 40 MW of solar (or other RE) IPPs, including investment from IFC.

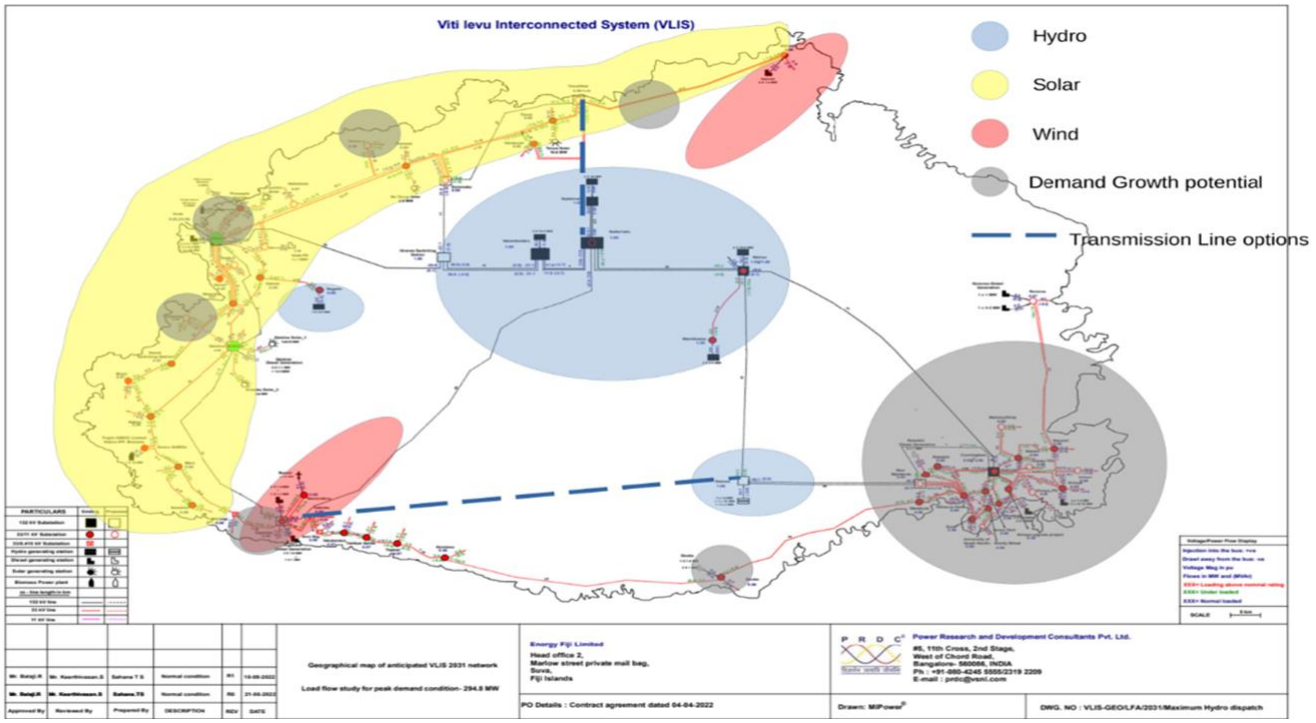
- Technical assistance studies for putting in place systems to (a) ensure a periodic assessment and agreement on an appropriate capacity reserve margin given Viti Levu's demand growth, resource mix, future development plans for generation and transmission as well as learnings from the first renewable projects, (b) update generation dispatch operational plans to incorporate variable renewable energy, (c) evaluate storage and demand response to increase firm capacity and improve flexibility over the medium-term as the share of renewables increase, (d) review and update the grid code and (e) support utility and regulator dialogue on supporting system security while improving the share of clean energy.
- Guarantees to mitigate risk perceptions (addressing expected risks around solar generation preceding transmission availability, concerns around curtailment of dispatch for operational reasons over the term of the power purchase agreement, timely payment security) that could result in wider bid participation from reputed developers and better pricing commensurate to Fiji's scale and potential in the Pacific.
- Investment in climate resilience of the transmission network through a number of potential managerial, operational, and structural measures.
    - **Managerial and operational** measures may include: (a) preparation of climate and disaster preparedness and response plans to handle transmission infrastructure damage; (b) investment in early warning systems or purchasing of insurance to address financial consequences of climate disaster events; (c) enhancing the monitoring of current assets to mitigate the risk of failure amid changing climate conditions; (d) instituting a comprehensive program for tree trimming and vegetation management around transmission and distribution lines; (e) training EFL staff and emergency response teams to enable swift repair of damaged infrastructure.
    - **Structural measures** may include: (a) building new assets in areas that are less exposed to climate hazards (e.g., avoiding new construction in flood plains); (b) building seawalls next to coastal power infrastructure; (c) increasing transmission tower heights; (d) burying distribution lines in major cities; and (e) using stainless steel material whenever feasible to reduce corrosion from water damage.

Under a business as usual (BAU) scenario where system security is prioritized in a small island context (without access to inter-island interconnections)- diesel generation is expected to provide dispatchable power to customers while EFL expects hydropower to be developed over the next 5-10 years. VRE penetration is limited to a small fraction of the daily requirement. There is an opportunity to support significant scale up of renewables in Viti Levu to provide adequate energy to reduce diesel generation during the daytime of a typical day. The interplay of variable renewable energy (solar PV), other generation sources and transmission plans as well as the need for limited storage would need to be assessed and suitably scaled over the medium-term.

The envisaged renewable energy generation plants are expected to be delivered by private sector independent power producers. Given the lack of large-scale renewable deployment in the Pacific in general and Fiji specifically, ADB will support project development with transaction advisory services. ADB will draw on its experience assisting the government of Cambodia with a 100 MW solar park project which utilized a public-private partnership approach that successfully crowded in IPPs, resulting in the lowest offtake prices

in the ASEAN region. ADB will also consider providing stapled guarantees, as necessary, to mitigate offtake risks for IPPs.[108]

**Renewable Energy Resource Potential in Viti Levu**




## Implementation Readiness

The Fiji economy has after contractions in 2020 and 2021 rebounded with real growth in 2022-2023 and an increase in electricity demand. EFL is responsible for generation, power purchase, transmission and distribution in Viti Levu. It generates more than 93% of electricity in Fiji, with the remainder being provided by IPPs. After undergoing partial privatization in 2018, EFL remains profitable and is committed to its 10-year Power Development Plan. This plan estimates a total investment of FJD1.97 billion (US$900 million) needed for the development and commissioning of renewable energy projects over the next 10 years.[109] This investment will increase capacity to meet future electricity demand from renewable sources and improve the security and reliability of power supply. The investments foreseen in this Green Energy Circuit are planned to break ground in the next 5 years.

[108] ADB will draw on its prior experience using blended finance for grid expansions to accommodate gigawatt scale VRE growth in India using CTF cofinancing, as well as experience with viability gap financing for grid-connected IPP solar projects in Nepal using SREP cofinancing. ADB will also draw on more recent experience with transaction support for large scale IPP solar and wind projects in Central Asia as well as transactions in the Pacific where the Pacific Renewable Energy Program provides guarantee support to private sector projects to mitigate specific risks. ADB has funded multiple projects which incorporate grid enhancing technologies including high-performance conductors in Nepal and Bangladesh for upgrading existing lines as well as maximizing capacity and efficiency for new high-voltage line, and utility-scale energy storage systems in Mongolia and the Maldives.

[109] Republic of Fiji. (2023). "National Infrastructure Investment Plan," p. 51

EFL stated in its 2021 annual report that the new FCCC regulatory framework—which includes tariffs—allows the company to recover all costs related to the production, distribution, and retail supply of electricity,[110] while also providing the company and other key stakeholders a greater degree of certainty and transparency with the application of the tariff methodology.[111] The Government-endorsed National Infrastructure Investment Plan identifies the need for electricity transmission on Viti Levu to support renewable energy to assist Fiji in meetings clean energy goals.

### Rationale for REI Financing

Financing under the REI Program will ensure that the Green Energy Circuit on Viti Levu is cost-neutral or delivers cost savings to electricity end-users. A primary constraint on renewable energy deployment in Fiji is the additional costs of grid expansion and upgrade to facilitate significant scaling up of grid-connected generation capacity which will be mostly VRE (solar, wind, and hydro) as well as the ability to forecast and integrate renewables in a smooth manner. EFL's weighted average cost of capital (WACC) is capped by the regulator, FCCC. Blended finance is needed to ensure that WACC remains under the cap as well as provide long-term capital for transmission grid expansion that can dovetail with renewable energy development timelines.

### Results Indicators

The results indicators to be monitored throughout implementation of this component will include the following:

- MW of installed renewable energy capacity on new or upgraded transmission lines
- MWh of clean energy consumed by customers benefiting from the connections
- The volume of global ($CO_2$) and local (NOx, SOx, and particulates) emissions offset by providing access to a cleaner mix of energy.

### Financing Plan and Financial Instruments

The table below describes the financing foreseen by various parties.

This includes:

- CIF concessional financing for transmission investments under EFL's PDP of $25 million (public sector).
- Technical assistance grants from CIF and ADB on the identified studies and preparatory work.
- ADB financing of about $60 million for 132 kW transmission investment related to EFL's PDP; ADB will help facilitate public sector terms (loans, guarantees, and TA funds) to facilitate private sector investment in VRE.
- 40 MW of solar developed by the private sector, procured through reverse auctions to ensure lowest cost and highest compliance with bid terms (at roughly $1000/kW); roughly $15 million of this is anticipated to be financed by IFC.

[110] Energy Fiji Limited. (2022). "2021 Annual Report." Available at https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf, p.23
[111] Energy Fiji Limited. (2022). "2021 Annual Report." Available at https://www.parliament.gov.fj/wp-content/uploads/2022/08/Energy-Fiji-Limited-Annual-Report-2021.pdf, p.28

- ADB Private Sector debt financing of about US$20 million for new renewable energy generation developed by the private sector and co-financed with other partners inside and outside Fiji.
- CIF-financed public sector offtake guarantees (for renewable energy project developers) that could be stapled to the tenders to address some of the distinct risk perceptions with scaling up intermittent renewables and improve risk perception of projects.
- Counterpart financing – typically to cover applicable taxes and duties as well as overhead costs.

| Financing Source | CIF | | | | Others | | | |
|---|---|---|---|---|---|---|---|---|
| Program | CIF Financing | CIF Guarantee | Project TA Grant | Total CIF | ADB [112] | IFC | Private Sector | Total |
| | (US$ Million) | | | | | | | |
| Viti Levu Green Circuit | 25 | 8 | 2 | 35 | 60 | 15 | 35 | **145** |

The combined investments result in a leverage ratio of approximately 1:1.8 of CIF funds (in other words, the total investment package is 1.8 times the financing provided by CIF).

## Project Preparation Timetable

| Project Preparation Step | Timeline and Milestones |
|---|---|
| Preliminary pre-feasibility studies for generation options and transmission system and ADB transaction advisory services mandate initiation. | Q1 2024 |
| Detailed concept for Viti Levu Green Energy Circuit + commencement of TA consultants for feasibility studies. | Q2 2024 |
| Feasibility studies and due diligence completed.<br>Solar IPPs Risk mitigation matrix and market sounding completed. | Q4 2024 |
| CIF Project Funding proposal submitted by ADB, EFL and Government of Fiji. | Q1 2025 |
| ADB Board/Management approval and signing of loan agreements. | Q2 2025 |

[112] ADB funding comprises sovereign funding and non-sovereign funding for generation and transmission related investments in Viti Levu.

## Project Preparation Needs

### Technical Studies

Several technical studies will be important to identify and evaluate specific options for augmenting the current 132 kV transmission grid to secure and strengthen the connections from potential RE sources to the load centers on Viti Levu. These include the development of:

- **Reliability and risk assessment tools for generation resource adequacy.** Traditional resource adequacy methods are inadequate to guarantee reliability in a swiftly evolving electrical power system. Power grids are undergoing rapid transformations, shifting from a structure supported by resources that can be dispatched as needed to a structure that depends on intermittent energy sources and storage with limited duration. Typical resource planning models frequently overlook aspects such as weather data, the influence of climate, resources located behind the meter, transmission considerations, or comprehensive data regarding the availability of energy storage. In order to guarantee that resource adequacy models are capable of offering accurate risk assessments, Fiji should undertake probabilistic modeling that simulates random variables in a weather-dependent manner, compares simulations with historical data for benchmarking, models generator outages as being influenced by weather conditions, adjusts simulations to align with future expectations, and incorporate the impacts of climate change into the simulations.
- **Generation and transmission expansion tools.** Generation and transmission expansion tools are critical for long-term planning and optimization of the electricity grid. These tools help utilities, grid operators, and policymakers make informed decisions about the development of new generation capacity and the expansion of the transmission infrastructure. Specialized transmission expansion tools and considerations for systems with high renewable energy penetration include:
    - Grid interconnection and integration tools: Tools to facilitate the connection of renewable projects to the grid and ensure seamless integration
    - Energy storage sizing and optimization software: Tools to assess and optimize the size and operation of energy storage systems, including batteries
    - Generation and Transmission Planning Integration: Generation expansion tools should consider the impact of new generation projects on the transmission infrastructure, including the need for transmission upgrades
    - Power Flow Analysis: Power flow analysis tools evaluate the steady-state performance of the transmission grid under different operating conditions and generation scenarios.
- **Generation dispatch and network operation tools.** Generation dispatch and network operation tools for systems with high renewable energy penetration are essential for utility engineers to effectively manage and operate the grid. These tools help ensure grid reliability, stability, and efficiency in the presence of variable and intermittent renewable generation. Important tools and considerations for utility engineers in such systems are:
    - Energy Management Systems (EMS): EMS software is the core tool for generation dispatch. It provides real-time monitoring, control, and optimization of power generation and transmission. EMS includes components such as:
        - State Estimation: Calculates the real-time state of the power system
        - Load Forecasting: Provides short-term load forecasts to guide generation dispatch decisions
        - Renewable Energy Forecasting Tools: Software and models for predicting renewable energy generation, such as wind and solar forecasts

    - Optimization Algorithms: Determine the optimal generation schedule considering generation costs, constraints, and reliability requirements
    - Economic Dispatch Models: Economic dispatch models optimize the operation of existing and planned generation assets to minimize production costs while meeting demand and environmental constraints
    - Unit Commitment: Decides which generation units to start or stop based on predicted load and available generation resources
- Renewable Integration Models: These models assess the integration of variable renewable energy sources into the grid. They consider factors like variability, intermittency, and grid reliability
- Demand Response Management Systems: Software to manage demand response programs and optimize load flexibility
- Dynamic security assessment is one of the critical aspects of power system studies that are used to identify critical contingencies in the grid by analyzing their corresponding dynamic security constraint violations on the grid
- Grid Frequency Control Tools: Tools for monitoring and controlling grid frequency are critical for maintaining system stability. These tools include frequency measurement, load shedding, and Automated Generation Control (AGC) functions
- Voltage and Reactive Power Control Tools: Tools for managing voltage and reactive power in the grid, critical for renewable energy integration
- SCADA (Supervisory Control and Data Acquisition) Systems: Systems for monitoring and controlling grid assets, including renewable generation
- Advanced Metering Infrastructure Systems: Systems for collecting and managing data from smart meters and sensors for better grid management
- Distribution Management Systems: Software for managing the distribution grid, including integrating renewable distributed energy resources
- Stability Analysis: Stability analysis tools assess the dynamic behavior of the grid under transient conditions, ensuring that the transmission system remains stable during disturbances.

### Legal and Regulatory Reforms

The Government of Fiji is committed to the substantial legal and regulatory reforms required to bring more renewable energy into electricity generation. These reforms could include:

- The introduction of competitive auctions for renewable energy generation, especially from solar facilities, possibly including mandates for the purchase of renewable energy by utilities or large consumers
- Expansion of the use of net metering and/or net billing to spur investment in rooftop solar
- Legal recognition of storage as a distinct activity and regulatory reforms to promote investment in storage.

## Environmental and Social Issues

The investment financed under this project presents limited social and environmental risks. Upgrading existing transmission lines and substations is conducted within existing rights of way (ROW); no resettlement is required, there are no impacts on indigenous peoples, and minimal impacts—if any—on environment. New transmission lines and substations, as well as investments in generation and storage would follow ADB

Safeguard Policy and Government of Fiji's requirements. The benefits of diversification of generation locations and grid investments would support improved climate resilience, especially higher wind loading, to minimize the risk of grid-supplied electricity being disrupted by major meteorological events. The potential for climate insurance tools to facilitate investments (and at lower costs) would also be considered. The additional renewable energy supplies will reduce local air pollution and will reduce foreign exchange outflow for petroleum fuel purchases, freeing up funds for other socially beneficial investments.

### Activities Empowering Women and Vulnerable Groups

In order to ensure that women and other vulnerable groups equally benefit from economic opportunities generated by the project, several activities will be considered prior and during the implementation of the proposed program:

- Establishment of a gender working group involving the MoF's gender focal point, the Department of Women, DoE and EFL with support from SPC, PPA and WB to oversee the development of a Gender Action Plan for the project.
- Direct support for increased female representation in renewable energy decision-making through quotas.
- Fostering of female and vulnerable group participation during the consultation and decision-making process especially on land acquisition, compensation, and livelihood support packages.
- Introduction of gender and social inclusion criteria into bidding documents for subcontractor companies (e.g., specification of percent of women to be employed for the project).
- Introduction of targeted trainings on STEM and measures to attract (internships; bursaries; and scholarships) and retain (mentorship schemes) female talent.
- Support for vocational training for all women and vulnerable groups, including, for example, those in rural areas and women of Indian descent, in order to empower them to become solar engineers.
- Provision of training for women and vulnerable groups interested in operation and maintenance of solar equipment, including those interested in regular cleaning of panels and replacement of electric equipment, as well as training for women and vulnerable groups interested in other income-generating opportunities associated with the project, such as collecting tariffs, sale of tokens, and low-risk troubleshooting.

## A.2 OUTER ISLANDS ELECTRIFICATION

### Problem Statement

Most Fijians have access to electricity, but a portion of the country's population remains without, relying predominantly off-grid and traditional fuels. The majority of the unelectrified households are in the rural and maritime areas as well as in informal settlements. There is, therefore, a substantial rural-urban disparity: 96 percent of the country's population has access to electricity, but access is skewed toward urban and some rural areas because of the challenges of distributing power to small and isolated communities and rural villages

in the outer islands.[113] Four percent of urban residents and nearly 20 percent of people living in rural areas still lacked electricity access as of 2021.[114] Roughly five percent of the population rely on standalone diesel generators for electricity, making them vulnerable to price volatility in the international oil market. Women in rural communities with low incomes are particularly affected since without electricity they face challenges carrying out household daily tasks such as food preparation, helping children with homework, agriculture and business activities.

Achieving universal access to electricity is a priority for the Government of Fiji. Through the implementation of the *National Electrification Policy* and the development of an updated Electrification Master Plan, the Department of Energy has been working with national energy utilities, renewable energy suppliers, financing schemes, and relevant stakeholders to add both off-grid and on-grid energy capacity to fill all electrification access gaps and support as close to universal access to electricity as much as possible. The National Energy Policy 2023-2030 has "Energy Access and Equity" as one of its five policy pillars, alongside Energy Security and Resilience, Energy Sustainability, Energy Efficiency, and Energy Governance. In its 2017 National Development Plan[115] the GoF stated its intent to deliver 100 percent access to electricity by 2021, but this objective was indefinitely postponed given delays associated with the global COVID-19 pandemic. With CIF's assistance proposed, the goal could conceivably be achieved in the near future.

## Proposed Contribution to Initiating Transformation

CIF financing would be blended with World Bank financing to support the DoE and EFL in efforts to electrify and improve the quality and reliability of supply in rural areas, and increase the percentage of renewable energy generation available to customers in outer islands. These investments would expand the reach of the electricity grid of the Lakeba, Kadavu, Rotuma, Taveuni, Vanua Levu, and other priority outer islands to be identified to reach those with no or limited electricity access in rural communities; and would upgrade existing grid technologies and infrastructure to allow the shift from diesel-only generators to hybrid renewable energy systems.

Fiji's NIIP includes electrification investments planned by DoE for Lakeba, Kadavu, and Rotuma. DoE also has plans to invest in Taveuni. These islands collectively include roughly 30,000 people, nearly 100 villages, airstrips, government buildings, post offices, health centers and schools. The investments include:

- In Kadavu, grid extensions from the Vunisea mini-grid via Nasali to Nabukavesi ira.
- In Lakeba, grid extensions from Tubou to Nasaqalau, and from Tubou to Waitabu.
- In Rotuma, construction of a distribution line around the entire island.

  In Taveuni, grid extension, from Naselesele to Lavena, Wairiki to Navakawau, Salialevu Tee to Off, Soqulu Est. Tee to Off and Nacogai Tee to Off.
- In Vanua Levu, support to DoE and/or EFL in further line extensions, to complement plans in the NIIP to upgrade and expand connections to government stations and install solar hybrid systems.

[113] "Access to Electricity, Rural (% of Rural Population) - Fiji." World Bank Open Data. Accessed August 2, 2023. https://data.worldbank.org/indicator/EG.ELC.ACCS.RU.ZSend=2021&locations=FJ&start=1996&view=chart.
[114] Fiji Renewables Readiness Assessment. Accessed August 2, 2023. *https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2015/IRENA_RRA_Fiji_2015.pdf*.
[115] Republic of Fiji: Ministry of Economy. (2017). "5-Year & 20-Year National Development Plan," Available at *https://www.fiji.gov.fj/getattachment/15b0ba03-825e-47f7-bf69-094ad33004dd/5-Year-20-Year-NATIONAL-DEVELOPMENT-PLAN.aspx*.

These investments will help expand energy access and allow the country to reach its universal electricity access goal. It will help improve the quality of energy services, increase access for households from tier 1 to higher tiers of access[116], and improve reliability for business and commercial enterprises who rely on diesel generators. They will also provide the basis for the transition from polluting and inefficient diesel generators to decentralized, hybrid renewable energy systems for rural households.

Other possible investments could include contribution and collaboration with the Fiji Rural Electrification Fund for co-financing/financial risk mitigations, technical assistance, and knowledge exchange with other PICs.[117]

## Implementation Readiness

The World Bank has a longstanding with Fiji's Ministry of Finance (formerly, Ministry of Economy), which will act as the borrower. MoF will serve as intermediary to allocate CIF-REI resources effectively by on-lending or on-granting to both the DoE and EFL, who in turn will act as the Implementing Entities (IEs). MoF has excellent implementation readiness, as it works extensively with the World Bank and other donors. After a 17 percent GDP contraction in 2020 and a further 5.1 percent decline in 2021, Fiji's economy experienced a strong recovery in 2022 with an estimated 16 percent growth in 2022 attributed to a robust resurgence in tourist arrivals.[118] The IMF projects a seven percent real GDP growth for Fiji in 2023, accompanied by a decrease to 3.5 percent in inflation.[119] The fiscal deficit is also expected to improve, declining from 12.2 percent of GDP in FY2022 to a projected 7.7 percent for FY2023. Furthermore, Fiji's foreign exchange reserves remain comfortable at 6.2 months of prospective imports, supported by concessional financing and remittances.[120] Moreover, Government has acknowledged the need for a fiscal consolidation plan as a way of dealing with the longer-term structural risks associated with an economy with still high levels of public debt, heavily dependent on tourism, and susceptible to natural disasters.[121]

The World Bank has extensive experience working with DoE which reports to the Minister for Public Works, Transport, and Meteorological Services, and is responsible for developing energy policies and sector strategy, including government policies on renewable energy.[122] The DoE is also responsible for rural electrification. Since its inception, DoE has installed more than 400 generators and some 100 kilometers of low-voltage distribution to expand electricity access to rural areas.[123] DoE typically transfers the operation of the systems to rural communities or—if the area is part of EFL's service area—has EFL undertake construction and operation. As of 2023, responsibility for the FREF was also transferred from Fiji Development Bank to DoE.[124]

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[116] See the Multi-Tier Framework for energy access: *https://mtfenergyaccess.esmap.org/*.
[117] As of 2023, FREF is administered by the Department of Energy.
[118] International Monetary Fund. (2023). "IMF Staff Completes 2023 Article IV Mission to Fiji." Available at https://www.imf.org/en/News/Articles/2023/03/21/pr2386-fiji-imf-staff-completes-2023-article-iv-mission-to-fiji
[119] International Monetary Fund. (2023). "Republic of Fij." Available at https://www.imf.org/en/Countries/FJI#whatsnew
[120] International Monetary Fund. (2023). "IMF Staff Completes 2023 Article IV Mission to Fiji." Available at https://www.imf.org/en/News/Articles/2023/03/21/pr2386-fiji-imf-staff-completes-2023-article-iv-mission-to-fiji
[121] World Bank. (2023). "Fiji Public Expenditure Review" p.3
[122] IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific," p. 83
[123] IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific," p. 83
[124] Launched during Fiji's COP23 Presidency with support from the Leonardo DiCaprio Foundation (LDF), the fund provides renewable energy to Fiji's outlying islands and villages. Together with Sunergise (Fiji) Limited, the Fiji Locally Managed Marine Area Network (FLMMA) and the Fiji Electricity Authority (FEA), FREF seeks to bring solar power to communities with no electricity or that rely on pollution-emitting diesel generators. The goal of the program is for the communities served to receive round-the-clock electricity services from solar and battery hybrid systems for the same or less money than they would spend on fossil fuels to run diesel generators for only three to four hours a day.

DoE has roughly US$100 million in projects planned under the NIIP, with a focus on rural hydropower generation, zero energy building deployment, and re-charging stations.

As noted above, DoE is responsible for rural electrification in areas outside of EFL's mandated service areas. The department has been tendering hybrid mini-grids as Engineering Procurement and Construction (EPC) contracts through its online portal, with local authorities operating the schemes. These tenders have only included the building component of the electrification schemes and not their operation. All procurements by the DoE are conducted through the government's Procurement Office as per the Financial Management Act's Procurement Regulations of 2010. All tenders for rural electrification are published on the Procurement Office's website. The DoE is also open to receiving unsolicited bids for rural electrification from RE sources. Currently, there is no public procedure to manage unsolicited bids and all bids are managed on a case-by-case basis.

### Rationale for REI Financing

Financing under the REI Program has the potential to reduce the cost of power supply to end-users in outlying islands, many of whom are in rural and lower-income areas. This will allow government to continue to provide affordable service to the most vulnerable.

The GoF subsidizes electricity for low-income residential customers and small and medium-sized businesses, in order to ensure affordable access regardless of income and to stimulate local economic activities and job creation. The generous terms of CIF financing blended with World Bank concessional financing will help to keep the line extensions affordable for end-users while limiting Government's debt service outlays, especially in the earlier years.

In addition, the investments would allow the islands to decarbonize their power supply especially for users who rely on diesel-based self-generation, and contribute to the economic development through the provision of more reliable power.

### Results Indicators

The results indicators to be monitored throughout implementation of this component will include the following:

- Number of customers connected to the grid (by gender and type of customer)
- MWh of clean energy consumed by customers benefiting from the connections
- The volume of global ($CO_2$) and local (NOx, SOx, and particulates) emissions offset by providing access to a cleaner mix of energy
- MW of new renewable energy capacity installed as an indirect result of the grid investments.

### Financing Plan and Financial Instruments

The table below describes the financing foreseen by various parties.

| Financing source | CIF | | | Others | | |
|---|---|---|---|---|---|---|
| **Component** | **CIF Financing** | **Project Preparation (Grant)** | **Total CIF** | **World Bank** | **Private Sector** | **Total** |
| Electrification of Outer Islands | 33 | 2 | 35 | 15 | | **50** |

## Project Preparation Timetable

| Project Preparation Step | Timeline And Milestones |
|---|---|
| Community consultations and TA | Q1/2 2024 |
| Preliminary feasibility studies for identified lines | Q2 2024 |
| Environmental and Social Safeguards studies | Q3 2024 |
| Feasibility studies | Q3 2024 |
| World Bank Board approval | Q4 2024 |

## Project Preparation Needs

Project preparation would include consultations with communities on the selected islands to assess households' affordability, productive uses of energy, land ownership, environmental and social risks and mitigation measures, and technical/engineering aspects of the investments. The team will also assess the institutional, policy and regulatory framework that would allow sustainable operation of outer island electrification schemes. Based on these findings, preliminary feasibility studies will be carried out that will inform the project design, economic and financial feasibility, and implementation arrangements. These studies will, among other things, thoroughly evaluate the cost effectiveness of transmission lines in comparison to alternative investments, such as off-grid or mini-grid solutions. The intent will be to ensure optimal investment allocation and determine the most technically viable option for each area. For instance, while in outer islands the grid approach may be preferred, as the area size is small and the centralized generation source is easier to manage and maintain compared to isolated grids, the reverse may be true in other places, such as Viti Levu, where communities might benefit from an alternative solution, such as the one being studied by USTDA, in collaboration with GGGI and XENDEE Corporation, which aims to support up to 75 solar-powered mini-grids with energy storage, as discussed in Section 6.

Project preparation would also include the development of several activities targeting women and other vulnerable groups in order to ensure that they benefit equally from the economic opportunities generated by the electrification schemes. These activities would include fostering female and vulnerable group participation in the renewable energy sector, which could be facilitated by the introduction targeted bursaries and scholarships, focused outreach to female and vulnerable group students and upskilling training on hybrid renewable energy systems maintenance. It could also include direct support for increased female and vulnerable group representation in electrification decision-making through quotas.

## Environmental and Social Issues

The investments financed under this project present very limited social and environmental risks. New transmission lines and substations, as well as any investments in generation and storage would follow World Bank Safeguard Policy and GoF's requirements.

# APPENDIX B. RANKING OF POSSIBLE PROJECTS

Projects from the NIIP, NDC Implementation Roadmap and EFL's PDP were grouped into categories of investments that CIF had indicated were eligible for REI funding. The table below shows these categories.

| Opportunity | Possible CIF Engagement through REIIP | REIP activity category |
|---|---|---|
| **T&D for RE Projects** | Potential T&D projects could include grid interconnection to integrate regional markets and increase their flexibility. It could also include new and smart grids, both large and small scale, that complement each other and enable new ways to manage variable renewable energy generation. | Enhancing infrastructure to be renewable energy-ready |
| **Energy Storage & Grid Management Technologies** | Energy storage solutions could include all types of storage technologies, such as batteries, pumped hydro, and green hydrogen, which can back up the variability of renewables and provide various services. Grid management technologies could include new technologies for real-time grid management that enhance electricity system flexibility and facilitate distributed generation, such as advanced metering systems, wireless network control, and DSM, including outreach to specific users. | Scaling up renewable energy-enabling technologies |
| **Electrification of Land Transport Sector** | This would include the introduction of EVs, and EV-charging infrastructure. | Scaling up renewable energy-enabling technologies |
| **Electrification of Maritime Transport Sector** | This would include any technology that would help make Fiji's maritime transport sector low-carbon. | Scaling up renewable energy-enabling technologies |
| **Rural Electrification** | There may be an opportunity to support re-charging stations or grid upgrades needed to shift from diesel-only to hybrid systems in rural communities. In addition, CIF could finance the connection and other grid infrastructure costs of rooftop solar connections in rural communities. | Enhancing infrastructure to be renewable energy-ready |

These categories of projects were then ranked against 12 CIF REI criteria. The criteria were, in some cases, recharacterized slightly or simplified to capture what stakeholders understood to be the intent. The original REI IP criteria, and the criteria used by GoF are compared in the table below.

| REI IP Criteria | Simplified Criteria |
|---|---|
| Relevance | Relevance |
| Scale | Scale |
| Speed | Speed |
| Systemic change | Systemic change |
| *Adaptive sustainability* | ***Resilience*** |
| *Potential for GHG emissions reduction/avoidance* | ***Emissions reduction*** |
| *Potential to contribute to just transition* | ***Protection of vulnerable*** |
| *Value for money* | ***Financial and economic benefits (CBA)*** |
| *Mobilization potential* | ***Potential for leverage*** |
| Implementation potential | Implementation potential ***(readiness)*** |
| *Gender equality* | ***Gender equality and social inclusion impact*** |
| *Development impact potential (SDGs)* | ***Development impact*** |
| *Development impact potential (co-benefits)* | |

The ranking of each category, against each criterion, are shown in tables on the following pages. The highest-ranked groups were (i) Transmission & distribution investments for renewable energy projects; (ii) rural electrification, and (iii) Energy Storage & Grid Management Technologies. It was ultimately decided that the focus of Fiji's REI IP should be on (i) and (ii) because of the priority these types of investments for Fiji, and because such investments are necessary precursors to eventual, expanded investment in (iii).

| Criteria | T&D for RE Projects | Energy Storage & Grid Management Technologies | Electrification of Land Transport Sector | Electrification of Marine Transport Sector | Rural Electrification |
|---|---|---|---|---|---|
| **Relevance** | 5<br>Fiji needs more RE generation to achieve its climate goals, which require significant investments in T&D | 4<br>Highly relevant to managing VRE; but transmission is more important at this stage, as Fiji is still figuring out how to expand RE generation | 3<br>Land transport sector is primarily dependent on hydrocarbons and plays a significant role in total transport emissions | 2<br>Maritime transport sector is primarily dependent on hydrocarbons but is responsible for only a fraction of total transport emissions | 5<br>Fiji is committed to provide electricity for all. Many remain disconnected from the grid due to challenges of distributing power to isolated rural communities |
| **Scale** | 4<br>Electricity and other energy generation were responsible for emitting an estimated 237,124 metric tonnes CO2e in 2020 | 4<br>Electricity and other energy generation were responsible for emitting an estimated 237,124 metric tonnes CO2e in 2020 | 5<br>The land transport sector emitted an estimated 817,396 metric tonnes CO2e in 2020 | 3<br>The maritime transport sector emitted an estimated 198,500 metric tonnes CO2e in 2020 | 2<br>Difficult to quantify. Total estimated household emissions for 2020 were 28,751 metric tonnes CO2e for both urban and rural households |
| **Speed** | 5<br>Many new lines slated by EFL to begin construction in coming 1-2 years; lines can be built relatively quickly | 4<br>Could be built and installed relatively quickly, depending on the specific technology | 2<br>T&D network probably still too underdeveloped for much uptake of charging stations; no clear business model yet | 2<br>Lots of small investments with diverse ownership, so could take time to implement; would need to go through a financial intermediary | 3<br>Lines could be built relatively quickly, assuming there is enough generation |
| **Systemic change** | 5<br>Would allow for uptake of substantial new VRE, where Fiji currently has very little | 4<br>Depends on the specific technology being considered, but could be transformational if it encourages uptake of more VRE | 2<br>Change likely to be more gradual/incremental initially | 2<br>Change likely to be more gradual/incremental initially | 4<br>Would move Fiji close to 100% electrification and be transformational for unserved or underserved rural areas |
| **Resilience** | 5<br>Grid redundancy improves grid resilience during a cyclone event | 5<br>Support of VRE reduces reliance on hydro, lowering vulnerability to droughts | 2<br>Diversification of fleet fuel use helps build resilience to fuel supply disruptions | 2<br>Diversification of fleet fuel use helps build resilience to fuel supply disruptions | 4<br>Improved energy access builds resilience in remote areas most vulnerable to effects of climate change |

| Criteria | T&D for RE Projects | Energy Storage & Grid Management Technologies | Electrification of Land Transport Sector | Electrification of Marine Transport Sector | Rural Electrification |
|---|---|---|---|---|---|
| **Emissions reduction** | 5<br>Major gains in emission reductions if Fiji manages to achieve its 100 percent renewable electricity generation by 2036 | 4<br>Significant gains achievable if it leads to uptake of RE generation; there may be some marginal efficiency gains in having better grid management | 3<br>Increasing the share of HEVs and EVs may have a significant impact on emissions. However, GHG reduction/avoidance will only happen if electricity generation has more RE in the mix, so that should be a priority. | 2<br>Electrifying passenger and cargo ships could result in sizeable emission reductions, but it would not be quick due to challenges mentioned above | 1<br>Providing rural households with renewable electricity will limit the increase of GHG emissions coming from households, but will have limited impact on current emission levels |
| **Protection of vulnerable** | 3<br>Opportunities for new types of jobs for women engineers and energy professionals | 3<br>Opportunities for new types of jobs for women engineers and energy professionals | 3<br>Transition to EVs would include training for professionals working on combustion vehicles | 3<br>Potential for new types of skilled and low-skilled greens jobs built around a sustainable marine economy | 5<br>Improved energy access reduces household burdens on women in remote areas and outer islands, allowing for greater economic opportunities |
| **Financial and economic benefits (CBA)** | 5<br>Financial return is assured because of regulatory framework; economic return is large because of potential for avoided diesel once VREs are connected | 4<br>Financial return assured because of regulatory framework; economic return depends on specific equipment used but should be relatively high if it offsets diesel generation | 2<br>Economic benefits limited by fact that a lot of electricity comes from diesel | 3<br>Relatively high CAPEX costs would potentially outweigh benefits | 2<br>Financial return likely to be low (as is the case for a lot of rural electrification investment); economic return depends on extent to which diesel costs would be avoided and electricity would be put to productive use |
| **Potential for leverage** | 5<br>MDBs are keen to finance T&D and have offered to do so in the past | 4<br>MDBs keen to finance, but these are newer technologies and not as visible, so may be somewhat more difficult to make the case | 3<br>Various bilaterals and MDBs have shown interest and supported studies; FDB also looking to support | 3<br>Various bilaterals and MDBs have shown interest and supported studies; FDB also looking to support | 5<br>Likely to be substantial donor interest in rural electrification projects |

| Criteria | T&D for RE Projects | Energy Storage & Grid Management Technologies | Electrification of Land Transport Sector | Electrification of Marine Transport Sector | Rural Electrification |
|---|---|---|---|---|---|
| **Implementation potential (readiness)** | 5<br>Plans for most near-term T&D investments already in PDP and at pre-feasibility or feasibility study phase | 1<br>Few existing plans for these types of investments | 1<br>A number of donor studies have been funded, but little beyond the study stage | 1<br>A number of donor studies have been funded, but little beyond the study stage | 5<br>Department of Energy already has quite detailed plans |
| **Gender equality and social inclusion impact** | 3<br>Opportunities for new types of jobs for women engineers and energy professionals | 3<br>Opportunities for new types of jobs for women engineers and energy professionals | 4<br>New electric buses would improve accessibility over legacy buses | 3<br>Supports Fiji's continued progress in promoting inclusion in maritime industry | 5<br>Women in outer islands are more vulnerable to effects of climate change |
| **Development impact potential** | 4<br>Enable development of private utility-scale generation market | 5<br>Enables development of private sector market for distributed energy resource tech | 3<br>Reduced pollutants from combustion vehicles improves air quality | 3<br>Health benefits for fishers and other maritime crew due to both zero emissions and reduced noise of electric onboard motors | 5<br>Potential to create new economic opportunities in remote and off-grid areas |
| **Total Score and Ranks of RE Technologies** | | | | | |
| Score | 54 | 45 | 33 | 29 | 46 |
| **Rank** | **1** | **3** | **4** | **5** | **2** |

These projects best meet the CIF criteria

# APPENDIX C. INDEPENDENT TECHNICAL REVIEW

1. Title of the investment plan: **Fiji Country Investment Plan for Renewable Energy Integration Program**
2. Program under the GCAP: **CIF Renewable Energy Integration Program**
3. Name of the reviewer: **Stratos Tavoulareas**
4. Date of submission: **October 2, 2023**

**Overall Assessment**: Fiji's goal to achieve net-zero GHG emissions from the power sector by 2030 (or 2036[125]) seems ambitious, but it is feasible, as it has already roughly 70% of its electricity from renewables (hydro and bioenergy). The challenge will be to ensure that there is adequate firm capacity and ancillary services to ensure reliable power system operation (see more below). This is exactly the focus of the REI program which focuses on the integration of renewables in the power system.

The IP complies with the general and REI-specific criteria; the proposed activities are essential for the decarbonization of Fiji; and the IP is well-prepared and ready for implementation. A number of recommendations are made (and questions raised) to improve further the design and implementation of the program.

5. **Part I: General criteria**

The IP certainly complies with the general criteria indicated in Annex A; it complies with the principles, objectives and criteria of REI. Also, the capacity of the country is adequate to implement such programs; the MDBs are very active in the country and many local institutions have worked with them to implement projects and programs of similar size and complexity. While it would have been preferable for specific studies to have been carried out already, based on which the scope of the two proposed project components to be developed, there is enough relevant information to ensure that the proposed scope is appropriate; there is some risk associated with the required investment (which may change after more detailed studies have been completed), but the investment requirements should be of the same order of magnitude envisioned in the IP.

Successful implementation of the IP is transformative for Fiji, but also for many other islands around the world which need to decarbonize. Fiji could provide many lessons learned which will benefit other islands to plan and implement similar programs.

Prioritization of investments, the monitoring and evaluation plan, and the results framework are well-designed to capture the lessons learned; the dissemination could be strengthened, even though the presence of the MDBs could ensure that the lessons learned are widely disseminated.

Adequate effort has been made (including stakeholder consultation) to assess and address the environmental and social issues, including gender.

[125] The IP refers to both 2030 and 2036 as the target for decarbonization of the power sector; this needs to be clarified and be corrected.

The investments included in the IP require additional funding to the ongoing and planned funding from MDBs; and adequate justification is provided in the IP regarding their additionality.

Institutional arrangements and coordination are appropriate, but additional effort should be made to clarify the role of each ministry and the various agencies; also, to streamline their responsibilities and authority (see further comments below).

6. **Part II: Compliance with the investment criteria or business model of the REI**

The proposed IP consists mainly of strengthening and expanding the power grid, which is the enabling infrastructure for increased market penetration of renewables. Also, it provides transaction advisory support for privately-financed solar, which is the best approach to develop renewable energy in Fiji. Finally, it provides resources for capacity building, policy support and technical assistance for program planning/implementation.

The country has set clear targets for decarbonization of the power sector first (by 2030) and the economy later (by 2050). These targets are documented and supported in numerous official documents including:

- The National Climate Change Policy (NCCP), of producing 100 percent of national electricity from renewable energy sources by 2030, achieving net zero annual greenhouse gas emissions by 2050, and decarbonizing Fiji's transport sector.
- The National Energy Policy (NEP) 2023-2030—Fiji's main energy sector policy.
- The National Infrastructure Investment Plan (NIIP).
- The Nationally Determined Contribution (NDC) Implementation Roadmap.
- EFL's (the power company's) most recent 10-year Power Development Plan (PDP).

The proposed IP focuses clearly on RE integration; nearly all the proposed scope is on power grid strengthening which is needed for more REs to be integrated.

Also, the IP mobilizes $195 million more lending which will be added to the $70 million provided by CIF. The additional financing comes from World Bank, ADB and IFC loans as well as private investors.

Furthermore, the IP provides resources for technical assistance to support the Government to strengthen its policies and continuously monitor and adjust its strategy toward its ultimate goal which is decarbonization of the economy by 2050.

7. **Part III. Recommendations**

While the overall assessment of the IP is positive, a number of recommendations will be made to strengthen further the program and increase the likelihood for success. The most important recommendations are:

- ***Include balancing services activities ("group (iii)") in the IP; at least the most critical needs of the power system with regard to balancing services should be included.***
- ***A comprehensive assessment of the balancing services of the power system is needed for the planning period (present to 2050); the role of hydro and energy storage would be critical elements of this assessment.***

The projects included in the IP were selected from a long list of projects which were part of the various sector development plans and policies. These projects were ranked against the 12 REI criteria and the highest-

ranked groups were: (i) Transmission & distribution investments for renewable energy projects; (ii) rural electrification, and (iii) Energy Storage & Grid Management Technologies. Then, the decision was made to focus on groups (i) and (ii) only; ***group (iii) was excluded. This was unfortunate and I would urge the Government to reconsider*** for the following reasons:

- For the power system to operate reliably and efficiently, there are three key elements which are needed: 1) energy (MWh); 2) firm capacity (MW), which is available when needed, especially when electricity demand is at its peak; and 3) ancillary services[126], which includes back-up power, frequency and voltage support, black start, etc. All these three elements are essential.
- Balancing services (group (iii) activities) should be at the same level of importance as the power grid strengthening (group (i) above). This is because if the power grid is strengthened without having the required balancing services, it can not deliver the necessary reliability of power supply.
- Comparing groups (i) and (iii) to group (ii), which is rural electrification of the remaining 4% of Fiji's population, is not easy as they outcomes are very different. One could argue that group (ii) activities aim to electrify 4% of the population, but if groups (i) and (iii) are not implemented adequately, 96% of the population may not have reliable power supply.

***So, the recommendation is to expand the group (i) to include balancing services*** (group (iii) components)***. At least start with the most critical balancing services needs and add more in the future as more resources become available.*** As it is be mentioned below, there may be opportunities for shifting resources to group (iii) activities; also, the overall investment envelop may be enlarged. ***What specific balancing service activities should be prioritized and included in this program should be the result of a comprehensive assessment of the needs of Fiji's power system over the planning period*** (see more details below).

***A comprehensive power system plan should be developed, which, in addition to the required energy and firm capacity*** (typical power system planning analysis)***, ensures that the power system has adequate balancing (ancillary) services to operate reliably and efficiently. This plan should be added to the proposed technical assistance proposed***. A few more specifics on this study:

- Hydroelectric resources are very important in achieving net zero emissions in the power sector. Both the existing and the future hydro plants need to be looked at from the perspective of the evolving needs of the power system and not based on historical norms. More specifically, a lot of these plants may have been providing energy when the water was available; in the future, the hydro plants would be needed to provide firm capacity (especially at times of peak demand) and ancillary services, which will be in short supply and would be very valuable. Hence, the existing plants may need to be modified and the new plants be designed with the emerging needs of the power system in mind. Without hydro, elimination of thermal power plants would not be possible. It is recognized that hydro projects have often negative environmental and social impacts, but these impacts need to be assessed and mitigated; in some cases where the impacts are severe, hydro projects may not be implemented.
- A comprehensive assessment of all the hydro resources of Fiji should be carried out including the potential for pumped storage hydro (PSH) inland as well as in the coastal areas. PSH is a very important option going forward.

[126] From here on I will refer to group (iii) above as "Balancing Services" because it is broader than just energy storage and describes better what the power system needs. Of course, energy storage is a critical element, but it is not the only one.

- Assessment of the balancing service needs of the power system requires comprehensive analysis which includes both normal and abnormal operating conditions. For example, it should assess how the power system will operate if a major component has failed (often referred to in the power industry as "N-1 analysis"); such components may include the largest power plant, all or the majority of solar or wind, an important transmission line, etc. Steady-state analysis, which is common in power system planning, is not adequate; detailed power system operation and dynamic analyses would be needed.
- In page 16, it is mentioned that there is competition for the land resources which may set limits to how much renewable energy can be produced. A clear plan with the available land resources should be developed, which in turn provides a basis for estimating the practical maximum renewable energy that can be produced.

**Additional comments and questions**

A number of comments have been embedded in the IP document. The main ones are mentioned here too.

- As mentioned above, the net zero target for the power sector should be clarified; is it 2030 or 2036? The document mentions both.
- Similarly, (especially in Section 2), the contribution of various fuels (e.g., biofuels; hydro; liquid fuels) to the power generation mix vary. The numbers need to be consistent throughout the document.
- Page 13 states the "*EFL should develop new tariff methodology*". Shouldn't this be done by FCCC? The new methodology should consider the (potentially substantial) increase in the costs of firm capacity and ancillary services.
- It is not clear what agency is responsible for monitoring and implementing the IP. This agency should have the responsibility and the authority to decide. Coordination with the multiple ministries and agencies would be a challenge and efforts need to be made to improve it.
- Is component 2 of the IP adequate to electrify the remaining population which does not have access to energy? I am asking this because the scope of Component 2 is exclusively grid expansion; no off-grid and mini-grid installations. Yet, page 59 mentions a US TDA study which aims to identify 75 mini-grids solar-powered projects with energy storage. So, the key questions: 1. Is the proposed scope going to achieve the 100% electrification goal? and 2. Has the cost-effectiveness of grid expansion been established vs. off-grid and mini-grid systems? For some of the rural area consumers grid expansion may be more cost-effective but for others off-grid or mini-grid options may be more attractive.
- The decision to encourage the private sector to finance the renewable power projects is certainly the correct one. If the tenders are well and the projects are de-risked, they will result in very competitive tariffs.
- One question on the guarantee facility: considering that EFL's recent financial condition is rather good, is there a need for such guarantees?
- Connecting to a previous comment about potentially shifting some financing to support group (iii) activities (balancing services, especially energy storage): elimination or reduction of the guarantees may be one source of increased funding; another source may be re-evaluation of the rural electrification activities.

## Response to Independent Technical Review

The Ministry of Finance very much appreciates the Independent Reviewers' valuable comments and has endeavored to reflect these comments in the current REI IP. Below, we provide a comment matrix with our response to each individual recommendation/comment provided.

**Overall Recommendations**

| # | Recommendation/Comment | Response |
|---|---|---|
| 1 | Include balancing services activities ("group (iii)") in the IP; at least the most critical needs of the power system with regard to balancing services should be included. | Agreed, we have included the possibility of investments and technical assistance on balancing services under Component 1. |
| 2 | A comprehensive assessment of the balancing services of the power system is needed for the planning period (present to 2050); the role of hydro and energy storage would be critical elements of this assessment.<br>- The recommendation is to expand the group (i) to include balancing services (group (iii) components). At least start with the most critical balancing services needs and add more in the future as more resources become available.<br>- What specific balancing service activities should be prioritized and included in this program should be the result of a comprehensive assessment of the needs of Fiji's power system over the planning period. | Agreed, we have included the possibility of investments and technical assistance on balancing services under Component 1, and the assessment of balancing services can be done as part of project preparation. |
| 3 | A comprehensive power system plan should be developed, which, in addition to the required energy and firm capacity (typical power system planning analysis), ensures that the power system has adequate balancing (ancillary) services to operate reliably and efficiently. This plan should be added to the proposed technical assistance proposed. | Agreed, we have now included this under Component 1 (but it would also cover outer islands under Component 2). |

**Additional Comments**

| # | **Comments** [page] | **Response** |
|---|---|---|
| 1 | As mentioned above, the net zero target for the power sector should be clarified; is it 2030 or 2036? The document mentions both. [from email] | Thank you. That is correct. While some policies, namely the National Climate Change Policy, the National Energy Policy, and the Nationally Determined Contribution set a target of *"as close to 100 percent renewable energy as possible"* by 2030, both Fiji's National Development Plan and National Infrastructure Investment Plan set a more concrete goal of 100 percent renewable generation by 2036. In order to avoid any confusion, we have adopted this latter target year – 2036 – throughout this report. |
| 2 | Similarly, (especially in Section 2), the contribution of various fuels (e.g., biofuels; hydro; liquid fuels) to the power generation mix vary. The numbers need to be consistent throughout the document. [from email] | Thank you. We have made sure that the numbers are consistent throughout the document. This was achieved by standardizing our data sources, and only using the most reliable and up-to-date information regarding Fiji's current power generation mix. |
| 3 | Page 13 states the "EFL should develop new tariff methodology". Shouldn't this be done by FCCC? The new methodology should consider the (potentially substantial) increase in the costs of firm capacity and ancillary services. [from email] | You are correct. We have now updated the report with the correct information. We have also included a mention of the need to consider the potentially substantial increase in the costs of firm capacity and ancillary services. |
| 4 | It is not clear what agency is responsible for monitoring and implementing the IP. This agency should have the responsibility and the authority to decide. Coordination with the multiple ministries and agencies would be a challenge and efforts need to be made to improve it. [from email] | We have made this clearer by expanding on the implementation arrangements under Section 8. |

| # | **Comments** [page] | **Response** |
|---|---|---|
| 5 | Is component 2 of the IP adequate to electrify the remaining population which does not have access to energy? I am asking this because the scope of Component 2 is exclusively grid expansion; no off-grid and mini-grid installations. Yet, page 59 mentions a US TDA study which aims to identify 75 mini-grids solar-powered projects with energy storage. So, the key questions: 1. Is the proposed scope going to achieve the 100% electrification goal? and 2. Has the cost-effectiveness of grid expansion been established vs. off-grid and mini-grid systems? For some of the rural area consumers grid expansion may be more cost-effective but for others off-grid or mini-grid options may be more attractive. [from email] | Thank you. It is correct that, in some areas, other solutions such as off-grid and mini-grid installations may be preferred. It is likely that, for outer islands, the grid approach may be preferred as the size is small and the centralized generation source is easier to manage and maintain compared to isolated grids. The reverse may be more cost effective in other places, such as Viti Levu. The cost effectiveness of these lines will be re-evaluated as part of project preparation in order to ensure optimal resource allocation and in order to determine the most technically viable option for each area.<br><br>Regarding your question on the proposed scope, we believe that much if not all of the off-grid areas could be served by properly designed transmission alone. When combined with other solutions, which may be more economical in certain areas (as it will be revealed once preparation studies are carried out), the goal of 100% electrification is achievable. |
| 6 | The decision to encourage the private sector to finance the renewable power projects is certainly the correct one. If the tenders are well and the projects are de-risked, they will result in very competitive tariffs. [from email] | Agreed. Recent experience in the Pacific indicates that tariffs from competitive tenders for solar, for example—even with substantial storage—are well below the levelized cost of diesel generation. |
| 7 | One question on the guarantee facility: considering that EFL's recent financial condition is rather good, is there a need for such guarantees? [from email] | The thinking is that Guarantees could cover risks other than offtake risk, for example:<br><br>1. 6-9 months of payments in case of default events, termination to address timely debt service<br>2. Climate change related first loss (which can make it easier for insurers to come in and offer reasonable premiums). Big issue in the Pacific<br>3. Transmission connectivity upfront or during the lie of the project (provide more comfort compared to a take or pay arrangement)<br>4. Potentially currency risk<br>5. Helping local banks get comfortable to extend tenors<br>We have now added this text in the document. |
| 8 | I understand but (iii) is essential for grid balancing, reliability and safe operation [page 2] | Agreed. We have now included the need for balancing investments under Component 1. |
| 9 | should this be 18? see figure below [page 7] | Yes, that is correct. We have updated the report to reflect the correct figure. |

| # | **Comments** [page] | **Response** |
|---|---|---|
| 10 | Electricity produced by what primary energy source? [page 7] | Thank you. This would be electricity produced by all sources. "Electricity" in this context refers to gross electricity production, which is the sum of the electrical energy production by all the generating units/installations concerned (but excluding from pumped storage) measured at the output terminals of the main generators We have included a note under the relevant figure 4 providing this explanation. |
| 11 | Clarify the legends of the figure especially the right side [page 7] | Thank you for the feedback. We have made sure to clarify the legends in our final report. |
| 12 | 40%V vs 35%. Should these be the same? [page 8] | Thank you. Yes, they should be the same. We relied on two different data sources initially, which has led to this discrepancy. We acknowledge that this may lead to confusion and have decided to solely rely on EFL data for this section, which is the most reliable and up-to-date source of information when it comes to generation data for Fiji. |
| 13 | A lofty goal. It can be achieved but more emphasis on balancing services is needed [page 9] | We have now noted the need for balancing services and incorporated possible investments in balancing services under Component 1. |
| 14 | Different from 2030? or this is a typing error? [page 11] | No, that is not a typing error. While some policies, namely the National Climate Change Policy, the National Energy Policy, and the Nationally Determined Contribution set a target of *"as close to 100 percent renewable energy as possible"* by 2030, both Fiji's National Development Plan and National Infrastructure Investment Plan set a more concrete goal of 100 percent renewable generation by 2036. In order to avoid any confusion, we have adopted this latter target year – 2036 – throughout this report. |
| 15 | What about EFL's 10-year Plan. Doesn't this cover the whole power sector? It should. If not done already, it should be developed collaboratively with all the key stakeholders including Ministries, Regulator, the public, advocacy groups etc. [page 12] | Agreed. One of our recommendations on sector reforms—which was perhaps not clear in the draft—is to have a sector-wide power development plan that is led by Government and includes EFL's service areas as well as service areas under DoE. We have tried to make that clearer in this draft. |
| 16 | The methodology should be developed by the Regulator or the Ministry; not EFL [page 13] | Agreed. We have amended the text accordingly. |
| 17 | Furthermore, it should be expected that balancing services cost will increase with increasing RE market penetration and they should be reflected appropriately in the tariff calculation [page 13] | Agreed. |

| # | **Comments** [page] | **Response** |
|---|---|---|
| 18 | This is an opportunity to encourage/support gender initiatives [page 14] | Thank you. We have included discussion of a number of potential interventions to ensure that women equally benefit from the economic opportunities generated by the proposed investments. |
| 19 | Balancing services need to be added (energy storage; back-up; black start; frequency and voltage support: etc.) [page 14] | Agreed, we have now added this. |
| 20 | This is fine for data collection and analysis, but not to ensure coordinated plans and implementation [page 15] | Agreed. We have now emphasized (in other sections) the need for coordinated planning for the sector as a whole. |
| 21 | Fully agree but it would be wise to have a comprehensive assessment of the firm capacity and balancing needs of the power system based on which it is decided what needs to be added and when. Pumped storage and in general storage hydro should be included in the assessment; also demand response and longer term the use of EV batteries for power system balancing [page 15] | Thank you. As noted in responses to other comments, we have now acknowledged the importance of assessing and incorporating balancing investments into the IP. |
| 22 | This sounds line a serious barrier and needs to be assessed carefully to set practical limits for REs [page 16] | Agreed. This will be assessed as part of project preparation, and we have added text noting this under Component 1. |
| 23 | Above it says 60% [page 22] | Thank you. We used two different data sources to write this section but have since been able to get all the information from EFL report. As a result, we decided to rely solely on EFL data, since it has the most up-to-date information on generation. In addition, this approach also allows us to ensure consistency throughout the report. |
| 24 | Not clear [page 23] | Thank you for the feedback. We have made sure to clarify the legends in our final report. |
| 25 | Above it says 60% [page 23] | Thank you, you are correct. That was due to rounding the actual figure of 58.5 percent. We have now used 58.5 percent throughout this section to avoid any confusion. |
| 26 | Which Ministry is responsible? Does it have the authority to coordinate among all key stakeholders? [page 29] | Responsibility or climate change is with the Climate Change and International Cooperation Division (CCID). CCID now sits under the Prime Minister's Office; was formerly under Ministry of Finance. |
| 27 | Is hybrid diesel+RE? If so, the diesel part of the hybrid would need to stop operating by 2036 [page 31] | It is foreseen that they would initially be diesel+RE hybrids and we agree with the comment that these would need to be transitioned away from diesel in order to meet the 2036 goal. |

| # | **Comments** [page] | **Response** |
|---|---|---|
| 28 | Is there Ministry of Environment? [page 32] | Yes, there is a Ministry of Waterways and Environment (MoWE). We have included a description of MoWE, and their role in Environmental Impact Assessments of large-scale projects, including large-scale renewable energy projects. |
| 29 | If indeed FCCC sets the tariff methodology, the text above (early in the IP) which says that EFL sets the methodology should be corrected [page 37] | Thank you. We have corrected the text above, and changed it from EFL to FCCC, which is the correct entity. |
| 30 | I assume that FCCC recommends regulations which are approved by the Parliament. Then FCCC monitors and implements along with the Ministry of Energy. These roles need to be clarified [page 37] | FCCC has the ability for instance to update its tariff methodology from time to time, as that is clearly stated in the Electricity Act. It is also able to set out the technical standards in the electricity sector in terms of connection and operation requirements for generators supplying electricity to the national grid. It does not need Parliamentary approval to do that, as long as it is acting within the limits set out by the Electricity Act or any other legislation. |
| 31 | 2036? [page 38] | Yes, that is correct. We updated the report with the correct year. |
| 32 | Unsolicited bids are not the preferred way to go for two main reasons: 1. They may not be the lowest cost; or at least one can not prove that they are the lowest cost; and 2. the hydro plants in the future should be designed with the power system needs and priorities in mind; this may involve changing the role of hydro from maximizing energy production to providing firm capacity and ancilalry services (being the flexible energy source in the system). This can only be done with comprehensive power system planning and solicited bids specifying the right project design [page 38] | We absolutely agree with this comment. The intent of the reforms running in parallel with project preparation will be to end this modality of procurement and have competitive tenders. |
| 33 | Please clarify. Above says that 96% of the population has access to energy; this sentence conveys a different message [page 52] | Thank you, this was an error based on outdated information. The 96% number is correct. We have updated the report to provide the correct information. |
| 34 | What is the status of this study? It may shape or at least impact the second component of the proposed IP | The study is in its initial stages. The funding for the study was only granted in May of this year (2023), and no information has been released regarding the expected date of publication. |

| # | **Comments** [page] | **Response** |
|---|---|---|
| 35 | Are these studies likely to change the scope and investment requirements of this project component? If so, this is a risk that should be reflected in the risk matrix<br>- It seems that these studies have not been done yet | We have now noted as a possible risk in the risk matrix the possibility that mini-grids may compete with new transmission lines and vice versa and the need for close coordination between this study and studies being undertaken as part of project preparation with DoE and EFL. |

# APPENDIX D. STAKEHOLDER CONSULTATIONS

A mix of virtual and in-country stakeholder consultations were undertaken between November 2022 and October 2023. Stakeholders consulted are indicated below, grouped by organization.

## GENERAL CONSULTATIONS

**World Bank**

1. Mr. Mitsunori Motohashi, Pacific Hub Energy Program Coordinator
2. Mr. Kamleshwar Khelawan, Senior Energy Specialist and World Bank Lead
3. Ms. Slavena Georgieva, Energy Specialist

**Asian Development Bank (ADB)**

1. Mr. Len George, Principal Energy Specialist and ADB Lead
3. Mr. Ranishka Wimalasena, Energy Specialist
4. Ms. Katherine Guy, Infrastructure Specialist
5. Mr. Karan Chouksey, Climate Finance (Energy) Specialist

**International Finance Corporation (IFC)**

1. Mr. Bilal Aslam, Investment Officer

**Office of the Prime Minister**

1. Ms. Deepitika Chand, Senior Climate Change Officer (Mitigation)

**Ministry of Finance, Strategic Planning, National Development and Statistics**

1. Mr. Kamal Gounder, Manager/Coordinator, Infrastructure Sector, Budget & Planning Division
2. Ms. Ranjila Singh, Mitigation Specialist, Climate Change and International Cooperation Division
3. Ms. Malvina Singh, Senior Budget Analyst, Infrastructure Sector, Budget & Planning Division

**Ministry of Infrastructure and Meteorological Services**

1. The Honorable Mr. Ro Filipe Tuisawau, Minister
2. Mr. Taitusi Vakadravuyaca, Permanent Secretary
3. Mr. Mikaele Baleti, Director, Department of Energy
4. Mr. Deepak Chand, Deputy Director, Department of Energy
5. Mr. Taniela Tabuya, Principal Scientific Officer, Department of Energy
6. Mr. Jonati Delaimoala, Senior Scientific Officer, Department of Energy

**Ministry of Commerce, Trade, Tourism & Transport**

1. Mr. Shaheen Ali, Permananet Secretary
2. Ms. Faranisese Kinivuwai, Director Transport
3. Ms. Jacinta Lal, Principal Tourism Officer
4. Ms. Sherine Lata, Principal Transport Planner
5. Ms. Aseri Driu, Senior Transport Planner

**Fiji Development Bank**

1. Saul Minam, CEO
2. Setaita Tamanikaiyaraoi, Climate and Eco Finance Manager

**Other Development Partners**

1. Mr. Kapchae Ra, Country Director, Korea International Cooperation Agency

2. Mr. Uliasi Butukoro, Korea International Cooperation Agency
3. Mr. Patrick Ramananarivo, Head of Section, Climate Change, Environment, and Energy, Delegation of the European Union
4. Ms. Roxane Castelein, Programme Manager, Delegation of the European Union
5. Mr. Benoit Cambier, European Investment Bank Representative for the Pacific

**Energy Fiji Limited (EFL)**

1. Mr. Hasmukh Patel, Chief Executive Officer
2. Mr. Chitoshi Fukuka, Deputy Chief Executive Officer
3. Mr. Bobby Naimawi, Chief Operating Officer
4. Mr. Khrisneel Prasad, General Manager Special Projects
5. Mr. Om Dutt, General Manager-System Control & Planning

**Fiji Competition and Consumer Commission**

1. Mr. Avneet Singh, Senior Market Analyst (Energy)
2. Ms. Lice Dakunimata, Market Analyst (Energy)
3. Ms. Tulia Dicoka, Market Analyst (Energy)

**Private Sector**

1. Mr. Ajay Raniga, CEO, Sunergise
2. Mr. Peter Nuttal, Member, Micronesian Center for Sustainable Transport

## GENDER AND SOCIAL CONSULTATIONS

Separate consultations were also undertaken to specifically focus on gender-related and social issues. These included interviews, a focus group discussion, and a workshop hosted at the Ministry of Women, Children and Social Protection on August 23, 2023.

The consultation process started with interviews with relevant government, financial institutions, utilities, and regional and multilateral organizations. A full list of the stakeholders consulted is provided below. Except for one online interview, face-to-face, in-depth interviews were held in Suva. An explanation of the project was presented, and the following questions guided the discussion:

- Do you have an organizational policy or program that addresses gender and energy?
- What are the gender challenges and barriers faced?
- How can/does your organization address these challenges?
- What opportunities are there for this project to mitigate these challenges?

**List of Organizations and Persons Consulted**

| Government | Description | Name & Position | Comment |
|---|---|---|---|
| Department of Women - Ministry of Women, Children & Social Protection (MWCSP) | This is the government's women's machinery and national focal point responsible for gender and women's development | Eseta Nadakuitavuki - Permanent Secretary | An in-person meeting was held with the PS.<br>Ms Mawa attended the stakeholder talanoa session |
| | | Selai Koroivusere - Director, Department of Women | |
| | | Raijeli Mawa - Senior Women's Development Officer | |
| Department of Energy - Ministry of Infrastructure and Transport | The department is the focal point for implementing the National Energy Policy and responsible for Rural Electrification | Mikaele Belena - Director | A meeting was held with the team who then attended the stakeholder talanoa session |
| | | Deepak Chand - Deputy Director | |
| | | Taniela Tabuya -Principal Scientific Officer | |
| | | Vishal Prasad - Senior Scientific Officer | |
| | | Jonati Delaimoala - Senior Scientific Officer | |
| Budget and Planning Division, Ministry of Finance (MoF) | The Manager of this division is the gender focal point of the MoF. The MoF will be the recipient of funds from the CIF on the behalf of the Government of Fiji | Kelera Kolivuso Ravono - Manager, Budget and Planning Division | An in-depth interview in-person was conducted |
| Climate Change Division, Prime Minister's Office (PMO) | Previously under the Ministry of Economy, this division is now under the PMO. It is Fiji's national focal point to the GCF. | Mereani Nata - Climate Finance Officer | An in-depth interview in-person was conducted |
| Department of Environment, Prime Minister's Office | Previously under the Ministry of Environment, the department | Sandeep Singh - Director | An in-depth interview in-person was conducted with both officers |
| | | Salvin Deo - Principal Environment Officer | |
| **Financial Institution** | | | |

| | | | |
|---|---|---|---|
| Fiji Development Bank | The only organization in Fiji that is accredited to the GCF | Saud Minam - CEO<br>Setaita Tamanikaiyaroi - Manager Climate & Eco Finance | An in-depth interview in-person was conducted with both officers |
| **Public Utility** | | | |
| Energy Fiji Limited | | Annabel Ducia - General Manager, Customer Services<br>Yvonne Fatiaki - Manager, Legal | An in-depth interview in-person was conducted with both officers |
| **Regional Organizations** | | | |
| Georesources and Energy Programme (GEP), Geoscience, Energy and Maritime Division, Pacific Community (SPC) | SPC is the regional scientific and technical intergovernmental organization. GEP provides support in the move toward a green economy | Florence Ventura -Acting Deputy Director, GEP<br>Shane Harrison, Gender Adviser, GEP | An in-depth interview in-person was conducted with both officers |
| Pacific Power Association (PPA) | PPA is a regional intergovernmental to promote the direct cooperation of Pacific Island power utilities | Gordon Chang - Acting Executive Director (ED)<br>Reena Suliana | Telephone contact with the ED followed by referral to WB gender adviser |
| **Multilateral Organizations** | | | |
| World Bank, Pacific Women in Power (PWIP) Program | WB partnership with PPA to deliver on the PWIP program in collaboration with SPC | Lilika Fusimalohi - Senior Pacific Gender Specialist (consultant) | An in-depth interview online as a referral from PPA |
| UN Women Pacific office | Works with governments and NGOs to address gender inequality, empower women and build more inclusive societies | Laisani Petersen - Technical Adviser, to the Department of Women | She participated in the stakeholder talanoa session |
| ADB Pacific subregional office | Serves as the focal point of ADB for programming, processing, and administering assistance in Fiji and other Pacific Island countries. | Uzma Ultaf - Gender Adviser | An in-depth interview in-person was conducted |

## Summary of Information Gathered

**Department of Women, Ministry of Women, Children & Social Protection (MWCSP)**

The Department of Women is the national women's machinery of government and the focal point for the National Gender Policy (2014),[127] which is the overarching national gender policy. The policy explicitly refers to access to energy,[128] which emphasizes the need to implement a policy of access to energy to ensure that women are consulted in any energy projects, recognize that rural women have the most limited access to energy sources including access to renewable energy sources; and monitor the detrimental effect on the health of women and ensure affordable access to energy sources. MWCSP recently launched the Fiji Country Gender Assessment[129] which identifies the following energy-related gender challenges:

- Parents, teachers, and school committees have gender biases that prevent school-age girls developing interests and educational opportunities in STEM and STEM-related fields. Due to their lower levels of STEM training, Fijian women are not well-positioned to secure work in some emerging digital and technical fields.
- In rural areas, women spend up to 80 hours per week on unpaid care work, whereas men spend as little as 30 hours per week on similar tasks. Women are expected prioritize caregiving as their primary role and those who work outside the home often face criticism and may even experience violence for disrupting cultural norms.
- Nearly two-thirds (64%) of Fijian women experience intimate partner violence (IPV), including physical violence (61%) and emotional violence (58%). More than four in 10 women (44%) experience severe physical violence.
- Poverty is recognized as a significant contributing factor of violence against women and girls (VAWG); however, promoting women's economic empowerment may also have unintended DV consequences. For example, there are cases of men rebuking their wives when the wives' income-generating activities interfere with their domestic responsibilities, or of men demanding and/or controlling the money that their wives earn.
- Most working Fijian women are engaged in informal employment characterized by a lack of job security, irregular income, and no social protection.

[127] Available at *https://www.fiji.gov.fj/getattachment/db294b55-f2ca-4d44-bc81-f832e73cab6c/NATIONAL-GENDER-POLICY*AWARENESS.aspx
[128] Ibid, Section 5.15 (pp. 24-25)
[129] Available at *https://www.mwcpa.gov.fj/wp-content/uploads/2023/04/FCGA_PolicyBriefs-FINAL-FOR-PRINTING-21-FEB2023.pdf*

- Throughout Fiji, biomass (firewood and crop residue) and kerosene represent the main sources of cooking fuel; two-thirds of households rely on open cooking fires without a chimney, and most cooking occurs in interior spaces. Fijian women spend, on average, nearly two hours per day exposed to cooking fumes, compared to men who spend an average of 24 minutes per day, and women experience health problems linked to smoke exposure at twice the rate of men.[130]

During the interview, MWCSP also highlighted that there is an *opportunity to train rural women as solar engineers*. The Ministry is constructing the Fiji Barefoot Vocational Training College in Vanua Levu. Barefoot College is a solar electrification training center jointly supported by the Government of Fiji and the Government of India, the first of its kind in the Pacific. The goal is to empower rural women in Fiji to be solar engineers, build local capacity and electrify the poor, "off-the-grid" communities with clean, low-cost solar energy. The college will provide solar engineering training for mothers and grandmothers because women, especially older women normally stay in their community.

**Department of Energy (DoE), Ministry of Infrastructure and Transport (MoIT)**

The Department is the focal point for the *National Energy Policy 2023-2030*[131] a recently revised policy stated as the blueprint toward a highly sustainable, inclusive, reliable, and affordable energy services sector for the government of Fiji's target of net zero carbon emissions by 2050. The policy seeks to directly improve gender equity, equality, and empowerment through targeted objectives that address the nexus between gender and energy issues in addition to a focus on ensuring that Fiji's energy sector development brings about a just transition for all Fijians in the form of new opportunities and employment.

The following challenges were identified from the meeting with department officials:

- The department is predominantly male. Of a total of 52 staff, only eight are female. Out of 40 technical staff, only one is female.
- Although there is a gender-focused Energy Policy, the department lacks gender expertise.
- When staff members conduct village consultations during pre-implementation and post implementation, they witness the low levels of women's participation. There is need for capacity building training and empowerment of women.
- Energy poverty has a disproportionately negative impact on women in part because a lack of energy access and women and girls shoulder time-consuming and laborious tasks such as collecting biomass for cooking.
- Time and physical exertion involved with supporting household energy needs reduce women and girls' access to education, employment, and worsens the existing inequality they experience in society.

[130] Ibid, p 7-D
[131] Available at *https://pacificdata.org/data/dataset/draft-energy-policy-2021-2030*

The following solutions and mitigation measures were identified from the meeting with department officials:

- Improve access to affordable, reliable, and clean energy to significantly protect, empower, and support the lives and livelihoods of women and girls.
- Ensure safe and affordable energy access and efforts to enable women to play an active role in decision-making, responsibilities, and activities involved with securing this access.
- Reduce the specific burdens, barriers, inequities, and norms that impact the way women and girls interact with energy services, experience energy poverty, access employment opportunities within the energy sector, and take part in energy-related decision-making.
- Empower women and girls through activities and approaches that create new opportunities.
- Ensure both women and men have equal opportunities for employment within the energy sector.
- Increase access to clean cooking fuels through the promotion of affordable and accessible alternatives that allow for the effective reduction of reliance on biomass, wood, and kerosene as primary energy sources, while also reducing dependence on harmful cooking fuels.
- Improved collaboration between the DoE and the MWCSP, Ministry of Health, Ministry of Forestry, Ministry of Rural and Maritime Development and Ministry of Environment will help to increase alignment between related Policy objectives, awareness programs, and standards.

**Budget and Planning Division, Ministry of Finance (MoF)**

The Budget and Planning Division is the gender focal point for the MoF. Formerly called the Ministry of Economy, the Ministry developed its Gender Equality and Social Inclusion Policy 2021 & Action Plan 2021-2022. The goal of this Policy is to ensure that Gender equity and social inclusion is fully mainstreamed (integrated) in all the Ministry plans, budgets, processes, and systems, including projects administered by the Ministry and its delivery partners, in line with Fiji's international, regional, and national GESI commitments.

The Division implements gender-responsive budgeting, the only country in the region to do so. This is to be rolled out to ministries through a budget template to be completed by each ministry and data to be collected. MOIT (including DoE) will be supported in the next budget cycle (2023/2024). Technical gender expertise is needed to support ministries as the Department of Women also lack this capacity.

**Climate Change Division, Prime Minister's Office (PMO)**

This division is Fiji's national focal point to the GCF. It was previously under the MoF. The MoF GESI Policy developed when the MoF was trying to get accredited to the GCF as this was one of the requirements. A Committee was established of senior officers to drive policy implementation to mainstream across the Ministry.

There have been challenges, including lack of high-level ownership, structural changes, and staff turnover. There needs to be a system in place to identify climate change projects across the board. Reference was made to the Ovalau Agrophotovoltaic Project which is meant to be the first GCF-funded project under Fiji Development Bank.

**Department of Environment**

This department is the regulatory authority enforcing environmental and social safeguards to ensure the sustainable use and development of Fiji's environment. For this project, the department will receive a screening application from the DoE and EFL and will then commission an EIA and SIA from the Department panel of registered consultants who will undertake these assessments.

In the SIA, gender issues are to be addressed including how community consultations will include the voices of women, how the project will improve women's livelihoods, and how the life of women and children will be improved. The project will need to demonstrate cultural sensitivities in dealing with communities in traditional settings.

For environmental impact, mitigation measures will be required on how solar panels affect biodiversity. The Ovalau project was given as an example of a comprehensive assessment. The gender assessment for the Ovalau project is available online.[132]

**Fiji Development Bank**

FDB is the only Fiji accredited organization which is providing funding for the Fiji Agrophotovoltaic Project in Ovalau (6th largest island).[133] This project aims to overcome barriers of financing, technical capacity, and limited availability of land by supporting an innovative technology that combines photovoltaic power generation and agricultural production.

With funding from GCF, FDB will finance a 4 MW solar Agrophotovoltaic (APV) system and 5MW battery energy storage system in Ovalau. It will develop solar power generation simultaneously with battery storage and, as a co-benefit, boost local agricultural production.

A key feature of this initiative is the way it will provide technical assistance to strengthen the capacity of local communities while also establishing a climate project financing facility within Fiji's Development Bank. Discussion with the FDB team revealed various problems encountered which has delayed the start of the project for over a year, including disputes involving tariff levels and details related to the Power Purchase Agreement.

For the Ovalau project, the gender assessment proposed the following key interventions: 1) well-designed benefit-sharing arrangements (e.g. quota-based female employment and skill training with concrete target percentages for PV system installation and associated construction as well as farming) and 2) gender mainstreaming measures (e.g. ensuring the equal participation of women in community consultation, decision-making platforms at all levels). A Gender Action Plan is also included for incorporation in the overall design, planning, implementation and operation of the project.

[132] Available at *https://www.greenclimate.fund/sites/default/files/document/sap016-gender-assessment.pdf*
[133] See *https://www.greenclimate.fund/project/sap016#documents* for the more information.

**Energy Fiji Limited (EFL)**

Formerly known as Fiji Electrical Authority, EFL was corporatized in 2018 and became a public company, now 56% owned by the government of Fiji and 44% by a Japanese consortium.

EFL is a male-dominated organization, and there are challenges related to gender inclusion, for instance:

- There is neither a gender policy nor obvious institutional commitment to addressing gender inequality.
- Although EFL has been in existence for 57 years, there is no female Board member in the 7-member Board.
- Out of the nine General Managers, only one is female, and only six out of the 24 middle managers are females.
- There is a female electrical engineer - a key technical expert – who has been in the company for 23 years but has not been promoted.
- Of interest, three women are attending 2-year women in leadership program with the US Energy Association *Female Leaders in Energy* (FLIE) through a contestable and competitive application process.
- Upon enquiring with the Pacific Power Authority (PPA) what support could be made available to the EFL to develop a gender policy or to address gender issues, the Social and Gender Inclusion expert was referred to the World Bank Gender Adviser.

**World Bank**

The Pacific Women in Power (PWIP)[134] is a WB program in partnership with PPA launched in May, 2023 at the 5th Pacific Regional Energy and Transport Ministers Meeting being held in Port Vila, Vanuatu. In collaboration with the Pacific Community (SPC), the program will support the increase of women's employment as engineers, scientists, and leaders in the energy sector.

The PWIP program objective builds on and compliments the PPA's mission to support its energy utility members to promote and advance gender equality within a diverse and motivated workforce. Under the PWIP program, the World Bank will be gathering data and helping energy institutions increase women's participation in the energy sector. PWIP will also align with SPC's Pacific Energy and Gender Strategic Action Plan (PEGSAP - 2020-2030) to mainstream gender in the clean energy sector and to address gender imbalance. The biggest gap is training. There are not enough institutions to train people.

[134] More information available at *https://prdrse4all.spc.int/sites/default/files/6279_ctif_pegsap_gba_report_part_i_clean_energy_sector_analysis_final_200908.pdf*

**SPC Pacific Energy and Gender Network - 2020 Gender-Based Assessment – Clean Energy Sector Analysis & Strategic Action Plan**

SPC commissioned a Clean Energy Gender-Based Assessment of six Pacific Island countries, including Fiji, which identified structural challenges to the economic inclusion of women, such as:

- *Discriminatory legal framework*: women face some type of legal discrimination when trying to join the labor force as employees or entrepreneurs.
- *Family and community values and customs*: patriarchal societies resulting in low participation of women in decision-making at all levels of society. Community and family values, stereotyping, social norms, streaming in schools determine the careers girls choose.
- *Balance of productive and reproductive role: r*eproductive and unpaid care work leaves little time for women to engage in paid work, hence they are over-represented in the informal economy. In the formal workforce, women continue to shoulder multiple roles and responsibilities of unpaid work as well as community spaces and burdens.
- *Difficulties linked to female entrepreneurship:* unfavorable business climate, difficulties accessing credit due to lack of collateral and financial advisory services.
- *Lack of access to resources:* gender inequalities regarding access to land, access to financing, market services, and access to energy are impediments to women's financial inclusion.
- *Gender-based violence*: over 60% of adult women suffer physical or sexual abuse during their lifetime (compared to estimated world average of 35.6%) which translate into low productivity or economic participation.

Other key gender challenges identified by the assessment include:

- Gender and unpaid care work roles impact on men and women differently in the uses of energy. Women lack access and their needs are often not represented in decision-making spaces to voice their energy needs and financial resources to access energy technologies.
- National energy policy frameworks tend to be gender blind.
- Women do not typically participate in STEM fields that traditionally serve the energy sector. As a result, the clean energy workforce lacks diversity and is male-dominated.
- Initiatives to date have limited impacts in including women in the clean energy value chain. Value chain weaknesses are impeding the green energy transition, including lack of a qualified technical workforce, lack of a strong and qualified private sector; and missing value chain segments such as maintenance and decommissioning.
- Opportunities to increase women's employment and income through productive uses of renewable energy are not being fully realized.

Main entry points for women identified in the clean energy value chain, include:

- As micro-entrepreneurs and community self-help groups in sales, distribution and maintenance of RE off-grid systems;

- As micro-entrepreneurs and community self-help groups across the efficient cookstove value chain;
- As public servants in planning and implementing energy policies, projects and programs;
- As entrepreneurs in the fisheries and agricultural sector (and related value-add industries such as food processing and handicrafts), whereby increased access to clean energy could result in substantial business growth).

The Pacific Women in Energy Conference in October 2022[135] reinvigorated the Pacific Energy and Gender (PEG) Network and launched the PEG Network Strategic Gender Action Plan (PEGSAP)[136], which offers guidelines for gender mainstreaming. The Regional Strategy is to mainstream gender equality in the Pacific clean energy sector to empower women with increased career and income-generating opportunities and enhanced access to energy in four areas:

1) *Institutional:* Current institutional and policy frameworks are gender blind. The objective is to strengthen gender-responsive regional and national energy policies that address women's practical and productive energy needs and promote women's involvement in the clean energy value chain.
2) *Service Providers - Business/Utilities*: The clean energy workforce is male-dominated. The private sector is not yet structured for the development of a vibrant clean energy sector. The objective is to enhance employment opportunities for women in the clean energy workforce, including as entrepreneurs.
3) *Society/Community/Households:* Traditional gender roles lead to differential energy needs. The clean energy technologies and services deployed often do not fulfill the specific energy needs of women. Women lack decision-making power to access energy solutions and resources. The objective is to promote women's access to, and representation in energy-related decision-making in communities and households.
4) *Individual:* Women need agency, skills, knowledge and access to resources to voice their energy needs and seek greater economic engagement in the clean energy value chain. The objective is for women to have enhanced agency, knowledge, skills and access to resources to voice their energy needs and engage in the clean energy value chain.

## WORKSHOP DISCUSSIONS

Following the consultations with key stakeholders, a roundtable discussion (*talanoa* session) was hosted at the Ministry of Women, Children, and Social Protection, which was attended by the following participants:

1) Reijieli Mawa, Department of Women - Ministry of Women, Children and Social Protection
2) Laisani Petersen, UNWomen/ MWCSP
3) Mereseini Baleilevuka - Community Leader, Educator - Nadi
4) Faith Grace - Indigenous Community Leader - Suva

[135] More information available at *https://gem.spc.int/meetings/pacific-women-in-energy*
[136] Available at *https://prdrse4all.spc.int/data/content/pacific-energy-and-gender-network-pegsap*

5) Deepak Chand - Department of Energy -Assistant Director
6) Vishal Prasad - Department of Energy - Senior Scientific Officer
7) Jonati Delaimoala - Department of Energy - Senior Scientific Officer
8) Alanieta Volevole - Community leader, Yasawa (Western Division)
9) Emele Duituturaga - Consultant

A summary of the key findings from the workshop consultations is included below.

**Key Findings**

Women in Fiji's energy sector confront a myriad of challenges that restrict their active participation and representation. One notable issue is the limited female involvement in training programs. Access to quality education and vocational training remains unequal, preventing women from acquiring the technical skills necessary for careers in the energy sector. This gender disparity is further exacerbated by the sector's male dominance, with women predominantly relegated to administrative roles while men dominate the technical areas.

These disparities begin at the educational level, with a low representation of females in STEM curricula from school to tertiary levels. Societal stereotypes and cultural norms steer women away from pursuing energy-related careers, perpetuating the underrepresentation of women in this crucial industry.

Poverty also plays a significant role in limiting women's participation. Many women are burdened with manual household chores, leaving them with little time for productive work in the energy sector. Additionally, women face hurdles in decision-making processes, and their contributions often go underappreciated and undervalued.

Furthermore, the migration of trained men overseas for employment leaves a gap in the industry's workforce. Climate change impacts, such as dry spells and reduced dam capacity, further strain Fiji's energy infrastructure. Land acquisition issues affect those without access to power, particularly in informal housing areas.

The disposal of solar panels and batteries raises environmental concerns, while growing urban migration compounds the energy sector's challenges. Technology transfer becomes crucial with outward migration, and solutions are needed to empower women and create employment opportunities.

To address these issues, several solutions have been proposed. Empowering women through training and promoting their involvement in troubleshooting and maintenance of solar systems can provide livelihoods and employment opportunities. Encouraging women to manage projects, raise awareness, and carry out training can also help bridge the gender gap.

Barefoot College, a residential training center, holds potential for training community women. Community education and awareness programs linking solar systems to climate change understanding are vital. The new Energy Policy with a gender focus and increased mentions of gender can be a policy lever to drive change. Data collection, gender integration in key performance indicators (KPIs), and collaboration among stakeholders are essential steps forward.

Incorporating the Ministry of Itaukei Affairs into community engagement can strengthen outreach efforts. Building the capacity of government agencies for gender analysis and inclusion of women in planning and decision-making processes are critical strategies. The Pacific Gender and Energy Network's Strategic Action Plan, addressing institutional, sectoral, decision-making, and individual agency levels, presents a framework for progress in Fiji's energy sector.

## Focus Group Discussions

A total of 49 women – from Suva (central division, Viti Levu), Lautoka (Western Division), Rotuma, Lakeba, Kadavu, and Nausori – were interviewed in six focus group discussions. The table below provides a breakdown of the focus group discussion participants.

| No. | Location | Number of Participants | Comment |
|---|---|---|---|
| 1 | Lakeba | 13 (9 women + 4 youth -- of which, 2 male and 2 female) | Village-based.<br>Average age: 44 |
| 2 | Rotuma | 8 - all female | Live in Rotuma were attending a church event in Suva.<br>Average Age: 53 |
| 3. | Kadavu | 13 - all female | Mix of those who live in Kadavu and in Vitilevu.<br>Average age: 62 |
| 4. | Lakeba women residing in Suva and Nadi | 3 - all female | Average Age: 60<br>One is a businesswoman, one a librarian, and one is a seamstress |
| 5. | Lautoka | 13 - all female | Villagers/ Market Vendors |
| 6, | Nausori | 3 - all female | Peri-Urban dwellers/ Market vendors |

The focus group discussions included three women from Lakeba (one of the areas to be electrified under DoE plans). One of these now lives in Nadi, one in Nausori, and one in Lakeba.

The questions asked included:

- Q1. What sort of power/energy source is used
- Q 2. What is power used for?
- Q 3. What are the issues and challenges faced by women and communities?
- Q 4. What are gender issues?
- Q 5. What are possible solutions to address these challenges?
- Q 6. What can this project do to improve women's livelihoods, quality of life and contribute to gender equality?

A summary of this discussion is included below.

**Key Findings**

In recent times, Viti Levu experienced unexpected power cuts that caught many residents off guard. One particularly challenging situation unfolded at a hairdressing salon, where customers found themselves in the midst of a hair wash when the power abruptly went out. This left both the salon owner and her clients in a precarious situation. After hastily finishing the hair wash, the salon owner rushed home, where her sick husband awaited her care. However, her phone's battery was running low due to the power outage, and the solar lights at home hadn't charged. Despite owning a business, she still bore the primary responsibility for meal preparations and her husband's well-being, highlighting the dual roles that many women in Fiji juggle.

Another issue stemming from these power cuts is the damage caused to electrical appliances. Determining responsibility and compensation for these damaged goods, especially if they were purchased on hire purchase and are still being paid off, has become a pressing concern for affected individuals and families.

In situations where the supply of electricity is limited, men are often given priority. This prioritization leaves children unable to study, and women find themselves cooking in the dark or relying on candlelight, further compounding the challenges they face during power cuts.

Lakeba, characterized by its traditional patriarchal setting and chiefly hierarchy, requires a sensitive approach to addressing energy issues. Enlisting the support of chiefly women or those married into the chiefly line is essential, as they hold a respected standing in the community and can effectively advocate for change.

The breakdown of the diesel generator in Lakeba from November to December of the previous year was a particularly trying period for women and families in the region. It led to damage to appliances, forcing residents to resort to alternative energy sources such as kerosene, gas, and solar panels to meet their basic energy needs.

Typically, the generator operates from 6 am to 1 pm and again from 2 pm to 11 pm, incurring an average monthly cost of $15, which is a significant expense for many families in Fiji. These challenges underscore the urgent need for reliable and equitable access to electricity in the region, with a specific focus on addressing the unique concerns faced by women and their families during power interruptions.

A table containing the key findings and responses to each individual question by focus group is provided below.

**Responses by Focus Groups Discussions**

| Questions | Kadavu | Lakeba | Rotuma | Vitilevu |
|---|---|---|---|---|
| Q1. Power/energy source | In the Maritime areas of Kadavu, Lakeba, Rotuma - there is a hybrid system of diesel generators and solar panels installed by households. In Suva, Lautoka and Nausori, there is a dependency on EFL. One of the Nausori residents and one in Lautoka who live in a semi-rural area with feeder road, have set up solar panels to supplement the EFL grid system | | | |
| Q2. Power usage | All participants use power source for light, cooking, electrical appliances | | | |
| Q3. Issues and challenges | Not enough power to accommodate all families and electrical appliances. Can't stock up fish for sale, which affects source of income on the island; Diesel supply is expensive and inconsistent due to irregular boat schedules; schools and hospitals also suffer as generator runs as back-up for power supply in hospitals and government stations. Bad weather affects solar system and there is no back-up supply.Solar system gets damaged easily due to drastic weather affecting the islands. Repair works take forever and is also expensive for individual families | There are restrictions to the hours of supply from the village power supply (Tubou/Levuka), Normally the generator is 6am1pm and 2-11pm; which costs on average $15 a month. Inconvenience caused as not all electrical appliances can be used at one time. Problem with repairs and maintenance of the power source as no one on the island is adequately trained to know how to fix the problems, (There are 100 unused solar panels lying around in one location)<br>Expensive and inconsistent supply of diesel affects power supply; hence food cannot be stored for long in deep fridges and freezers. Waste of resources and income for business entrepreneurs on the island. Security issues for students in the hostel as power is turned off from 11pm, this is a huge risk to the students | There is no power supply during the day and only for 2-3 hours in the evening. This limited power supply is very frustrating and places a lot of stress on women; Inability to keep food in the freezers for a long time affects women and men as they spend more time on food gathering which often is wasted again; Use of electrical appliance is restricted; Shortage of diesel to keep the generators operating affects school and hospital services; Many cannot afford to use solar power; Poor academic performance of students as they cannot study or complete homework due to poor light. Expensive to run generators with the cost of diesel | For women who live in Vitilevu, none of them are trained in changing light bulbs and they depend on men to make the changes or do the electrical wiring or pay electricians - all of whom are men. The two with solar said they can only use it for lights, hot water, charging phones but not for other electrical appliances.<br>Recent power cuts in Vitilevu no warning, affected hairdressing saloon, customers still in the middle of hair wash; rushed home to sick husband; low battery on phone; solar lights at home not charged. Though she owns a business, she is still responsible for home - meal preparations, care of sick husband.<br>Damaged electrical appliances who is responsible? Who will compensate the damaged goods especially if they are bought on |

| | | | | |
|---|---|---|---|---|
| | | and makes work more difficult for teachers. | | |

| | | | | |
|---|---|---|---|---|
| | | The diesel generator in Lakeba broke down from November to December last year which was a difficult period for women and families; damage to appliances had to resort to kerosene primus, gas, solar, firewood | | hire purchase and still being paid off. This is a problem. |
| Q4. Gender issues | Women are left out of decision-making; there is unequal access to power and unequal division of labor | | | |

| | | | | |
|---|---|---|---|---|
| Q5. Possible solutions | More women to be given leadership roles in the implementation of such projects that affect women; Include women in development committees in the village, district and island councils. More opportunities to be given to women to make decisions on matters affecting the families and children, e.g. Electricity supply. Men to be empowered to understand the importance of sharing tasks with women and also to prioritize education of their children and women's role toward the family welfare. More solar panels needed in the villages and costs of materials, installations and maintenance to be subsidized. Increase battery voltage for solar system so that more appliances can be used by individual families. This will also avoid damages to electrical appliances. | Increase in power supply will support many current activities and increase productivity. For example, women sew, bake, sell frozen items to earn income for the families. There must be a standby source of power apart from diesel generator and install solar in all villages for each family/household. Women to be part of decision-making. More women leaders to be engaged in projects that support the welfare of families and children. | Other affordable sources of power to be explored, e.g. Biogas. and solar; Training to be held for some leaders on the island, including women, so they can attend to breakdowns of generator, solar system, etc. Villagers to be subsidized with installation, materials and maintenance of the solar power or generator parts. engage responsible and trustworthy community leaders on the island to spearhead the projects. This will address mismanagement and abuse of funds and processes which were causes of failures in similar projects in the past. | The women in Vitilevu proposed more training in solar and electrical troubleshooting. They said they can't go all the way to Vanua Levu (the other main island in Fiji) to the barefoot college as their husbands won't let them. |

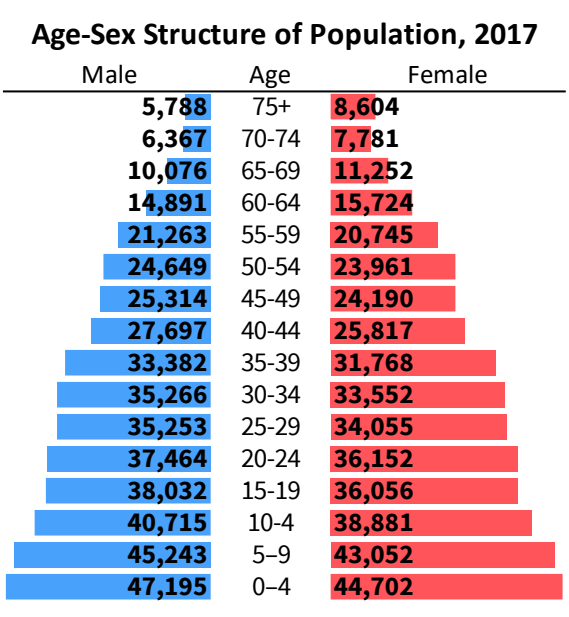
| | | | | |
|---|---|---|---|---|
| Q6. What can be done? | It will encourage more income-generating activities for women in the island like baking and sewing. This will improve the standard of living for the families. Woman can achieve a lot during the day and will be able to plan their activities better without so much stress. Improved quality of life for women. Ability to use more electrical appliances during the day and simultaneously. Better time utilization. Women can complete some work at night since there is enough light for them to complete weaving or sewing. Supervision of children doing homework is easier. Better communication with the families in other parts of Fiji and the world. Improved quality of education with access to better technology available through constant and stronger power supply. Ability to keep food (fish, meat, fruits) longer for consumption in the families, school hostels, hospitals and stores. Provides security for the homes with constant accessibility to light in the home and village surroundings. | Women will have more income earning projects to improve their livelihood. Less stress on women as they can have more time for self-care and leisure activities. Convenient to use solar energy and even biogas to provide more power to the people on the island. However, the government to subsidize costs of materials, costs and repair/maintenance of solar and biogas sources of power. More families can invest in other electrical appliances that can make life easier for them. Improve education quality and medical services as more advanced machines can be used to take care of the needs of people on the island. Youth can improve their technical skills as accessibility to computers will be constant. Security lights can be installed along the roads and in the villages, school and government stations to protect the residents and other assets on the premises. Women can have more free time to engage in other self- care activities. This can reduce criminal activities on the island. | Regular and longer access to electricity would improve quality of life by supporting women in their daily chores. Less stress on women and children. Women can have more free time to engage in other self-care activities. Students will aspire to achieve better academic results, thus contribute back to their families' livelihood. Women can engage in some income-generating activities to support their families. | Entrepreneurial opportunities for women.<br>More training for women in their local communities |

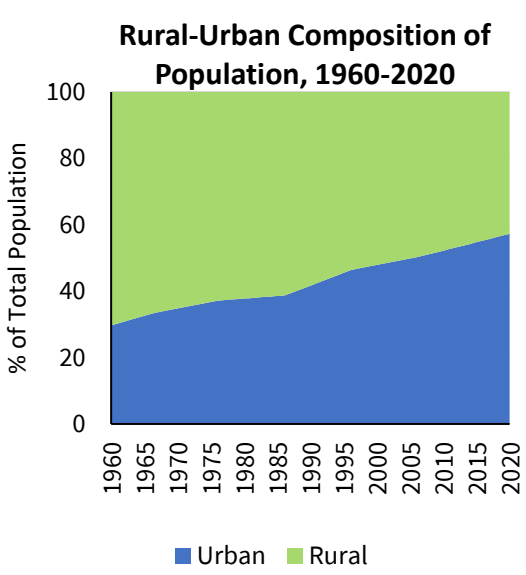
# APPENDIX E. ADDITIONAL BACKGROUND INFORMATION

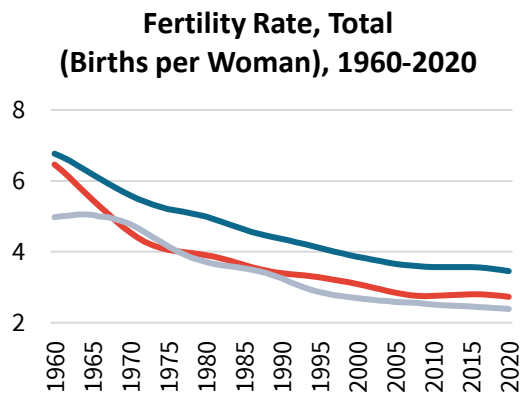
## Demographic Context

The figure below provides key demographic statistics for Fiji, including the country's age-sex structure as of 2017 (top lefthand side), the rural-urban composition of its population over time (top righthand side), Fiji's fertility rate (bottom lefthand side), and its life expectancy at birth (bottom righthand side). The data shows that the country is relatively young, with a youth bulge of those aged 0-19 making up the largest segments of the population, and those aged 60 and above only making up a small fraction of the country, indicating the country is set to enjoy an increase in the size of its working aged population for the foreseeable future. Fiji is also rapidly urbanizing, with almost 60 percent of the population living in urban areas in 2020, compared to 30 percent in 1960. Rapid urbanization, combined with improvements in living standards, have also led to lower fertility rates, with the country boasting a fertility rate of 2.7 births per woman in 2020 (lower than the Pacific Island Small States' average of 3.45 births per woman in the same year), compared to 6.5 births per woman in 1960. At the same time, Fiji has also experienced significant improvements in life expectancy, which has jumped from average of 60.8 years in 1960 to 67.5 years in 2020.

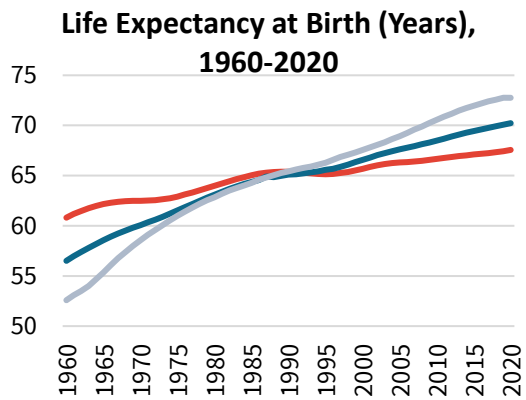
### Fiji's Key Demographic Statistics






**Fertility Rate, Total (Births per Woman), 1960-2020**




**Life Expectancy at Birth (Years), 1960-2020**

Sources: Fiji Bureau of Statistics. (2018). "2017 Population and Housing Census." and World Bank World Development Indicators. (2022). "Fiji." Available at https://data.worldbank.org/country/FJ

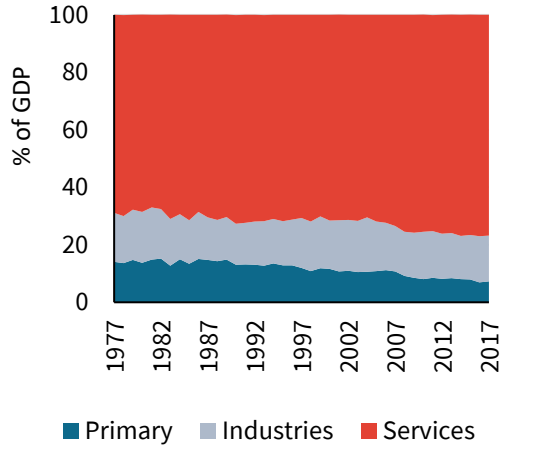
## Economic and Social Context

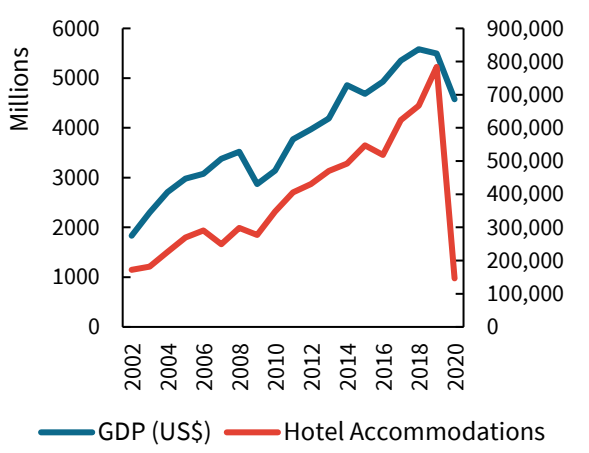
Fiji is one of the five largest Pacific Island economies, backed by a large service sector that is highly dependent on tourism. Since the late 1970s, the contribution of agriculture to GDP has decreased substantially as the economy grew more reliant on services. Over the same period, the economic output of the industrial sector has remained stable. As tourism rapidly expanded over the last 40 years, GDP grew at an average pace of 5 percent per year between 1977 and 2017.[137] At the same time, the growth of the tourism industry has also made the Fijian economy more susceptible to external shocks. This was evidenced by the economic impact of the recent COVID-19 pandemic, which led to travel restrictions that drastically reduced tourist inflows to the country and contributed to a 17 percent drop in GDP in 2020.[138]

The figure below shows the composition of Fiji's GDP by sector between 1977 and 2017 (lefthand side) and the relationship between tourism (represented by the level of hotel accommodations in the country) and the country's economic output, as represented by GDP (righthand side).

[137] Own calculation of the CAGR of Fiji's GDP between the years of 1977 and 2017 using data from the World Bank.
[138] World Bank World Development Indicators. (2022). "Fiji." Available at https://data.worldbank.org/country/FJ

**Overview of Fiji's GDP Composition and the Impact of Tourism on Economic Output**




Note: "Primary," "Industries," and "Services" are the three major categories of economic activity used by the Fiji Bureau of Statistics to measure economic output. "Primary" sector activities include agriculture, fishing, and forestry; "Industries" refers to secondary sector activities such as processing, manufacturing, construction as well as mining and quarrying; and "Services" refers to all tertiary sector activities, including wholesale and retail trade, accommodation, and financial activities, which together make up the largest share of "Services" sector activities in Fiji.

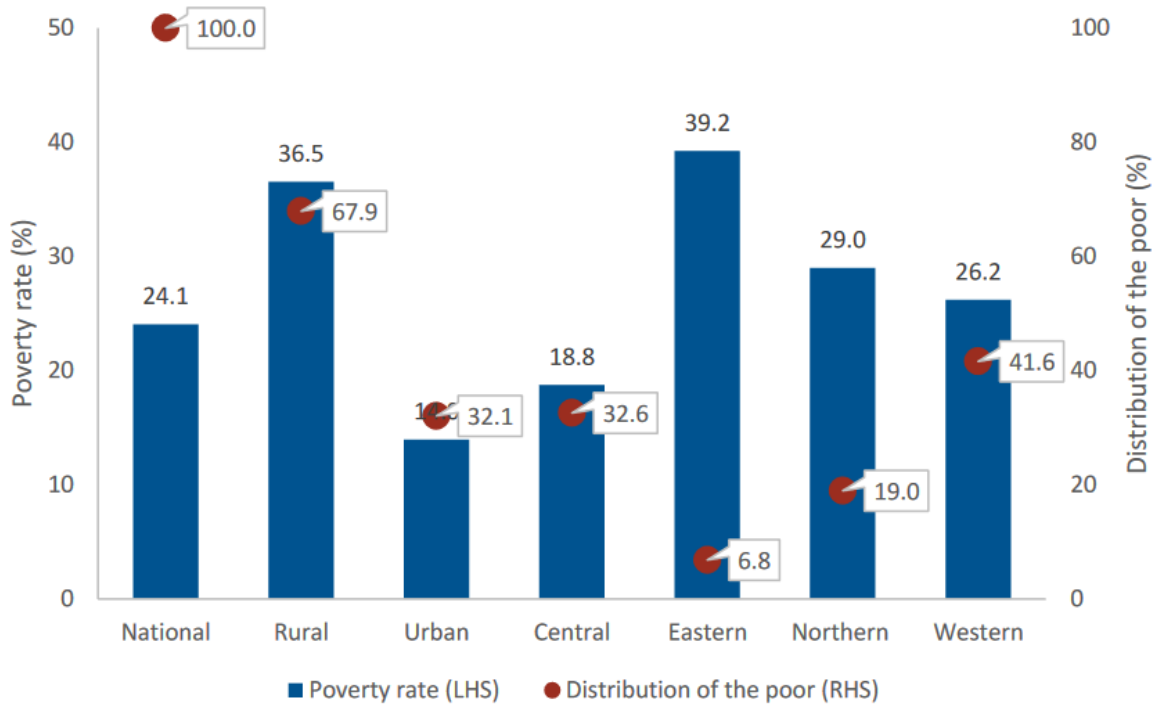
Sources: Fiji Bureau of Statistics. (2021). "Hotel Statistics - Turnover (All Hotels)," Available at *https://www.statsfiji.gov.fj/latest-releases/key-stats.raw?view=download&fileId=1609;* and

Fiji Bureau of Statistics. (2021). "Contribution to Real Gross Domestic Product by Sectors." Available at *https://www.statsfiji.gov.fj/latest-releases/key-stats.raw?view=download&fileId=6508;* and

World Bank World Development Indicators. (2022). "Fiji." Available at *https://data.worldbank.org/country/FJ*

Fiji's poverty rate is estimated at 24.1 percent of the total population in 2020. The poor are mostly rural residents (67.9 percent), and poverty rates are especially high on the Eastern Division, which comprises small rural islands mostly detached from the main isles' economic development. The figure below details poverty rates and distribution of the poor by division and population composition.

**Poverty Rates and Distribution of the Poor by Division, 2019-2020**




Source: Fiji Bureau of Statistics. (2021). "2019-20 Household Income and Expenditure Survey Main Report (HIES)." Available at https://www.statsfiji.gov.fj/images/documents/HIES_2019-20/2019-20_HIES_Main_Report.pdf

Despite relatively high levels of poverty, most Fijians have access to electricity, water supply, and sanitation. Roughly 96 percent of the population has access to electricity, either via a connection to the state grid (80 percent), home solar systems (11 percent), or diesel generators (4.5 percent).[139] Water supply is also available to the same proportion of Fijians, either through metered connection (66 percent), communal standpipes (25 percent) or boreholes (5 percent).[140] In addition, 87 percent of the population has access to non-shared improved sanitation facilities.

In its 2017 National Development Plan[141] the GoF stated its compromise in delivering 100 percent access to clean and safe water to urban areas by 2021 and for the rural and maritime areas by 2030, as well as 100 percent access to electricity by 2021. While World Bank data shows the electricity goal was achieved in 2020[142], GoF 2021 MICS report estimated that access to clean water is still absent for about 2.4 percent of the population.[143]

[139] Fiji Bureau of Statistics, "2019-20 HIES."
[140] Fiji Bureau of Statistics, "2019-20 HIES."
[141] Republic of Fiji: Ministry of Economy. (2017). "5-Year & 20-Year National Development Plan," Available at https://www.fiji.gov.fj/getattachment/15b0ba03-825e-47f7-bf69-094ad33004dd/5-Year-20-Year-NATIONAL-DEVELOPMENT-PLAN.aspx.
[142] World Bank World Development Indicators.
[143] Fiji Bureau of Statistics, "Fiji MICS 2021."

## Climate Change Adaptation and Mitigation Challenges

Given its location in the Pacific and its land topography, Fiji is broadly exposed to the impacts of climate change, including rises in sea level, warming, acidification and the aggravation of extreme weather events – particularly flooding and tropical cyclones, which have impacted Fiji a lot in recent years. The conditions of Fiji's climate, particularly its tropical marine environment, are also heavily influenced by the South Pacific Convergence Zone (SPCZ).[144]

The GoF recognizes the risks posed by climate change to the current and future development of Fiji and has committed to achieving net zero annual GHG emissions by 2050.[145] However, given the country's negligible contribution to total global emissions, the extent of climate change impact on Fiji will be determined by factors outside of its control. Future climate projections point to a worst-case scenario if the world follows a high emissions pathway up to 2040 and the SPCZ moves south, while best-case scenarios are dependent on the world maintaining a low emissions pathway until 2040. The figure below shows future climate scenarios by emission pathways and movement of the SPCZ.

**Standardized scenarios for Fiji for the period 2040-2059 relative to 1986-2005 for low and high emission pathways**

| | Scenario 1<br>SPCZ moves north | Scenario 2<br>SPCZ moves south |
|---|---|---|
| Low emissions (RCP2.6) | ***Warmer & drier***<br>• Annual temperature: +0.5°C<br>• Annual rainfall: -10%<br>• More heatwaves<br>• Less humidity<br>• More solar radiation<br>• Heavier rainfall events<br>• Greater tropical cyclone impacts<br>• Sea level rise: 17-30 cm | ***Much warmer & wetter***<br>• Annual temperature: +1.1°C<br>• Annual rainfall: +10%<br>• More heatwaves<br>• More humidity<br>• Less solar radiation<br>• Much heavier rainfall events<br>• Greater tropical cyclone impacts<br>• Sea level rise: 17-30 cm |
| High emissions (RCP8.5) | ***Much warmer & drier***<br>• Annual temperature: +0.9°C<br>• Annual rainfall: -20%<br>• More heatwaves<br>• Less humidity<br>• More solar radiation<br>• Heavier rainfall events<br>• Greater tropical cyclone impacts<br>• Sea level rise: 21-37 cm | ***Hotter & wetter***<br>• Annual temperature: +1.6°C<br>• Annual rainfall: +10%<br>• Many more heatwaves<br>• More humidity<br>• Less solar radiation<br>• Much heavier rainfall events<br>• Greater tropical cyclone impacts<br>• Sea level rise: 21-37 cm |

[144] The South Pacific Convergence Zone is a band of low-level convergence, cloudiness and precipitation which stretches from the Solomon Islands through Vanuatu, Fiji, Samoa, and Tonga.

[145] Government of Fiji. (2019) "National Climate Change Policy 2018-2030." Available at https://fijiclimatechangeportal.gov.fj/wp-content/uploads/2022/01/FIJI-NCCP-2018-2030_0.pdf

Source: Fiji Meteorological Service. (2021) "Current and Future Climate for Fiji." Available at https://www.met.gov.fj/aifs_prods/Climate_Products/Country%20Report%20Fiji.pdf

Fiji's economic reliance on natural capital, which is particularly vulnerable to climate change, imposes long-term threats to food security and nutrition, which was evident after tropical cyclone Winston. It is likely that coastal fisheries will become unable to support local needs and Fiji will become a net importer of fish over the coming decades.[146] Highly vulnerable sectors such as water, fisheries, transport and the environment are expected to face combined annual losses of up to 20 percent of Fiji's GDP from climate change impacts, if no preventive measures are taken.[147] According to Fiji's Climate Vulnerability Assessment (CVA), a significant investment of F$9.3 billion (nearly 100% of GDP) is required over a decade, along with additional costs for maintenance, operation, and social expenses, to significantly diminish the country's vulnerability.[148]

In order to address the challenges posed by climate change in Fiji, the GoF has commissioned a climate change vulnerability assessment, identifying the sectors most vulnerable to climate risk, which include housing & land use, transport, water, energy, health & education, and agriculture. Sector-specific challenges and risks are shown below in the table below.

**Sector-Specific Challenges and Risks Posed by Climate Change**

| Sector | Sea level rise | Increased temperatures | Extreme weather events[149] | Challenges and risks |
|---|---|---|---|---|
| Housing & Land use | ✓ | | ✓ | Coastal erosion and shoreline retreats represent an issue faced by rural communities located in isolated isles or in near coast settlements. Higher incidence of storms and cyclones constitutes a risk for at least 20 percent[150] of the national population that still lives in informal housing. |
| Transport | ✓ | | ✓ | Poor condition of a large portion of the land and marine networks in the urban, rural, and coastal areas presents high degree of vulnerability of the networks to disruption |

[146] Source: Government of Fiji. (2018) "Talanoa Dialogue Submission – 'Where Are We?'" Available at https://unfccc.int/sites/default/files/resource/105_Talanoa%20dialogue_Where%20Are%20We.pdf
[147] Source: World Bank. (2023) "Fiji Public Expenditure Review" Available at https://documents1.worldbank.org/curated/en/099040323214538735/pdf/P1776900f90a0f0e00825406ce7962da34c.pdf, p. 3.
[148] Source: World Bank. (2023) "Fiji Public Expenditure Review" Available at https://documents1.worldbank.org/curated/en/099040323214538735/pdf/P1776900f90a0f0e00825406ce7962da34c.pdf, p. 3.
[149] Extreme weather events include tropical cyclones, floods, droughts, excessive rainfalls and tropical storms.
[150] United Nations. (2023). "UN-Habitat - Fiji" Available at https://unhabitat.org/fiji

| | | | | |
|---|---|---|---|---|
| | | | | from damage to or failure of sections of roads and other assets. |
| Water | ✓ | ✓ | ✓ | Inadequate protection against runoff intrusion into pumping stations and water treatment plants. Insufficient protection of key assets against soil erosion and landslides. |
| Energy | | | ✓ | Negative impact of drought in hydro power stations that constitute over 60 percent of Fiji's electricity generation. Frequent flood events impose risk to diesel power stations and transformer assets. Lastly, cyclones and storms pose threats to transmission and distribution lines. Lack of investment in renewable energy by residential users and private sector where there is sizeable potential. |
| Health & Education | | ✓ | ✓ | Fiji will be particularly vulnerable to dengue fever, typhoid fever, leptospirosis, and diarrhea, as outbreaks of these diseases are more prevalent when floods or cyclones have occurred. Lack of adequate protection in health and education facilities make them highly vulnerable to damage caused by cyclones. |
| Agriculture & Aquaculture | ✓ | ✓ | ✓ | Cyclones generally result in destruction to crops, trees, farming and fishing equipment and related infrastructure. Increases to sea level rise and sea surface temperature may result in the destruction of the reef ecosystems that support fisheries. Floods also have detrimental effects causing crop damage due to inundation. These damages lead to negative impacts on productivity. |

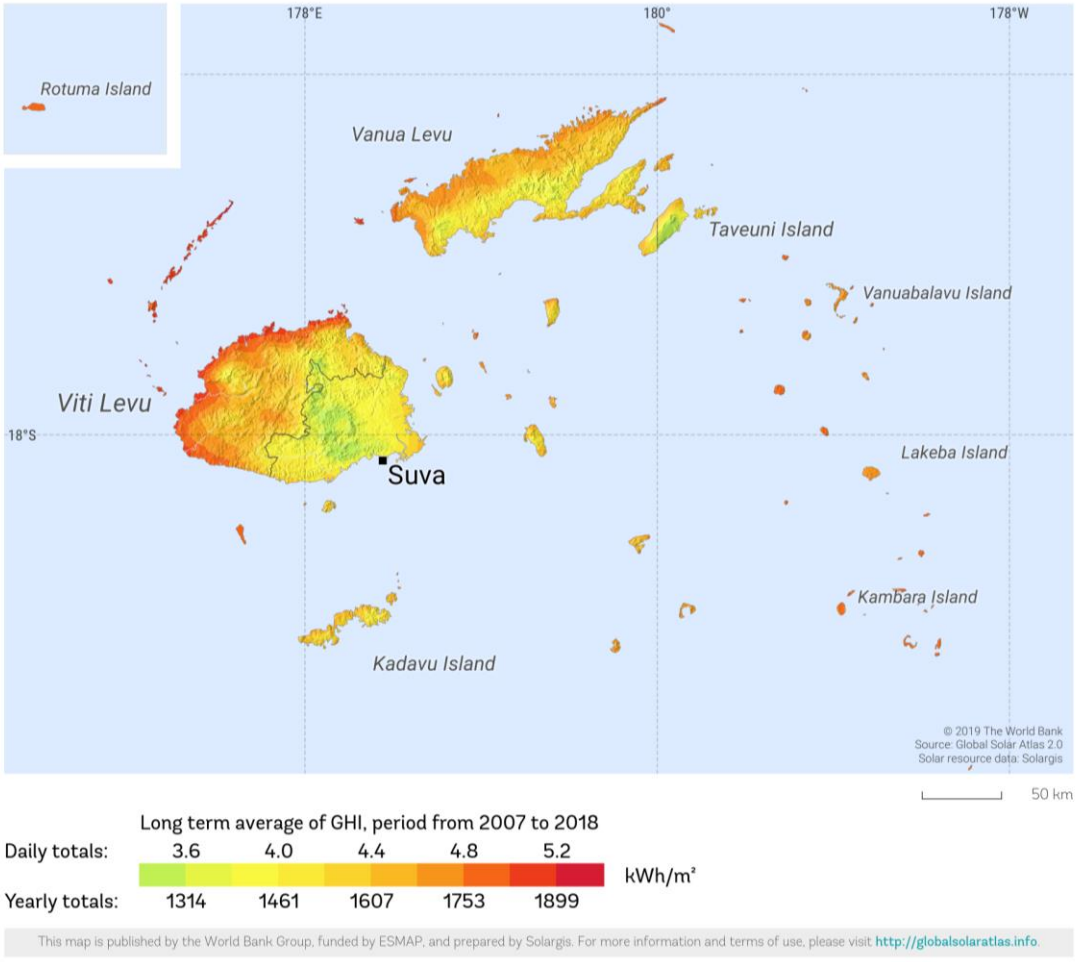
Source: Government of Fiji. (2018) "Talanoa Dialogue Submission – 'Where Are We?'" Available at https://unfccc.int/sites/default/files/resource/105_Talanoa%20dialogue_Where%20Are%20We.pdf

## Potential for Renewable Energy Generation

### Utility-scale Solar Photovoltaics (PV)

Solar potential in Fiji varies considerably: outer islands and the northwest coastal areas of the larger islands have good solar potential (annual average of 5–6 kWh/m2/day), while areas such as Viti Levu's interior are subject to considerably more cloud coverage and are therefore not as viable for solar PV projects (annual average of about 3.7 kWh/m2/day).[151] The figure below provides an overview of the long-term average solar irradiance in Fiji.

**Solar Irradiance Map of Fiji (average), 2007-2018**

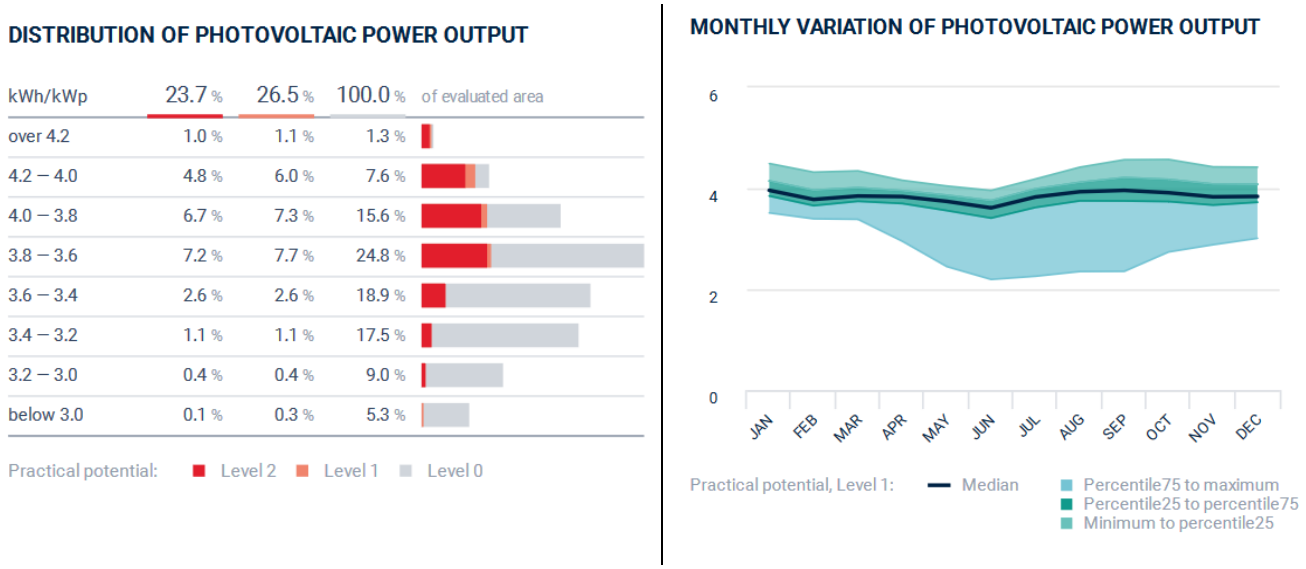



Source: Global Solar Atlas. (2022). "Global Horizontal Irradiation – Fiji." Available at *https://globalsolaratlas.info/download?c=-5.790897,162.597656,5*

[151] IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific." Available at *https://www.developmentaid.org/api/frontend/cms/file/2022/07/IFCPoweringthePacificGuide-FINAL.pdf* p.73

The Global Solar Atlas estimates that 26.5 percent of Fiji's territory has practical potential for the installation of PV generation[152] – excluding land with identifiable physical obstacles to utility-scale PV plants. Furthermore, 7.1 percent of this area has potential for over 4 kWh/kWp of photovoltaic power output, with low monthly variation.[153] The table below shows PV potential statistics for Fiji.

**Fiji PV Power Output Potential Statistics**




Source: Global Solar Atlas. (2022). "Global Photovoltaic Power Potential – Fiji." Available at https://globalsolaratlas.info/global-pv-potential-study

### Utility-scale Wind Power[154]

The scarcity of detailed feasibility studies on wind power for Fiji makes estimating generation potential a difficult task. In general, onshore wind potential is very limited, with only a few stretches of land exhibiting adequate conditions – for example Kadavu island and Suva Peninsula. EFL's Butoni Wind Farm, located south of the western division, has not met generation expectations, with only about 2.7 GWh generated in 2019 from its capacity of 10MW – which is equivalent to a capacity factor of about 3 percent. There is, however, high technical potential for wind power offshore, estimated by The World Bank at 27 GW for fixed turbines and 159 GW for floating turbines in regions of great water depth.[155] Nonetheless, the real practical potential needs to be assessed though a more comprehensive analysis. The figure below shows the wind speed map for Fiji provided by the Global Wind Atlas.

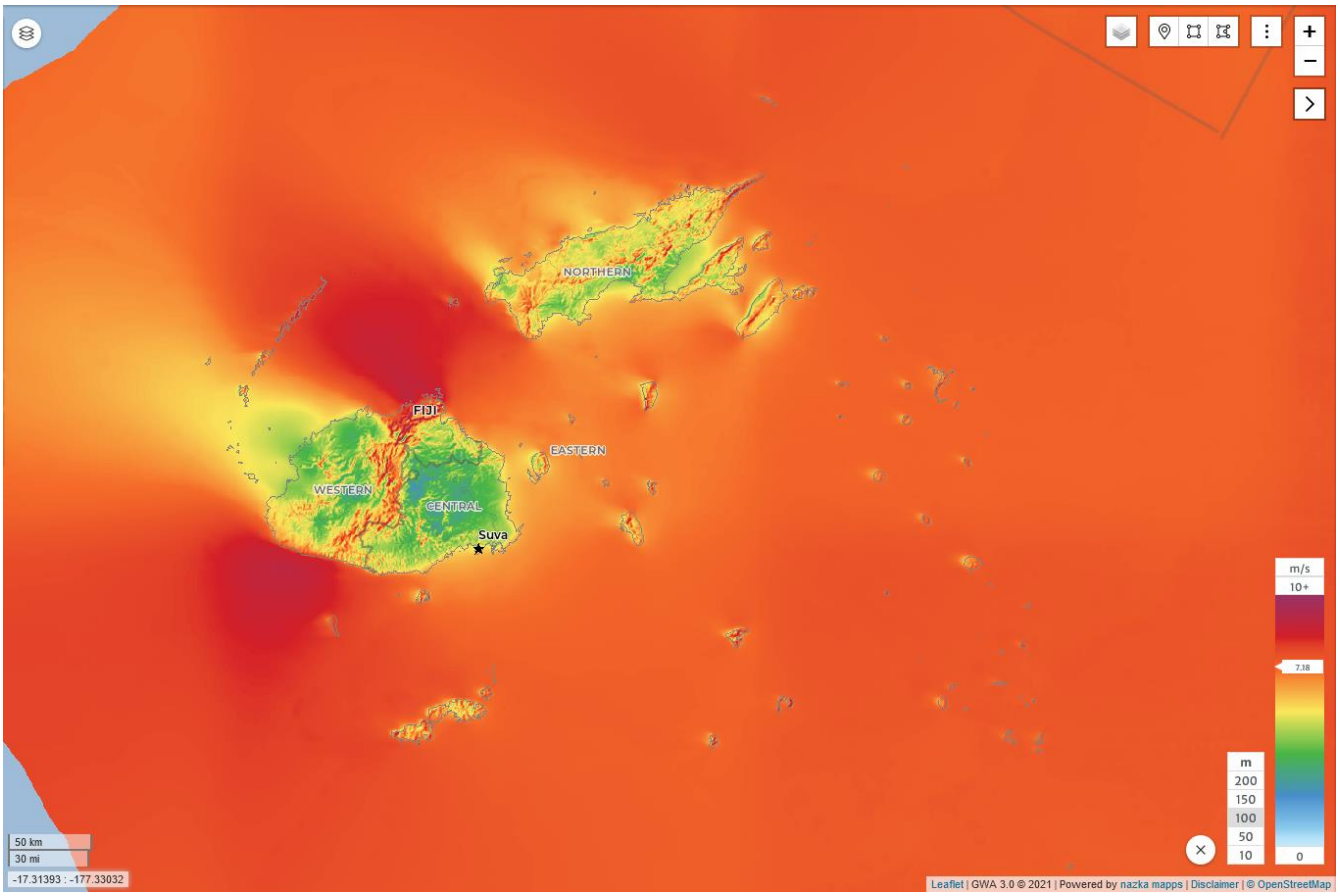
[152] Global Solar Atlas. (2022). "Global Photovoltaic Power Potential – Fiji." Available at https://globalsolaratlas.info/global-pv-potential-study

[153] Global Solar Atlas. (2022). "Global Photovoltaic Power Potential – Fiji." Available at https://globalsolaratlas.info/global-pv-potential-study

[154] IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific." Available at https://www.developmentaid.org/api/frontend/cms/file/2022/07/IFCPoweringthePacificGuide-FINAL.pdf p.74

[155] World Bank. (2020). "Offshore Wind Technical Potential in Fiji." Available at https://energydata.info/dataset/offshore-wind-technical-potential/resource/a66d9300-c3ef-4119-9ab0-97ad35276e39

**Wind Speed Map for Fiji (m/s), 2022**




Source: Global Wind Atlas. (2022). "Fiji." Available at *https://globalwindatlas.info/en/area/Fiji/Central*

### Hydropower[156]

Fiji has substantial potential for hydropower generation due to its high elevation and considerable rainfall. In 2015, the Japan International Cooperation Agency assessed hydropower potential in Fiji. Thirty-seven potential hydro sites in Viti Levu and Vanua Levu were reviewed and ranked. The potential sites ranged from 700 kW to 7,300 kW in size. The study identified six schemes, shown in the table below, as feasible under the current tariffs and load forecast.

[156] IFC. (2021). "Powering the Pacific: A Guide to Investing in Renewable Electricity Generation in the Pacific." Available at *https://www.developmentaid.org/api/frontend/cms/file/2022/07/IFCPoweringthePacificGuide-FINAL.pdf* p.72

**Indicatively feasible hydro schemes in Fiji—JICA assessment**

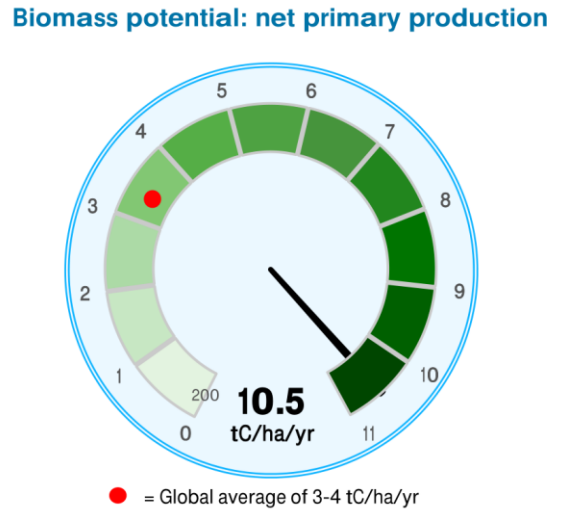
| Site | Basin | Estimated Peak Capacity (KW) | Estimated Annual Generation (MWh) |
|---|---|---|---|
| *Nabiaurua* | Ba | 1,400 | 8,197 |
| *Naboubuco* | Rewa | 2,700 | 15,308 |
| *Nakavika* | Navua | 2,600 | 14,205 |
| *Wainavadu* | Rewa | 2,500 | 13,749 |
| *Waisoi* | Rewa | 2,100 | 11,322 |
| *Saquru* | Labasa | 2,000 | 10,660 |

Source: JICA. (2015). "The Project for the Effective and Efficient Use of Renewable Energy Resources in Power Supply in Republic of Fiji — Final Report" Available at *https://openjicareport.jica.go.jp/pdf/12230173_01.pdf*

### Bioenergy

Fiji has substantial biomass potential as measured by its net primary production[157] of 10.5 tons of carbon per hectare per year (as shown in the figure below) – about three times the global average. Bagasse and wood residue constitute most of the biomass available to be used as fuel. Current bioenergy generation assets are comprised of the Lautoka and Labasa FSC power stations, which generate energy from bagasse, and the Nabou (Tropik Wood) Power Plant, which uses wood residue as fuel.

**Biomass Potential of Fiji**




Source: International Renewable Energy Agency (IRENA). (2022). "Energy Profile – Fiji."

The viability of bagasse as a fuel source for IPPs is rather limited, as state-owned FSC has exclusive rights to produce sugar in Fiji, hence why both bagasse power plants are owned by FSC. Potential for biomass

[157] Net primary production is the amount of carbon fixed by plants and accumulated as biomass each year, measured in tons of carbon per hectare per year (tC/ha/yr).

generation from wood residue was assessed by JICA at 10MW for Viti Levu and 3.7 MW for Vanua Levu, Furthermore, a Fiji Renewable Energy Power Project (FREPP) report on the feasibility of biomass in Fiji found that, although there is still considerable potential for biomass generation from wood residue, the feasibility of potential projects is uncertain due to inadequate grid connections and high transport costs. Operation of the Nabou Power Plant has demonstrated in practice these existing feasibility constraints as it experienced regular operating difficulties and had to close for long periods at a time due to lack of feedstock.

# APPENDIX F. DEVELOPMENT CO-BENEFITS

The projects described in this investment plan have the potential for extensive economic, social, and environmental co-benefits:

### Job Creation Benefits

- REI projects have the potential to generate jobs in the energy and infrastructure sectors, both in the short and long-run. This includes direct employment opportunities in project development and implementation, as well as indirect job creation through increased demand for local industries supplying components, materials, and services for REI infrastructure construction. More specifically, the projects will make possible new jobs constructing, operating, and maintaining new solar and hydropower generation projects that will use the new transmission and distribution lines (indirect job creation)
- The new transmission and distribution infrastructure will need to be built and maintained (direct job creation)
- Moreover, the projects will improve access and reliability of electricity supply, allowing for increased productivity of existing businesses and higher levels of economic activity in areas served by the new lines, potentially leading to new jobs and new businesses, with particular benefits expected for Fiji's tourism industry (second-order job creation)

### Energy Security Benefits

- Better availability and affordability of RE systems facilitated by REI financing can help ensure a more stable and reliable energy supply and reduce the frequency of outages. Additionally, given that connection to Fiji's interconnected transmission network is only possible on the major islands, Fiji's less populated islands would greatly benefit from having access to decentralized and affordable electricity generation systems.
- New transmission lines will allow for the greater deployment of solar and hydropower generation, displacing generation fueled by imported diesel, improving energy security and reducing high—and volatile—import costs, which exceeded five percent of Fiji's GDP in 2019.
- Less reliance on imported fuel can lead to lower inflation and costs of production, as well as the level of foreign currency reserves used to pay for the imports.

### Climate Change Effects and Local Air Pollution Benefits

- Fiji is vulnerable to climate change, which could increase the risk of flooding, worsen coastal erosion, harm biodiversity, and increase the frequency and severity of tropical cyclones. REI projects can help build a more disaster- and climate-resilient energy sector. Furthermore, reducing the share of hydro in the energy mix by increasing the availability of wind and solar energy can make the electricity supply less prone to disruptions or price surges during extended drought periods. Additionally, decentralized REI systems, such as solar panels on rooftops and mini-grids, combined with energy storage solutions, such as batteries, provide both localized energy generation and back-up power during outages. This reduces vulnerability to centralized power infrastructure damage and ensures a more reliable energy supply during disasters.

- The new transmission lines will displace diesel-fueled generation by allowing more renewable energy to be built. About 18 MW of solar generation is already planned for Viti Levu, and there is potential for about 100 MW of solar there by 2031. The displacement of diesel by renewables will reduce GHG and local pollutant emissions compared to diesel-fired generation. There is also substantial hydropower generation potential.
- Rural electrification may also displace the use of biomass in homes, leading to lower levels of indoor air pollution.

### Social Services and Infrastructure Benefits

- The increased access to and better reliability and quality of electricity that these transmission and distribution projects will make possible can also improve service delivery at schools, hospitals, and clinics, leading to better health and educational outcomes.
- Roads will need to be built to allow access to construction sites; these improvements to transportation infrastructure can lead to secondary benefits to the population, businesses, and tourists.

### Gender Benefits

- Better access to electricity will have several benefits for women, including better security through public streetlights, better access to information and communication, and more opportunities for economic activity inside and outside the home.
- Women will also benefit from jobs in the construction in the transmission and distribution lines or in the renewable generation that the new lines will enable. By actively recruiting and training women, investments made through REI projects can help bridge the gender gap in traditionally male-dominated industries and promote more equal access to employment opportunities.

## The Climate Investment Funds

The Climate Investment Funds (CIF) were established in 2008 to mobilize resources and trigger investments for low carbon, climate resilient development in select middle and low income countries. To date, 14 contributor countries have pledged funds to CIF that have been channeled for mitigation and adaptation interventions at an unprecedented scale in 72 recipient countries. The CIF is the largest active climate finance mechanism in the world.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