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Report No: PAD3026

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED CREDIT
IN THE AMOUNT OF SDR 29.2 MILLION
(US$40.0 MILLION EQUIVALENT)

A PROPOSED GRANT
IN THE AMOUNT OF US$4.9 MILLION
FROM SCALING-UP RENEWABLE ENERGY PROGRAM
UNDER THE STRATEGIC CLIMATE FUND

AND

A PROPOSED LOAN
IN THE AMOUNT OF US$8.0 MILLION
FROM SCALING-UP RENEWABLE ENERGY PROGRAM
UNDER THE STRATEGIC CLIMATE FUND

TO THE

KINGDOM OF LESOTHO

FOR THE

LESOTHO RENEWABLE ENERGY AND ENERGY ACCESS PROJECT

January 8, 2020

Energy and Extractives Global Practice
Africa Region

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CURRENCY EQUIVALENTS

Exchange Rate Effective November 30, 2019

Currency Unit =	Lesotho Maloti (M)
M 14.29 =	US$1
SDR 0.72838517	US$1

FISCAL YEAR
January 1 - December 31

ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
CAPEX	Capital Expenditures
CPLO	Community and Participation Liaison Officer
DFI	Development Finance Institution
DHS	Demographic and Health Survey
DoE	Department of Energy
EC	European Commission
EDM	Electricity of Mozambique (*Electricidade de Mocambique*)
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
EMP	Electrification Master Plan
ERR	Economic Rate of Return
ESKOM	South African Public Utility (*Elektrisiteitsvoorsieningskommissie*)
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
EU	European Union
FHH	Female-headed Household
FM	Financial Management
GBV	Gender-based Violence
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GNI	Gross National Income
GoL	Government of Lesotho
GRM	Grievance Redress Mechanism
GRS	Grievance Redress Service
IFC	International Finance Corporation
IFR	Interim Financial Report
IPF	Investment Project Financing

IVA	Independent Verification Agent
KPI	Key Performance Indicator
LEC	Lesotho Electricity Company
LEWA	Lesotho Electricity and Water Authority
LHDA	Lesotho Highlands Development Authority
LNDC	Lesotho National Development Corporation
LREEAP	Lesotho Renewable Energy and Energy Access Project
LV	Low Voltage
M&E	Monitoring and Evaluation
MoF	Ministry of Finance
MEM	Ministry of Energy and Meteorology
MHH	Male-headed Household
MV	Medium Voltage
NPV	Net Present Value
NSDP	National Strategic Development Plan
O&M	Operation and Maintenance
OPEX	Operating Expense
PDO	Project Development Objective
PIU	Project Implementation Unit
PIM	Project Implementation Manual
PPG	Project Preparation Grant
PPP	Public-Private Partnership
PPSD	Project Procurement Strategy for Development
PV	Photovoltaic
RAP	Resettlement Action Plan
RE	Renewable Energy
REU	Rural Electrification Unit
RPF	Resettlement Policy Framework
SDR	Special Drawing Rights
SHS	Solar Home Systems
SREP	Scaling Up Renewable Energy Program
STEM	Science, Technology, Engineering, and Mathematics
STEP	Systematic Tracking of Exchanges in Procurement
TU	Technical Unit
UAF	Universal Access Fund
UNDP	United Nations Development Programme
VAT	Value-added Tax
WB	World Bank

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Country Director:	Marie Francoise Marie-Nelly
Global and Regional Director:	Riccardo Puliti
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Task Team Leaders:	Frederic Verdol, Rhonda LeNai Jordan Antoine

DATASHEET

BASIC INFORMATION

Country(ies)	Project Name	
Lesotho	Lesotho Renewable Energy & Energy Access Project	
Project ID	**Financing Instrument**	**Environmental Assessment Category**
P166936	Investment Project Financing	B-Partial Assessment

Financing & Implementation Modalities

[ ] Multiphase Programmatic Approach (MPA)	[√] Contingent Emergency Response Component (CERC)
[ ] Series of Projects (SOP)	[ ] Fragile State(s)
[ ] Disbursement-linked Indicators (DLIs)	[√] Small State(s)
[ ] Financial Intermediaries (FI)	[ ] Fragile within a non-fragile Country
[ ] Project-Based Guarantee	[ ] Conflict
[ ] Deferred Drawdown	[ ] Responding to Natural or Man-made Disaster
[ ] Alternate Procurement Arrangements (APA)	

Expected Approval Date	Expected Closing Date
30-Jan-2020	31-Jan-2027

Bank/IFC Collaboration

No

Proposed Development Objective(s)

The Project Development Objective is to increase access to electricity in rural and peri-urban areas of Lesotho.

Components

Component Name	Cost (US$, millions)

Grid Extension to Peri-Urban Areas of Lesotho	30.00
Rural Electrification by Mini-grids	20.00
Technical Assistance and Implementation Support	2.90
Contingent Emergency Response Component	0.00

Organizations

Borrower:	Kingdom of Lesotho
Implementing Agency:	Ministry of Energy and Meteorology

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	52.90
Total Financing	52.90
of which IBRD/IDA	40.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Development Association (IDA)	40.00
IDA Credit	40.00

Non-World Bank Group Financing

Trust Funds	12.90
Climate Investment Funds	12.90

IDA Resources (in US$, Millions)

	Credit Amount	Grant Amount	Guarantee Amount	Total Amount
Lesotho	40.00	0.00	0.00	40.00
National PBA	40.00	0.00	0.00	40.00

Total	**40.00**	**0.00**	**0.00**	**40.00**

Expected Disbursements (in US$, Millions)

WB Fiscal Year	2020	2021	2022	2023	2024	2025	2026	2027
Annual	1.00	2.50	6.50	8.50	10.10	8.50	1.90	1.00
Cumulative	1.00	3.50	10.00	18.50	28.60	37.10	39.00	40.00

INSTITUTIONAL DATA

Practice Area (Lead)

Energy & Extractives

Contributing Practice Areas

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	High
2. Macroeconomic	High
3. Sector Strategies and Policies	Substantial
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	High
6. Fiduciary	Moderate
7. Environment and Social	Moderate
8. Stakeholders	Moderate
9. Other	
10. Overall	Substantial

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[ ] Yes [✓] No

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	✓	
Performance Standards for Private Sector Activities OP/BP 4.03		✓
Natural Habitats OP/BP 4.04	✓	
Forests OP/BP 4.36		✓
Pest Management OP 4.09		✓
Physical Cultural Resources OP/BP 4.11	✓	
Indigenous Peoples OP/BP 4.10		✓
Involuntary Resettlement OP/BP 4.12	✓	
Safety of Dams OP/BP 4.37	✓	
Projects on International Waterways OP/BP 7.50	✓	
Projects in Disputed Areas OP/BP 7.60		✓

Legal Covenants

Sections and Description

a) By no later than one (1) month after the Effective Date, the Recipient shall establish and thereafter maintain, at all times during the implementation of the Project, a Project steering committee, with a mandate, terms of reference, composition, and resources satisfactory to the Association, to be responsible for reviewing Project progress, providing guidance to DOE and the Project Implementing Entity and resolving any challenges faced by the Project.

Sections and Description

b) The Recipient, through MEM, shall hold overall responsibility for the Project. Specifically, by no later than one (1) month after the Effective Date, the Recipient, through MEM, shall establish and thereafter maintain, throughout the period of implementation of the Project, a Project implementation unit within DOE, under terms of reference, functions and resources satisfactory to the Association.

Sections and Description
The Recipient shall ensure that where industrial and economic zones benefit from activities financed out of proceeds of the Credit under Part 1 (Component 1) of the Project, those industrial and economic zones shall be selected in accordance with the criteria setforth in the Project Implementation Manual ("Selected Industrial and Economic Zones"). The Recipient shall ensure that the Selected Industrial and Economic Zones are operated in accordance with standards and procedures acceptable to the Association.

Conditions

Type	Description
Effectiveness	The Recipient and the Project Implementing Entity have adopted the Project Implementation Manual, in form and substance satisfactory to the Association.
Effectiveness	The Recipient has recruited to the Project implementing unit, within DOE, a Project coordinator, an environmental specialist, and a social specialist; all with qualifications, experience and terms of reference satisfactory to the Association.
Effectiveness	The Project Implementing Entity has recruited to the technical unit a Project coordinator, an environmental specialist and a social specialist; all with qualifications, experience and terms of reference satisfactory to the Association.
Effectiveness	The SREP Loan Agreement and the SREP Grant Agreement have been signed and delivered by all the parties to such agreement, and all conditions precedent to their effectiveness (other than the fulfillment of effectiveness of this Agreement) have been fulfilled
Effectiveness	The Subsidiary Agreement has been executed on behalf of the Recipient and the Project Implementing Entity, in form and substance satisfactory to the Association.
Effectiveness	The Recipient and the Project Implementing Entity have issued legal opinions from counsels satisfactory to the Association, stating that the Subsidiary Agreement has been duly authorized or ratified by the Recipient and the Project Implementing Entity and is legally binding upon the Recipient and the Project Implementing Entity in accordance with its terms.

I. STRATEGIC CONTEXT

A. Country Context

1. **The Kingdom of Lesotho is a mountainous country in Southern Africa, with a unique geography as it is landlocked by South Africa.** Roughly 80 percent of Lesotho's land is more than 1,800 m above sea level; the average elevation is 2,161 m.[1] Lesotho is a lower-middle-income country with per capita gross national income (GNI) of US$1,330.[2] It is a small and largely rural country of about 2.1 million people, of whom more than 99 percent are ethnic Basotho. About 60 percent of Basotho live in the districts of Berea, Leribe, Maseru, and Mafeteng, in the arable lowlands. The remaining population lives in six districts that include the Senqu River Valley and comparatively more mountainous lands. Most people live in rural areas, but the share of the urban population has increased substantially, from 14 percent in 1990 to 27 percent in 2015. Population growth has slowed since the early 1990s, from 2 percent a year to slightly more than 1 percent. Lesotho diaspora living abroad totals approximately 135,000[3] people, mostly educated professionals and mining workers in South Africa.

2. **Lesotho has an open economy, traditionally centered on trade. Its main exports are textiles, water, and diamonds.** Lesotho's economy has changed structurally in the last two decades; once based on remittances and agriculture, the country's economic growth is now driven by value-added output in the service sectors, such as wholesale and retail trade, and in manufacturing sectors, such as textile manufacture and mining. Lesotho's main trading partners are the United States and South Africa. As a member of the Common Monetary Area, its currency the Lesotho maloti is pegged to the South African rand. Lesotho is also part of the Southern African Customs Union, a union between Botswana, Lesotho, Namibia, South Africa, and Swaziland by which members pool the customs duties and excise taxes they collect and redistribute the funds among the five member states. Lesotho is also highly vulnerable to climate change and regularly experiences drought, floods, frosts, heavy snowfalls, strong winds, hailstorms, and tornadoes. These adverse conditions undermine the country's economic development and are expected to worsen as Lesotho becomes drier and hotter in the years to come.[4]

3. **Despite a track record of economic growth, Lesotho faces a triple challenge of poverty, inequality, and unemployment.** Lesotho recorded continuous economic growth of 2.5 percent per capita over the past decade but showed moderate progress in poverty reduction.[5] It is estimated that 49.7 percent of the population lives below the national poverty line, down from 56.6 percent in 2002.[6] Urban areas saw strong poverty reduction, while rural areas' poverty levels stagnated, adding to an already large urban-rural divide. The modest decline in the national poverty rate masks a notable decline in extreme poverty and inequality. Although Lesotho is now more equal than its neighbors, with a Gini coefficient of 44.6, it remains one of the 20 percent most unequal countries in the world.

4. **Prospects of future growth are hindered by acute and persistent unemployment among the large cohorts of youth.** Lesotho suffers from double-digit unemployment rates, particularly severe among

[1] GoL (Government of Lesotho). 2017. 2016 Population and Housing Census Preliminary Results Report.
[2] 2014 Atlas GNI per capita.
[3] International Organization for Migration. 2014. "ACP Observatory of Migrations."
[4] World Bank. 2015. Lesotho Systematic Country Diagnostic.
[5] World Development Indicators (WDI) https://data.worldbank.org/indicator/NY.GDP.PCAP.KN?locations=LS
[6] World Bank. 2019 (forthcoming). Lesotho Poverty Assessment: Progress and Challenges in Reducing Poverty. World Bank.

the youth. In 2015, the broad unemployment rate was 28 percent and 43 percent among the youth (ages 15 to 24), reflecting no significant improvement since the beginning of the century (overall and youth unemployment rates were, respectively, 27 percent and 33 percent in 1999). This dismal situation in the labor market comes at a time when the country is entering a window of demographic opportunity, a period when the ratio of the working-age population to the dependent-age population increases rapidly. If the current large cohorts of young Basotho are productively employed, the country can leverage the demographic opportunity to grow richer. Recent simulations show that gross domestic product per capita in Lesotho could more than triple by 2050 by improving education, employment, and productivity among the younger generations.[7]

B. Sectoral and Institutional Context

5. The Ministry of Energy and Meteorology (MEM) is responsible for overall policy making and financial planning in Lesotho's energy sector. The Department of Energy (DoE), a part of the MEM, is responsible for coordinating, monitoring, and evaluating programs and activities in the energy sector. The DoE has three divisions: conventional energy, renewable energy (RE), and planning. Each division is responsible for collecting data on sector activities and supporting coordination among stakeholders relevant to its focus area.

6. **The electricity sector in Lesotho is vertically unbundled** with the Lesotho Highlands Development Authority (LHDA)[8] having the mandate to generate electricity and the Lesotho Electricity Company (LEC) having the mandate for transmission and distribution of electricity, bulk electricity supply, and management of off-grid stations (mini-hydro and diesel) in the mountainous areas of Semonkong and Mantšonyane. The electricity sector is regulated by the Lesotho Electricity and Water Authority (LEWA) with the mandate to promote the expansion of electricity supply in Lesotho, where it is economically viable and cost-effective; ensure the operation and development of a safe, efficient, and economic electricity sector; protect the interests of all classes of electricity consumers as to the terms, conditions, and price of supply; and ensure that electrification is accelerated.

Table 1. Key Parameters of the Lesotho Electricity Sector

Parameter	Value
Electricity access rates (%)[a]	38 (60 percent urban and 18 percent rural)
Number of electricity customers	235,000
System peak demand (MW)[b]	160
Installed generation capacity (MW)	75 (72 Muela Dam and three mini-hydros)
Annual generation (GWh)	862
Imported generation (GWh)[b]	373
Average electricity tariff (US$/kWh)	0.10
System losses (%)	12.8

Source: DoE.
Note: a. As of December 2018, the electricity access rate was measured at 43 percent.
b. LEWA Annual Report 2018.

[7] Bruni, et al. 2016. *Forever Young? Social Policies for a Changing Population in Southern Africa*.
[8] The LHDA is responsible for the implementation, operation, and maintenance of Lesotho's portion of the Lesotho Highlands Water Project, a water project (jointly with South Africa), and a hydropower generation project (Lesotho only).

7. **Electricity demand in Lesotho totals 160 MW;[9] however, more than half of the demand is supplied from imports of electricity.** Lesotho's main source of power generation is the 72 MW Muela hydropower plant managed by the LHDA. This provides for 40 percent of the demand and the rest is supplied using imports from South African Public Utility (*Elektrisiteitsvoorsieningskommissie*, ESKOM) and Electricity of Mozambique (*Electricidade de Mocambique,* EDM)—mostly coal-based power generation. In 2016–2017, of the 862 GWh of electricity purchased, LEC imported 373 GWh of electricity from South Africa (ESKOM) and Mozambique (EDM) at prices which range from M 0.77 to M 1.50 per kWh, substantially higher than purchases from the Muela hydropower plant at M 0.13 per kWh. As such, electricity imports amounted to 86 percent of LEC's supply costs. According to LEC's projections, peak power demand is expected to grow to 204 MW by 2020 and 432 MW by 2030.

8. **Lesotho is fortunate to have an abundance of RE resources such as solar, wind, and hydropower, which have the potential to surpass Lesotho's relatively modest energy needs.** Wind potential exceeds 1,000 W/m^2 in certain pockets of the country, and global horizontal irradiation exceeds 5.3 kWh/m^2 in most parts of the country.[10] The Scaling Up Renewable Energy Program in Low Income Countries (SREP) Investment Plan for Lesotho (P166936), prepared with the support of the World Bank and other donors, presents the total technical capacity[11] of renewable resources as 2,300 MW, with annual energy generation potential of 5,900 GWh. Lesotho's Energy Policy 2015–2025 recognizes that these resources can be transformational energy sources, especially in remote, hard-to-reach areas of the country such as the highlands located in the east and central parts of the country mainly in the districts of Thaba-Tseka, Mokhotlong, Qacha's Nek, and Quthing.

9. **Realizing the potential of these RE resources is a focus of the Government's Vision 2020 Strategy,[12] and the draft National Strategic Development Plan (NSDP) II 2019–2023 viewed it to be a potential catalyst for job creation and growth in private sector investment.** The NSDP calls for increased clean energy production to attain self-sufficiency and export potential, expanded electricity access, and better, more efficient use of domestic energy resources. Investment in RE is viewed as a means for addressing many of the energy sector challenges faced by Lesotho, as it would contribute to reduce Lesotho's dependence on electricity imports, alleviate fuel imports and the use of wood fuel, as well as provide decentralized electricity for rural development and leverage private sector investment. Therefore, the Government of Lesotho (GoL) has set a target to increase the use of RE resources by 200 MW by 2020. Despite its low market penetration, demonstrated cost-effectiveness of decentralized RE technologies powered by solar photovoltaic (PV), wind, or micro-hydro could bring access to modern energy services to the Basotho who currently rely on biomass and kerosene to meet their energy needs.

10. **Despite the significant RE potential, larger-scale development and private sector investment have not yet materialized.** The constraints limiting RE development in Lesotho include the following:

(a) Regulatory and institutional barriers, such as an incomplete legal and regulatory framework, overlapping institutional mandates of various energy sector entities, and the lack of

[9] LEWA Annual Report 2018 - System Peak Demand.
[10] As part of Energy Sector Management Assistance Program's initiative on Renewable Resource Mapping, biomass, small hydro, solar, and wind potential in Lesotho was assessed.
[11] The assessment excludes large hydro potential but includes utility-scale solar and wind, small-scale hydro, waste-to-energy, solar micro-grids, micro-hydro micro-grids, solar home systems (SHS), and micro-solar technologies.
[12] https://www.gov.ls/wp-content/uploads/2018/04/National_Vision_Document_Final.pdf.

technical standards on RE installations and appliances, create an uncertain investment climate for RE investors and development.

(b) Technical and capacity barriers, such as irregular, outdated, and incomplete RE resource and energy baseline studies and limited knowledge and capacity from the institutional to the end-user level, hinder RE uptake.

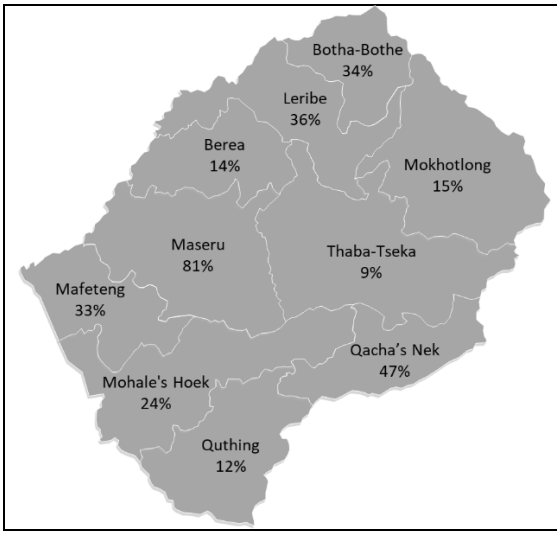
(c) Environmental barriers, such as declining biomass stock, increasingly variable rainfall and periods of drought, and limited availability of suitable land for RE development, increase the cost of RE deployment.

(d) Financial barriers, such as limited access to financing and underdeveloped delivery mechanisms for households and private sector, high levies and taxes on imported components of RE systems, and the high cost of distributing RE technologies to dispersed and remote communities in Lesotho, limit the scaling-up of RE deployment.

(e) Social barriers, in particular the lack of awareness among Basotho about the health and cost saving benefits of RE technologies, limit RE uptake.

11. **Electricity access in Lesotho is low.** The national electricity access rates stand at 38 percent with 60 percent for urban and peri-urban households and 18 percent for rural households (see figure 1). Current access rates have been achieved largely due to the recent push by the Government to accelerate electrification through an annual budget for electrification and funding from the Universal Access Fund (UAF) managed by LEWA. The UAF collects roughly M 18 million annually used to promote national electrification. The UAF is funded by levies (M 0.02 for domestic and M 0.03 for industrial) on every unit of electricity purchased. The main purpose of the UAF is to (a) subsidize the capital costs of new areas for electrification; (b) provide concessionary financing to developers toward the construction and upgrading for electrical systems for new areas of electrification; (c) facilitate education and training to local communities in the safe and efficient use of electricity; and (d) facilitate research relevant to the supply of electricity in rural areas. The UAF is currently funding only on-grid electrification efforts, mainly extensions of the existing LEC grid network. In 2016–2017, the annual budget allocation funded 21 electrification projects while the UAF funded five electrification projects. The GoL sets annual electrification targets for LEC of 15,000 connections, which LEC has been successfully achieving by extending its grid. Roughly 80 percent and 60 percent of currently connected households were provided with access in the last 10 and 5 years, respectively. To date, LEC customer connections are at 235,000.

Figure 1. Household Electricity Access Rates by District and the Electrification Status of Public Facilities in Lesotho



Attribute	Total	Electrified	Unelectrified
Households	537 457	~40%	~60%
Businesses (small shops)	10 750	4 300	6 450
Schools	1 452	787	665
Health Facilities	294	230	64
Principal Chief's Offices	22	7	15
Local Courts	33	29	4
Community Council Offices	47	14	33
Other Government Offices	77	16	61
Agricultural Resource Centres	22	8	14
Police Stations	60	41	19
Post Offices	47	40	7
Hostels and Barracks	131	109	22
Guest Houses and Hotels	285	258	27
Churches	1965	504	940

Source: Lesotho Electrification Master Plan (EMP), GoL June 2019.

12. **Rural electrification efforts involve a mix of sector institutions.** LEC is responsible for rural electrification projects within its service territory (within 3.5 km from the existing distribution network). The Rural Electrification Unit (REU), established in 2004, is a Project Implementation Unit (PIU) under the DoE that coordinates and manages the implementation of off-grid and grid rural electrification projects outside the LEC service area. REU projects are also funded through the GoL allocation budget for electrification and the UAF managed by LEWA. Almost all those with access to electricity are grid connected. The majority of the country is mountainous with low population densities, making access to the grid difficult, hence the need for off-grid electrification efforts to complement on-grid electrification efforts. Grid connection costs are partially subsidized while households pay nearly cost-reflective, LEC tariffs.[13] If households are more than 50 m from the network, the customer bears the true cost of connection. However, if households are within 50 m of the network, connection costs are subsidized at M 2,000 (approximately US$140) per connection and the GoL covers the difference in connection costs, which on average totals M 18,000 per connection. In addition, given that 76 percent of Lesotho's population lives in rural areas engaging in subsistence farming, the demand for electricity for residential consumers is low. According to the recent household energy survey, residential grid customers consume 30–150 kWh per month, leading to an average of 90 kWh per month with expenditures of approximately M 130 (roughly US$9) per month. Such low levels of consumption render LEC's electrification efforts commercially unviable, and the shortfall between sales and operation and maintenance (O&M) costs comes from the GoL budget.

13. **The Government has considered other alternatives, such as micro-grids and distributed RE technologies (that is, stand-alone systems), to accelerate electricity access using off-grid initiatives; however, quality assurance of service delivery remains a concern.** In 2007, under the World Bank Utilities Sector Reform Project (P070673), the GoL through the REU commissioned three mini-grids—two diesel based and the other micro-hydro. LEC operated the diesel mini-grids, which served only domestic

[13] Current tariffs reflect running costs; amortization is not included.

consumers; however, due to extremely high fuel and operating costs, the diesel generators were decommissioned and eventually connected to LEC's network. The other mini-grid, a 180 kVA run-of-river micro-hydro site in Semonkong, is currently operated[14] by LEC. Due to increasing demand and the seasonality of the water flow, the mini-grid is now being supplied by a 350 kVA diesel genset. The quality of service has been limited to 14 hours per day, and the system consumes approximately 14,000 liters of diesel fuel per month, which is transported to the site on vans. Domestic customers pay the normal LEC tariff of M 1.47 per kWh but the high cost of service provision is a burden to LEC.

14. The REU[15] operates a mini-grid as a small power distributor in the southern border of Lesotho by purchasing power in bulk from ESKOM in South Africa and distributing electricity to roughly 300 customers. As the bulk supply costs were originally lower than the LEC tariff paid by customers, the REU was able to recover costs of service provision. However, recent increases in ESKOM's prices mean that the REU cannot recover costs and must draw funding from the GoL budget and the UAF.

15. **With an access target of 75 percent by 2020, expanding access is at the heart of the Lesotho Energy Policy 2015–2025 and a major component of Vision 2020 and the NSDP.** Without electricity, households rely on biomass, which is time-consuming[16] and can lead to negative health outcomes. Electricity is viewed as a driver of socioeconomic development in Lesotho; as such, the GoL—in 2017—set an electrification target to bring electricity to 75 percent of households by 2020. Correspondingly, the Energy Policy vision is that "Energy shall be universally accessible and affordable in a sustainable manner, with minimal negative impact on the environment," and the current policy framework is fundamentally aimed at supporting reliable and affordable energy access to improve the livelihoods of people in Lesotho. It is expected that this will be achieved through income-generating activities that sustain and improve lives by facilitating the provision of affordable electricity services. Electricity is also viewed as a driver of broader economic development in Lesotho, with the potential to support industrialization of the economy, tremendously increasing jobs and supporting diversification in manufacturing and agriculture sectors. As such, the Lesotho National Development Corporation (LNDC) identifies the provision of electricity to key economic development zones as critical to facilitating inclusive and sustainable private sector-led economic growth in Lesotho, also a key priority area identified in the NSDP.

16. **For improved coordination of electrification efforts, the GoL is preparing an Electrification Master Plan (EMP) that articulates the role of grid electrification and off-grid electrification in meeting the national access targets.** The EMP, financed by the European Commission (EC) under its capacity-building program with the DoE, will guide sector planning. While Lesotho has had the most successful experience with centralized grid extension, the master plan defines the areas that should be connected to the grid and those that require decentralized services. The final draft of the EMP was delivered to the GoL in June 2018 and presented to the Lesotho Energy Sector Coordination Forum on July 11, 2018. The EMP provides a recommendation on how best to use the GoL's annual public budget dedicated to electrification, currently amounting to M 150 million (approximately US$11.1 million), using an 80/20 allocation for grid expansion and off-grid electrification, respectively. The grid component of the study identified areas for electrification within 5 km and 7.5 km radius (depending on the location) to the nearest grid and having a potential of providing electricity to 70 or more households. The EMP estimates

[14] The REU was engaged in a management contract for the micro-hydro mini-grid; however, the REU was insufficiently staffed to maintain operations and the contract was terminated after one year and returned to LEC for O&M.
[15] LEC helps the REU with metering of customers, that is, revenue cycle services.
[16] According to African Clean Energy's 2015 survey of 2,652 rural households in Lesotho, households—mostly women and children—spent 31 hours per month travelling for fuel.

an average of M 15,000 (approximately US$1,112) per grid connection, which translates into 7,756 grid connections annually, hence 155,000 new grid connections until 2038. The off-grid component identified areas more than 5 km (highlands and river areas) and 7.5 km (lowlands and foothills) from the existing grid and planned grid extensions. Solar PV was identified as the most suitable option for off-grid electrification, proposing six off-grid options based on the affordability levels ranging from solar lanterns, solar kits, solar home systems (SHS) to mini-grids. Estimates for the off-grid component show that 10,346 off-grid connections will be made annually and 207,280 new off-grid connections up to 2038. In summary, it is expected that the grid extension will continue to play an important role in achieving the access target as it is the least-cost supply solution for roughly 64 percent of the total population, while off-grid solutions are becoming increasingly more important as they are least-cost for 36 percent of Lesotho's population.

17. To date there are currently no operational solar PV mini-grids in Lesotho. This is likely because the regulatory framework for mini-grids is weak. There are technical rural electricity service provision standards by LEWA; there is also the requirement that mini-grid service providers obtain a license (or license exemption) to operate. According to the current policy, cost-reflective tariffs are acceptable subject to review by LEWA and agreement by the community. However, a more clearly defined legal framework will be required to provide confidence to developers. Nevertheless, there is substantial private sector and development partner interest in developing mini-grids in parallel with interests from the DoE. For example, OnePower, a local private company involved in solar PV installations, has identified potential sites for solar PV mini-grids and will soon commission its first pilot PV mini-grid in a community located in Makebe. MOSCET, a solar equipment distributor, has partnered with international developers to participate in a donor-led request for proposals for a 75 kW solar mini-grid; however, the company was not selected for the project.

18. Mini-grids may be suitable for remote clusters of population whose demand justifies the capital investment. However, at lower population densities, grid extension and micro-grids can be challenging in terms of economic viability in the short run. For such situations, the latest generation of stand-alone technologies, for example, SHS or solar lanterns, are being explored to provide basic electricity services. Some public pilots have recently been tested, but without success due to lack of sustainability.

19. The United Nations Development Programme-Global Environmental Facility (UNDP-GEF) is funding pre-feasibility studies for RE-based mini-grids in 20 village communities spanning five of Lesotho's 10 districts. The studies will focus on electricity generation using RE technologies for household use and small income-generating activities and will provide a long-term plan for electrifying the identified remote areas. UNDP-funded studies and pilots should be conducted early 2019, building on recommendation of the final master plan once endorsed.

20. The GoL has had some experience in implementing distributed RE technologies through distribution of SHS. The REU, through a GEF-financed pilot project, distributed SHS to 300 households in the Linakaneng region in the Eastern highlands in 2014. Also, since 2007, UNDP and the GEF have supported a program to promote the use of RE technologies for basic household needs such as lighting, radios, and cell phone charging; this project—whose sustainability is still to be assessed—installed 1,537 SHS in the districts of Mokhotlong, Thaba-Tseka, and Qacha's Nek. While the sustainability of the latter is still to be assessed, it is largely perceived that these pilot projects have not been successful due to lack of

adequate product standards[17] and maintenance mechanisms. Many systems are not operational after a few months of being commissioned.

21. **While the current Energy Policy presents a framework to reliably and affordably ensure energy access to improve the economy of Lesotho and the livelihoods of its citizens, Lesotho does not currently have an Energy Act nor a regulatory framework in place that formally enacts Energy Policy and establishes the mandates of sector institutions.**[18] The African Development Bank (AfDB) and the European Union (EU) are supporting an elaboration of the Regulatory Framework in the electricity sector. In 2015, LEWA, with the support of the AfDB, developed a draft Regulatory Framework for the Development of Renewable Energy Resources in Lesotho ('RE regulatory framework') for expanding the use of RE resources. The framework specifies the procurement and regulatory approaches for both on-grid and off-grid RE. The EU, as part of its technical assistance to the DoE, is assessing the regulatory framework's robustness to support private sector participation in off-grid electrification and a new regulatory framework is being developed. The EC is also providing support to the institutional reforms in the energy sector. The main assessment is the review of the Energy Policy 2015 with an eventual output of transforming the policy into an Act of Parliament. The Energy Act will streamline the mandates for the respective energy institutions. It is also envisioned that the institutional reform would lead to the elevation of the REU into the Rural Energy Agency and the DoE into the Energy Commission.

C. Relevance to Higher Level Objectives

22. **The proposed project is aligned with the GoL's electrification agenda and will demonstrate the implementation of the Lesotho Energy Policy 2015–2025 by complementing ongoing efforts by other donors and stakeholders and supporting the provision of off-grid electricity services as well as grid electrification of economic zones to enhance job creation.** In the absence of a mature legal and regulatory framework, the proposed project is leading the way in demonstrating the expansion of access using innovation business models and private sector participation to address the challenges of affordability, reliability, and sustainability of service provision from the perspectives of both the service providers and electricity consumers. For the off-grid component, the project will provide technical assistance for creating an enabling environment for the deployment of mini-grids and will help finance the construction of mini-grid infrastructure needed to provide electricity services to new users. Under the on-grid component, the project will finance grid extensions to commercial and industrial consumers located in the economic zones of Lesotho with the aim of boosting economic growth through the creation of jobs for the youth. The project will also finance technical assistance and implementation support to build capacity of both public and private sectors to ensure sustainable provision of electricity service.

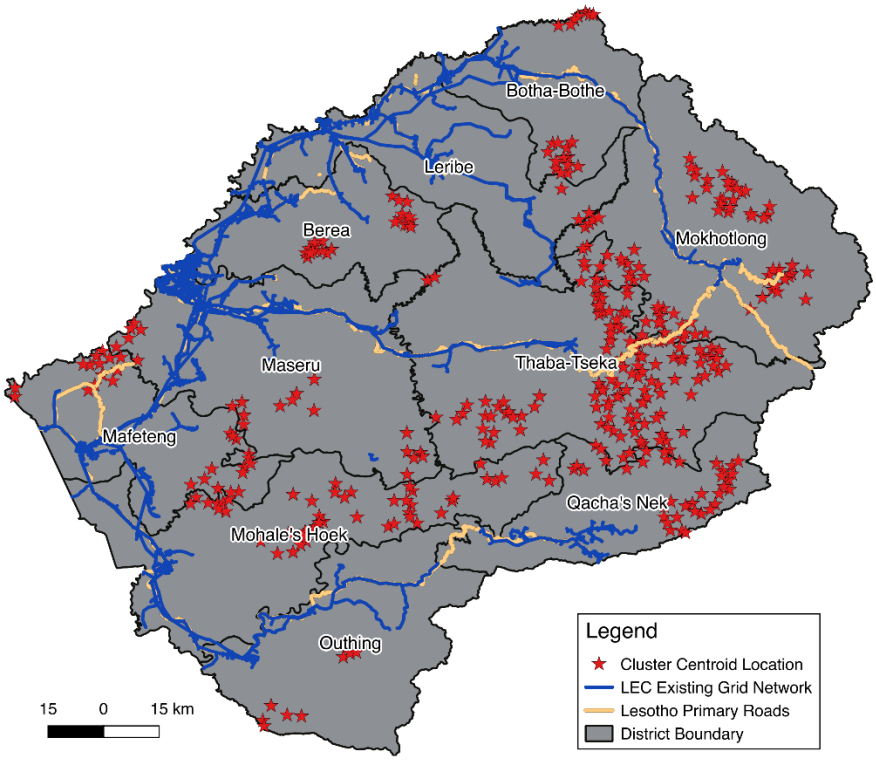
23. **The proposed project creates conditions for more effective delivery of public services in peri-urban and rural areas and contributes to an enabling environment for private sector participation in energy service delivery.** There are approximately 665 schools, 64 health facilities, 14 agricultural resource centers, 6,450 small businesses, 940 churches, and 188 other public buildings that lack electricity service. These community facilities can be anchor loads to enhance the commercial viability of rural electrification. A key feature of the Lesotho Energy Policy to scale up the deployment of off-grid solutions is to attract private sector participation to the off-grid market. To pilot this initiative, the project will explore the

[17] The Bureau of Standards was only recently created so there is no regulation governing the importation of solar products. Because of this, a range of noncertified products from China, India, and South Africa have entered Lesotho.
[18] See annex 7 for a list of key sector legislations, regulations, and guidelines.

possibility of private mini-grid developers and operators providing service to these anchor loads. There is an opportunity to create mechanisms to incentivize the private sector to deliver services in a sustainable manner, dovetail with anchor loads such as community facilities to reach remote households, and ensure affordability for consumers and adequacy of revenue for service providers. It is estimated that 205 schools, 30 health facilities, 10 agricultural resource centers, 4,165 households, and 490 small businesses will be connected to mini-grids through the project. The project will also provide on-grid electrification to about 1,400 residential customers who will be located within the vicinity of electrified economic zones.

24. **The project builds on analytic tools to optimize the use of different technologies to expand electricity access.** To complement the analysis undertaken in the development of the EMP, and validate the potential mini-grid sites identified by the GoL, the World Bank undertook a geospatial electrification planning analysis. By using a selection criteria for a distance of 15 km from the existing grid and community clusters of 100 households, 48 potential mini-grids were identified in the districts of Thaba-Tseka, Qacha's Nek, and Mohale's Hoek. Details are shown in figure 2.

Figure 2. Potential Mini-grid Sites with 100 Household Clusters Located Beyond 15 km from the Grid



Source: World Bank analysis.

25. **The proposed project is designed around four core principles: diversification, private sector participation, job creation, and flexibility.** The first principle is ensuring that the project reaches diverse beneficiaries with varied needs including households and community facilities such as health centers, schools, agricultural resource centers, and so on. Even then, the economies of scale are such that reaching all consumption points together allows a more attractive opportunity for the private sector as well as benefits the consumers in the form of longer-term reliable and affordable energy services. The second

principle centers on maximizing private sector participation in the delivery of off-grid energy services. Leveraging private sector investment will help reach a larger number of beneficiaries, maximize project impact, and support sustainability of service. Third, the electrification initiatives on the off-grid and grid space will eventually lead to job creation for the youth. Jobs will be created for the semi-skilled in the construction and operations of the mini-grids and the industrial/agro-based facilities located in the economic zones. Lastly, the project recognizes that achieving these outcomes requires flexibility with respect to market approaches. This spectrum ranges from fully market-delivered approaches to more regulated ones where the Government maintains a leading role in service provision. Most often, this necessitates a hybrid approach that leverages the comparative advantages of both public and private sectors. Such flexibility recognizes the complexities associated with delivering energy services in off-grid areas and seeks to maximize the likelihood of success through tailored approaches to sustainable market development.

26. **The proposed project directly contributes to the World Bank Group's Country Partnership Framework 2016–2020 (CPF106720) and draft Performance Learning Review 2016–2020 (PLR136011) for the Kingdom of Lesotho.** The CPF objectives of Focus Area 1, Improving Efficiency and Effectiveness of the Public Sector, include improving basic education outcomes and health outcomes. By increasing access to electricity services in rural areas, social services such as health and education will be easier to provide, potentially leading to, among other things, increased access and school completion rates; HIV/AIDS awareness, prevention, and treatment; tuberculosis treatment; improvement in maternal and child health; and reduction in infant mortality among the poor rural communities in the mountainous region. The project also contributes to Focus Area 2, Promoting Private Sector Jobs Creation, particularly on objective (i) improve the business environment and diversify the economy, and objective (iv) increase water and RE supply for industry, agriculture, and export opportunities. The proposed project will improve the viability of economic zones by providing grid electricity infrastructure to improve attractiveness for business development and for value addition of products being produced in these zones. In addition, employment opportunities will be created in these zones, thereby improving the economic livelihoods of the people through the indirect jobs and public services created around these zones. The project will promote private sector-led investments in off-grid electrification and distributed RE technologies. These electrification initiatives will create jobs for construction and electrical appliance manufacturing and retailing, as well as create and sustain general business activities in rural areas. It will further help rural communities grow by facilitating income-generating activities. In terms of diversification of the economy and RE development, the project will facilitate the development of solar PV energy. With these focus areas, the project is hence aligned with the World Bank Group's twin goals, to reduce extreme poverty and improve shared prosperity.

27. **Lesotho is vulnerable to climate change, which could increase the risk of droughts, flooding, land degradation, and loss of biodiversity.** Adopting RE technologies results in lower greenhouse gas (GHG) emissions; thus, this project is also aligned with the National Climate Change Policy 2018–2028 objective of reducing GHG emissions and climate mitigation.

28. **Lastly, the project is aligned with the GoL-endorsed SREP Investment Plan.** Approved by the SREP Subcommittee on December 14, 2017, the SREP Investment Plan[19] consists of two core investment-focused components. These investment components include (a) on-grid RE technologies and (b)

[19] Prepared with funding from the World Bank (P166936).

distributed RE technologies. The program plans to enable the increased adoption of RE technologies through the development of commercial on-grid and off-grid RE markets.

II. PROJECT DESCRIPTION

A. Project Development Objective

PDO Statement

29. The Project Development Objective (PDO) is to increase access to electricity in rural and peri-urban areas of Lesotho.

PDO-Level Indicators

30. The PDO-level indicators are shown in table 2 (section VI presents the full Results Framework).

Table 2. PDO-Level Indicators

Indicator Name	Corporate Result Indicator (CRI)	Baseline	End Target
Industrial/Economic Zones connected to main grid (Number)		0	6
People provided with new or improved electricity service (Number)	X	0	22,825
Renewable energy generation capacity of mini-grids constructed under the project (Megawatt)		0	4.09
Community facilities provided with access to electricity service by mini-grids (Number)		0	245
Small and Medium enterprises provided with access to electricity service by mini-grids (Number)		0	490

B. Project Components

31. The project will support the GoL's Energy Policy vision that "Energy shall be universally accessible and affordable in a sustainable manner, with minimal negative impact on the environment." While the centralized grid network has expanded significantly over the last 10 years, almost 60 percent of Basotho do not have access to electricity and rely mostly on biomass to meet their energy needs. The GoL views improving access to modern energy services as a vital step in improving the livelihoods and economic opportunities for its people. Given the largely mountainous terrain and low population density in remote villages, electrification using grid extensions is financially unviable in many parts of the country. Therefore, this project consists of financing support for rural mini-grids, which are viewed as a preferred option for delivering electricity services to off-grid households, community facilities, and small businesses.

32. Within the NSDP, energy has been identified as a critical input in two of the key priority areas for development in Lesotho. These are (a) Enhancing Inclusive and Sustainable Economic Growth and Private Sector-Led Job Creation and (b) Building an Enabling Infrastructure. While the NSDP recognizes the recent efforts made in increasing access to electricity, it notes that this access is concentrated mainly in urban areas and new connections have not been based on targeted industrial clustering or sector clustering that would have stimulated further industrialization and quickened production processes. As a part of its

growth strategy, the GoL has prioritized energy provision to industrial areas/zones for implementation in the NSDP. Therefore, this project also consists of financing support for grid extension to industrial and commercial zones of peri-urban areas in Lesotho.

33. This project will support a comprehensive suite of investments for the expansion of access to electricity in peri-urban and rural areas by (a) extending the main grid to industrial, commercial, and residential customers in peri-urban areas and (b) promoting the use of off-grid solutions in rural areas to maximize the number of households provided with electricity services while enabling basic public services, fostering local economic development, and supporting pragmatic business models to attract private investment. A substantial technical assistance component is proposed to support a widespread consumer education campaign to inform and engage with citizens and to launch a multipronged capacity-building program to address sector needs.

Component 1: Grid Extension to Peri-Urban Areas of Lesotho (IDA US$30 million equivalent)

34. This component, to be implemented by LEC, will finance the design, procurement of materials, and construction works required to electrify selected industrial and commercial loads in peri-urban areas of Lesotho, as well as provide connections to residential customers nearby. This component will create roughly six new connections economic development zones (which will become the home of approximately 252 companies) along with approximately 1,400 residential customers nearby. Table 2.3 in Annex 2 provides more information on the anticipated activities in these economic development zones.

35. The component will contribute toward construction of medium voltage (MV) and low voltage (LV) distribution lines (33 kV/11 kV) as well as the upgrading of existing or construction of new substations. Grid connections to the selected areas will cater to agricultural productive use such as in Butha-Buthe, industrial loads such as in Mokhotlong and Berea, and electrification in the highlands such as Qacha's Nek, which all have high potential for economic development.

36. LEC's core business includes the extension of the network. However, Component 1 will introduce new approaches to distribution system design and optimization to maximize the resources available and efficiently implement the project with the expectation of reducing connection costs. Additionally, this component will support the preparation of technical studies and consultancies as well as project management expenses such as the financing of external audit, oversight of implementation of the environmental and safeguards instruments for the investments, and the oversight of the health and safety aspects during construction.

37. The model envisioned is particularly viable for LEC, as the electrical corridors built under the project to connect large new customers will also be used by the utility to develop its LV network to underserved residential customers, accelerating the achievement of LEC's and the GoL's electricity access expansion targets. Site identification will be conducted in consultation with LNDC (and will be aligned with LNDC's Strategic Plan 2018–2022), the DoE, and LEC based on the potential for job creation and maximizing socioeconomic development in the peri-urban and industrial parts of Lesotho. The final selection of the sites will be confirmed and validated by the geospatial electrification analysis based on a least-cost approach.

38. This component will fund the connection of residential customers living within 600 m of existing and proposed distribution transformers in each zone, which according to LEC will range from US$300 to

US$1,000 per connection. The number of connections realized will depend on the sites finally selected for development by the DoE in collaboration with LEC and LNDC.

Component 2: Rural Electrification by Mini-grids (IDA US$10 million equivalent, SREP Loan US$8 million, SREP Grant US$2 million)

39. This component will support the electrification of areas where electricity supply through mini-grids represents the least-cost option from a country perspective, as underpinned by the EMP and geospatial analysis.

40. **Subcomponent 2A: Rehabilitation and Upgrading of LEC Mini-grid at Semonkong (SREP Loan US$3.5 million, SREP Grant US$2 million).** This subcomponent will fund the rehabilitation and upgrading of Semonkong, a hydro-based mini-grid with diesel as an alternative electricity supply source. Semonkong, located 113 km from the heart of Maseru, is operated by LEC. However, due to technical challenges and low hydrology, the hydro turbine is currently inoperable and installed capacity (180 kW of hydro and 500 kW of diesel) at the site does not meet the demand[20] of its service area. Therefore, rehabilitation of the turbine, expansion of generating capacity by adding 1.5 MW of solar PV and 500 kWh of storage, and the upgrade of the operational mechanisms for the simultaneous production of electricity by multiple supply sources are required and will be funded by the project. In addition, the expansion of the distribution network and connections to approximately 100 additional customers, both residential and commercial, as well as appropriate metering solutions for new and existing customers will also be funded through the project.

41. This demonstration project will provide a greater understanding of electricity demand in remote areas and contribute to greater economic activity at the site, a frequently visited tourist hub and the future home of a large hospital and newly conceived elementary school. LEC will share with the DoE all costs (capital and operating) as well as detailed consumption data of its customers served at the site.

42. Feasibility and engineering design studies as well as implementation support for LEC (oversight of implementation of the environmental and safeguards instruments for the investments as well as the oversight of the health and safety aspects during construction) will be supported under this subcomponent.

43. **Subcomponent 2B: Mini-grid Development under public-private partnership (PPP) Models (IDA US$10 million, SREP Loan US$4.5 million).** This subcomponent will support the electrification of areas where electricity supply through mini-grids represents the least-cost option from a country perspective, as underpinned by geospatial analysis. This subcomponent will fund the deployment of several mini-grids using private sector-led business models and help create state-of-the-art projects using mini-grids that will (a) test various PPP business models for service delivery; (b) improve availability of mini-grid market information, thereby attracting private sector participants; (c) offer technical support for due diligence and project implementation; (d) create customer awareness about different tiers of service offered by mini-grids; and (e) provide grid connections to approximately 4,800 customers to link them to the mini-grids supported under the Project; and (f) provide technical assistance to carry out associated feasibility

[20] Current demand totals 500 kW but does not include suppressed demand and self-generation.

studies and technical-economic analysis and implementation support activities for addressing technical, procurement, legal, environmental, social and capacity-building matters.

44. Up to 39 mini-grid sites will be selected in agreement with the DoE based on the high-priority areas proposed by the GoL (which identified 30 potential mini-grid sites[21]) and geospatial analysis (which has identified a long list of potential sites for development). Care will be taken to select sites with significant potential for economic development and job growth in diverse areas of the country, including the highlands. The mini-grids will service all households and community (education, health, and agricultural resource) facilities in the specified service area. Commercial customers and other anchor loads will be encouraged to connect as well. Based on preliminary analysis, it is expected that roughly 4,800 customers will be connected to mini-grids developed within this subcomponent.

45. The technical focus will be on solar hybrid systems, that is, solar generation with battery[22] storage and diesel backup. Mini-hydro[23] may also be considered on a case-by-case basis given Lesotho's extensive hydro potential throughout the country. The mini-grids will be built to standards specified by LEWA (LEWA's rural service standards or to Lesotho's grid code standard to allow for integration to the main grid in the future). Prepaid metering and smart meter systems will be required to mitigate revenue collection risk and enhance the bankability of the mini-grid subprojects.

46. The subcomponent will be implemented using a market-based approach whereby the private sector develops mini-grids to deliver electricity services on a build-own-operate basis, with financial support offered through a single funding window: minimum subsidy tender. Limited private investment is expected. The DoE will be responsible for providing payments to developers toward capital expenditures (CAPEX) through a clear and transparent process. For areas that private developers consider too risky, the DoE is considering fully public-financed approaches, with private sector participation in constructing and operating the mini-grid. This could be incorporated as a separate tender under this subcomponent depending on the uptake of the minimum subsidy tender and private sector interest to enter these areas. The assessment of this approach will be completed during the first year of the project.

47. The sites will be divided into two to three lots to encourage economies of scale in procurement and efficiency in O&M. By increasing the deal size, this window aims to attract some of the international private developers to enter the mini-grid market in Lesotho.

48. This subcomponent will be complemented by extensive technical assistance to (a) confirm the sites through further feasibility studies and techno-economic analysis; (b) promote productive and efficient use of energy by users; (c) provide technical, legal, and procurement support to effectively design the bidding documents and supervise the construction of the mini-grid assets; and (d) increase capacity of local mini-grid developers.

[21] UNDP-GEF is funding pre-feasibility studies for RE-based mini-grids in 20 village communities spanning 5 of the Lesotho's 10 districts. Results of this study will inform the selection of mini-grid sites.
[22] This approach is consistent with World Bank's recent initiative to promote battery storage.
[23] Subprojects that trigger Safety of Dams (OP/BP 4.37) will not be eligible for funding under this project. If proposed subprojects trigger Projects on International Waterways (OP/BP 7.5) and there is significant potential for economic development and job growth at the site, project restructuring may ensue.

Component 3: Technical Assistance and Implementation Support (SREP Grant US$2.9 million)

49. Given that the market is nascent, the technical assistance component will play a critical role in upstream and downstream capacity building. More specifically, the fund will be used to finance activities described in the following paragraphs.

50. **Subcomponent 3A: Project Implementation and Coordination Support (SREP Grant US$2.5 million).** This subcomponent will strengthen the capacity of the sector stakeholders for coordination, project management, and implementation. Activities will include (a) the hiring of independent verification agents (IVAs); (b) hiring of monitoring and evaluation staff,; (c) management of certification program for companies; (d) establishment of a PIU including dedicated project coordinator and additional fiduciary and environmental and social support staff; (e) establishment of a geospatial planning platform; (f) hiring of gender-based expert focusing on women's employment, consumer education and productive use of energy, and (g) related capacity-building and training activities for all key staff in the PIU to support implementation of the project. The capacity building will, among other things, address mitigating and managing social risks related to the labor influx (sexual exploitation, gender-based violence (GBV), and human trafficking). To facilitate implementation, this subcomponent will also fund (a) the preparation of feasibility studies under Components 1 and 2; (b) transaction advisory services to effectively design the bidding documents for mini-grids; and (c) supervision of the construction of the energy assets. This subcomponent will finance the services of a fiduciary services firm with a proven track record as an IVA. The IVA will be tasked with ensuring that companies meet their obligations to customers under all project components. See annex 2 for further details.

51. **Subcomponent 3B: Women's Employment, Female Entrepreneurship, Consumer Education and Citizen Engagement, and Productive Uses of Energy (SREP Grant US$0.4 million).** The subcomponent will fund the following activities.

52. The subcomponent will fund the technical assistance work centered on enhancing women's employment in the energy sector focused on key stakeholders such as the MEM, the DoE, and LEC. Limited sex-disaggregated data are available, but global data indicate that women are underrepresented in both technical and nontechnical roles and that the sector is male dominated. For example, total female employment at LEC sits at 116 out of a total of 502 employees indicating that female labor force participation is at around 23 percent. When looking at the data for women employed in technical areas, female employment drops to around 5 percent, with only 12 engineers out of the total of 212 being female at LEC. In the MEM, gaps between men and women are smaller with women representing 45 percent of the workforce (10 out of 22 staff) and 56 percent (22 out of 38 staff) within the DoE. However, many of the roles are administrative versus technical and the representation of women in engineering roles drops to 29 percent in the DoE (two females and five males).

53. The subcomponent will also fund the development and execution of a community awareness campaign, developed to inform people in target areas of the benefits and costs of electricity services, as well as the payment mechanisms, procedures, and safety practices of the electrification process. The campaign will also promote the productive and efficient use of energy by all customers. This is particularly important as Demographic and Health Survey (DHS) data from 2014 indicate a gap between male-headed households (MHHs) and female-headed households (FHHs) in access to energy services. An estimated 25 percent of all FHHs have access to electricity and an estimated 30 percent of MHHs have access to electricity in Lesotho in 2014. The program will target both MHHs and FHHs and will also pay particular

attention to the poorer community members in rural areas that may be reluctant to take advantage of the electrification opportunity or face barriers to access information. The activities supported under this subcomponent will provide recurring opportunities for consumers to interact with service providers to share their feedback and concerns and strengthen the electrification agenda through tackling issues around affordability.

54. Finally, the subcomponent will focus on closing gender gaps between women and men related to enterprises and livelihoods at the community level. The activity focuses on enhancing the productive uses of electricity to increase the income of women's enterprises and livelihoods. Key will be mapping out entry points under the activities under Component 2 with links to enhancing agro-processing, such as grain milling, various manufacturing/industrial industries, such as carpentry and tailoring, and the service sector, for example, in catering, bars, and restaurants that use electricity for lighting, sound systems, and refrigeration, as well as for charging mobile phones.

Component 4: Contingent Emergency Response Component (CERC) (IDA US$0 million)

55. A CERC with zero allocation may be used to partially cover emergency response through implementation of key activities by the appropriate agencies to respond to the emergency. The CERC could also be used to channel additional funds should they become available as a result of an eligible emergency. For the Lesotho energy sector, emergency conditions may arise subsequent to droughts, flooding, or energy import shortage.

56. The CERC mechanism will be further defined in a CERC Operational Manual attached to the Project Implementation Manual (PIM), which will include triggers and conditions for the use of funds. This manual will clearly outline the triggers, eligible expenditures, and procedures for tapping into the CERC. Should the CERC be triggered, all expenditures will be made in accordance with World Bank Policy and Directive for Investment Project Financing (IPF) and will be reviewed and accepted by the World Bank before any disbursement is made. In accordance with paragraphs 11 and 12 of World Bank IPF Policy, this component would provide immediate, rapidly disbursing support to finance goods (positive list agreed with the Government), works, and services needed for response, mitigation, and recovery and reconstruction. Operating costs that are eligible for financing would include the incremental expenses incurred for early recovery efforts arising from the impact of a major crisis.

Project Costs

57. The breakdown of project costs and financing by component is given in table 3. In addition, it is expected that the GoL will cover the costs of preparing and implementing[24] all required safeguards instruments during project implementation. These costs are estimated to be US$5 million.

Table 3. Project Cost and Financing by Component (US$, millions)

Project Components	IDA Financing	SREP Loan	SREP Grant	Total
Component 1: Grid Extension to Peri-Urban Areas of Lesotho	30.0	—	—	30.0
Component 2: Rural Electrification by Mini-grids	10.0	8.0	2.0	20.0

[24] This includes costs of compensation and resettlement assistance, implementation supervision, monitoring, training, consultations, disclosures, communication, and grievance redress mechanism (GRM) operating costs for each subproject.

Project Components	IDA Financing	SREP Loan	SREP Grant	Total
Subcomponent 2A: Rehabilitation and Upgrading of LEC Mini-grid at Semonkong	—	3.5	2.0	5.5
Subcomponent 2B: Mini-grid Deployment under PPP Models	10.0	4.5	—	14.5
Component 3: Technical Assistance and Implementation Support	—	—	2.9	2.9
Subcomponent 3A: Project Implementation and Coordination Support	—	—	2.5	2.5
Subcomponent 3B: Women's Employment, Female Entrepreneurship, Consumer Education and Citizen Engagement, and Productive Uses of Energy	—	—	0.4	0.4
Component 4: Contingent Emergency Response Component	**0**			**0.0**
Total project cost	**40.0**	**8.0**	**4.9**	**52.9**

Retroactive Financing

58. There is a provision for retroactive financing under the IDA credit, SREP loan, and SREP grant for all eligible expenditure under the project, up to an aggregate amount not exceeding SDR 6 million (US$8 million equivalent), US$1.6 million, and US$0.98 million, respectively, incurred after December 5, 2019.

59. It is expected that these funds will be used for the hiring of PIU staff and consultants, the preparation of feasibility studies, and the procurement of additional consultancy services.

C. Project Beneficiaries

60. The proposed project is expected to provide electricity services to 22,825 people,[25] 245 community facilities, 490 small and medium enterprises, and six large industrial/economic zones (the home of up to 252 industrial consumers). The direct project beneficiaries include residential customers in peri-urban areas who will connect to the main grid, as well as the households, community facilities, and small businesses in the rural communities of Lesotho who will gain access to electricity through mini-grids. In addition, mini-grid developers and RE technology providers (local and international) will gain access to finance to develop and expand their businesses in Lesotho, and the DoE will also benefit from capacity building and support in strengthening institutional roles to scale up electrification.

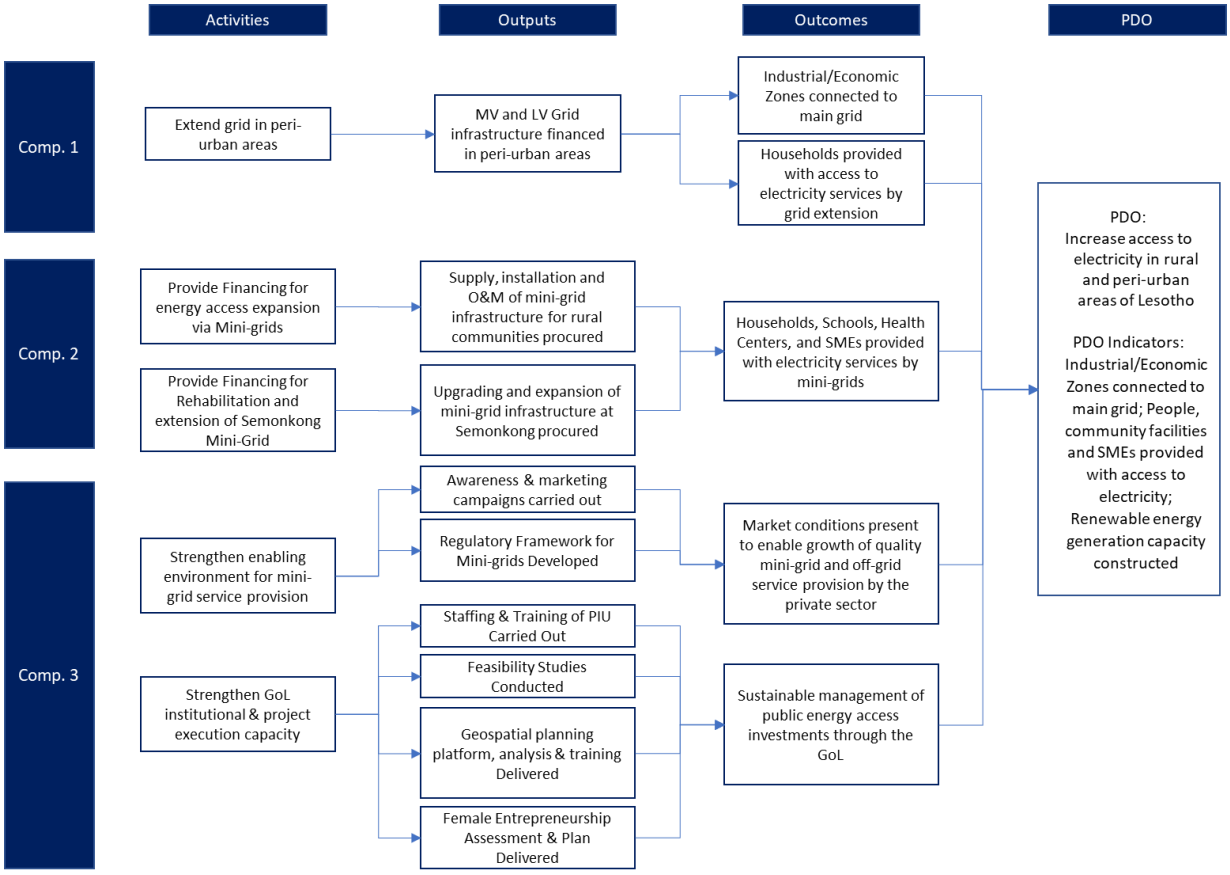
61. Potential indirect benefits of project activities can include (a) improvement in the quality of life of the households who will engage in productive and income-generating activities and have access to information through the use of phone, radio, and televisions; (b) health benefits owing to the reduction of indoor air pollution due to the decrease in the use of firewood and kerosene; (c) improved provision of education and health services resulting from the electrification of these facilities; (d) job creation for communities surround industrial sites gaining access to electricity under the project; and (e) improved education for women and creation of employment and business opportunities for women resulting from efforts to promote gender equality.

[25] The project will directly connect roughly 5,565 households to electricity. With an average household size of 4.1 people, the project will provide electricity access to 22,825 people.

D. Results Chain

62. The theory of change underpinning the proposed project is presented in figure 3. The project aims to increase RE-based off-grid electrification and increase access to new or improved electricity services to households, small businesses, community facilities, and industrial customers through multiple interventions as well as support to LEC and key government agencies, which will strengthen project implementation and lay a foundation for sustainable expansion of electricity access in the future beyond the life of the project.

Figure 3. Results Chain



Note: SMEs = Small and medium enterprises.

E. Rationale for World Bank Involvement and Role of Partners

63. The proposed operation provides public sector financing to promote private sector-led electrification initiatives where commercial financing is not considered viable by local financial institutions. Access to finance by private developers in Lesotho continues to hinder electrification growth, and experience worldwide confirms scale-up in electricity access cannot be achieved without substantial and sustained public support, since investment costs (that is, borrowing costs) can make projects financially unviable, and the corresponding retail tariff and front-end connection charges or component payment deposits (or upfront payments) make access unaffordable to most potential beneficiaries. Component 1 is supporting the electrification of economic zones located in the peri-urban and rural areas

where grid extension and related infrastructure costs have proven to be prohibitive for the industrial/agro-based industries to get connected. In addition, these economic zones have potential to boost economic growth through job creation for the youth, thereby improving the livelihoods of the communities.

64. In the proposed project, SREP funds and IDA resources will be used to de-risk investment opportunities for the private sector to participate in the off-grid space both as service providers and financiers. Public funding under Component 2 is supporting the development of mini-grid models by providing financial resources to demonstrate innovative business models that blend public and private sector experiences. The World Bank will draw on its recent experience in packaging and running tenders for setting up mini-grid sites to attract credible technically proven mini-grid developers.

65. Particularly, the World Bank involvement will (a) ensure that the project design and/or any proposed policy reforms will reflect principles of sustainability; (b) support best practices in market and demand assessments for off-grid technologies; (c) support best practice analytics such as geospatial planning to improve the off-grid electrification plan; (d) enable leveraging of additional financing from donors such as the EU, European Investment Bank (EIB), and Korean Trust Funds; (e) support competitive tendering and procurement for mini-grid developers and RE technology providers to ensure value for money during project implementation; and (f) draw on global experiences in mini-grid installations and operation/management as well as in designing credit lines to support the design of a robust off-grid electrification program.

66. **Maximizing finance for development.** In the proposed project, IDA concessional resources are strategically deployed to present de-risked opportunities to the private sector to participate as service providers or financiers. Public funding provided under Component 2 will support the development of mini-grids by providing financial resources in the form of capital investments that are currently not available for mini-grid developers, allowing these companies to provide quality services to consumers. Through the use of PPP business models for the mini-grids, developers will gain comfort with the business environment, which will eventually allow them to participate in the market on their own in the later stages. In addition, Component 3 will provide capacity building of local mini-grid developers.

67. **The role of development partners.** There is presence of development partners in the grid and off-grid electrification space in Lesotho. The EU is currently the biggest player in the energy sector and is supporting the institutional reform of the energy sector. Support is being provided for the review of the Energy Policy and mandates of sector institutions. The result will be the development of an Energy Act that will streamline the legal mandates of the respective sector institutions, which have proved to be a hurdle for private sector participation in the sector. Also, the EU is currently implementing a new program that seeks to promote the adoption of RE products by supporting local companies to set up energy centers to retail RE technologies to rural communities. UNDP is supporting the GoL to develop a regulatory framework for mini-grids, which will solve legal and technical issues and will guide private developers on the setup and operation of mini-grids. UNDP is also supporting the development of private sector-led 10 mini-grid sites and 10 energy centers in five of the 10 districts in Lesotho. Support to these private developers will be through providing a credit line that will have a blend of debt and results-based grant. The proposed World Bank engagement seeks to complement the initiatives of the respective development partners. Coordination and alignment of efforts by other development partners will be ensured through respective donor energy sector forums and meetings organized during missions. In the on-grid space, the

AfDB is supporting LEC in its network rehabilitation efforts and is also providing support to financing of on-grid generation initiatives, which include solar PV.

F. Lessons Learned and Reflected in the Project Design

68. Lessons from prior experience with energy access projects in Sub-Saharan Africa have informed the design of this project. The overarching lessons from electrification projects are detailed in the following paragraphs.

69. **Fostering cost-effective electrification using varied solutions.** The design of the project benefited from lessons learned by multiple countries in the region that have embarked on successful electrification programs, such as Kenya, Rwanda, and Tanzania. Universally, the GoL found that comprehensive approaches including both grid extension and off-grid electricity service provision are required to achieve scale at the least cost and achieve substantial improvement in access rates in the country. A wider range of solutions and flexible business models in one country (in parallel or sequentially) are needed to respond to the diverse needs of varied populations with different characteristics, the geographic population density and housing patterns, and income segments. New technologies, falling costs, and innovative business models provide an opportunity to reach a much wider spectrum of the population, including the poor, by catering to a broader range of technology options, business approaches, and intervention mechanisms, which can be provided in parallel.

70. **Electrification supported by least-cost plans using geospatial information.** Following recent Sub-Saharan Africa experience in Kenya, Nigeria, and Rwanda, geospatial information system least-cost planning tools have become best practice in electrification planning. Geospatial least-cost plans provide a powerful tool to the policy maker to balance the need to maximize the efficient use of limited public resources with the objective of providing equal opportunities to those living in areas far away from the existing grid. At the same time, geospatial plans enable the identification of communities for which off-grid electricity services (mini-grids and stand-alone systems) offer the least-cost supply solution or that may require pre-electrification solutions in the short to medium term while waiting for higher service standard connections.

71. **Mini-grid selection and technical design.** Mini-grids should be deployed where they are the least-cost electrification method. Mini-grids are mostly suited for rural towns/larger villages that (a) are relatively remote and therefore unlikely to be served by the national grid; (b) are relatively densely populated; and (c) have expected loads that justify the mini-grid investments as opposed to deploying individual household systems. This usually requires a certain size (for example, more than 100 households) and sufficient existing or potential business and institutional loads. Mini-grid potential should ideally be mapped through a least-cost electrification plan and its viability confirmed through detailed feasibility studies. Although mini-grids are typically applied in remote locations, sometimes they can be used as a temporary solution (pre-electrification) in areas where the grid may eventually arrive. In that case, the mini-grids should apply technical standards that would allow future interconnection with the main grid.

72. **Private sector participation.** Recent trends demonstrate a growing participation of the private sector, including several larger international utilities and technology providers, in mini-grids. Innovative private sector business models have emerged, for example, those using smart prepaid meters, allowing remote monitoring, and balancing supply and demand, resulting in increased reliability at reduced operating costs. This creates an opportunity to attract more private sector financing and efficiency in

operation into the mini-grid space. However, to attract the private sector, mini-grids need to be financially viable and regulatory risks need to be minimized. For example, the private sector needs to have clarity about the tariffs it is allowed to charge (and if applicable, subsidies it is entitled to), licensing regime, and the time frame during which it is entitled to operate the mini-grid and/or the rules of what happens when the main grid arrives. Private sector opportunities can be leveraged best through creating conditions for a large-scale mini-grid deployment to leverage economies of scale in both construction and operation.

73. **Consumers awareness campaigns as critical tools for the safe use of electricity.** Experience in several Sub-Saharan Africa countries shows that consumer awareness campaigns are important to educate both males and females on the benefits, correct use, and payment of electricity. As part of these campaigns, additional consultative meetings will be held with women only to provide an environment that invites women to openly raise questions, a situation that may be unlikely to materialize if the meeting is developed in a large, mixed group.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

74. The project will be implemented over seven years under the MEM. The MEM's DoE will implement Subcomponent 2B and Components 3 and 4, while LEC will implement Component 1 and Subcomponent 2A. It is expected that the Loan Agreement will be established with the Ministry of Finance (MoF) and the MEM, with a portion of project funds managed by the DoE for the implementation of Subcomponents 2B and Components 3 and 4 and the other portion being allocated to LEC according to a subsidiary Project Agreement enabling it to implement Component 1 and Subcomponent 2A; a separate subproject account will be established for LEC's management.

75. A single PIU located at the DoE will execute project activities and will have an overall project coordinator who will be responsible for overall coordination and oversight of the project and consolidation of the information related to project implementation, including (a) definition of areas to be electrified based on technical and policy development priorities; (b) aggregation and consolidation of information from implementing entities (DoE and LEC) and broader monitoring and evaluation (M&E); and (c) independent verification of project implementation.

76. The PIU will be responsible for M&E of project implementation progress and results indicators, as well as progress toward achievement of the PDO. Therefore, the PIU will have a dedicated M&E officer who will be responsible for M&E and preparing monthly and quarterly progress reports for discussion with the project coordinator and the World Bank during implementation and support missions. The PIU will also have a dedicated gender and community awareness specialist, responsible for informing the public of project objectives and progress, liaising with LEC and DoE officials in engaging the county governments and communities, and overseeing actions focused on women's employment and productive uses of energy. The gender and community awareness specialist will work closely with the community and participation liaison officer (CPLO) of each technical unit (TU). The CPLOs will play a critical role in ensuring citizen engagement and accessible (including vulnerable groups) consultations at the local level for all project activities.

77. Within the PIU, the DoE Technical Unit (DoE TU) will implement Subcomponent 2B and Components 3 and 4 and will be composed of a project manager, an engineer, a procurement specialist, a financial management (FM) specialist, and environmental and social specialists. The DoE TU will be responsible for providing due diligence on relevant project activities and evaluation of proposals/applications under consideration. Under Subcomponent 2B, the DoE TU will be responsible for (a) land acquisition for the construction of mini-grid sites; (b) implementation and monitoring of environmental and social instruments; (c) preparation of tender documents and management of the procurement process for mini-grid developers; (d) coordination with LEWA to provide license exemptions to successful mini-grid developers and to ensure compliance with technical service standards; and (e) monitoring of mini-grid implementation to standard specifications. A transaction adviser will be hired to facilitate the preparation of the tender documents and to establish and implement the mini-grid procurement process. Under Component 3, the DoE TU will be responsible for the provision of technical assistance and managing relevant consultancies.

78. Within the PIU, LEC will be an implementing agency with autonomy to implement and provide oversight of grid extension (Component 1) and the rehabilitation and expansion of Semonkong (Component 2A). This LEC TU will have its own project manager, engineer, procurement specialist, FM specialist, and environmental and social specialists tasked with the responsibility of providing technical and financial due diligence on the project and evaluating proposals/applications under consideration. LEC's extensive technical expertise in successfully implementing grid extension projects as well as donor-financed projects[26] will allow the LEC TU to capitalize on the experience accumulated to facilitate implementation and supervision of infrastructure investments of the proposed project.

B. Results Monitoring and Evaluation Arrangements

79. The PIU will be responsible for monitoring of project implementation progress and results indicators, as well as progress toward achievement of the PDO. The collection of connection data for both the economic zones and the Semonkong mini-grid will be provided by LEC, while the collection of connection data for other mini-grid installations will be provided to the DoE by the private mini-grid developers. LEC and the private mini-grid developers will also be responsible for the submission of sex-disaggregated data, where relevant, for presenting progress in key and intermediate indicators. Within the PIU, a dedicated M&E officer will be responsible for M&E and preparing monthly and quarterly progress reports for discussion by the project coordinator and the World Bank during implementation and support missions. In addition, an IVA will be procured by the PIU and tasked with ensuring that companies meet their obligations to customers of both mini-grids and grid extension There will be several midterm (in-depth) reviews of the project, the first one taking place 18 months after project effectiveness.

C. Sustainability

80. The project is intended to address the key barriers to RE-based off-grid electrification in Lesotho, and sustainability of the project is ensured through three major areas: (a) easing grid connection constraints for potential economic areas for industrial/agro-based activities in the peri-urban and rural

[26] Recent projects include the Lesotho Urban Power Distribution Rehabilitation Project, which is a US$9.5 million loan from the AfDB to LEC, approved in November 2016.

areas; (b) creating an ecosystem for private sector investment in the mini-grid installations; and (c) mobilizing funds for scale-up of mini-grid installations.

81. Drawing from results of the previous efforts by other donor agencies in rural electrification in Lesotho, which did not sustain the intended scale-up, the project will fund extensive capacity building for all stakeholders across the sector before and during the implementation of the project, which will include technical training for the industry players as well as institutional capacity building for the regulator and implementing government agency.

82. The project will foster competitive selection of mini-grid developers through tenders that will encourage greater participation of private developers, both domestic and international. Mobilization of public funds will help leverage private investment, and mechanisms such as results-based financing will ensure maximum utilization of grants through validated impacted assessments.

83. Lastly, the project will help support the operationalization and implementation of the regulatory framework for mini-grids that is under development if/when the national grid arrives at the mini-grid service territory through the technical assistance component. Various options will be explored such as compensation to the developers if their investment costs have not been recouped by that time, transfer of generation assets to new service territories, and switching role from being a small power producer to a small power distributor.

IV. PROJECT APPRAISAL SUMMARY

A. Economic Analysis

84. Achieving the GoL's goals of universal electrification by 2040 or earlier requires substantial scale-up of resources in the off-grid space in rural communities. Public financing of this project is necessary to leverage private sector financing, support and foster rapid access to electricity to develop industrial zones, considerably de-risk opportunities, and build capacity for private sector to operate in a market that is traditionally considered commercially unattractive.

85. Grid connectivity is required to provide access to peri-urban areas that are expected to grow into commercial and industrial zones to reinforce economic development. Because of the high cost of infrastructure, public financing is required to ensure affordable costs of connection and service. On the other hand, communities living in the remote highlands are characterized by low population density and acute levels of poverty, and thus grid connectivity in these areas is not economically feasible. The private sector footprint in these areas is extremely limited as there are only a few mini-grids and solar off-grid private players. Therefore, public resources will be used to harness private sector efficiencies by creating appropriate incentives to mitigate the risks of doing business in these areas deemed commercially unattractive by the private sector. Finally, public support is necessary to demonstrate the applicability of innovative business models that maximize public and private sector strengths.

86. The World Bank—with its ability to design a customized electrification program drawing from decades of global experience and to harness recent technological advancements to provide reliable, affordable, and sustainable energy services to consumers in remote rural areas—is well placed to assist Lesotho in designing and implementing a successful energy access program. The proposed project

presents an unparalleled opportunity to reach out to a large part of the country bereft of modern energy services.

87. The economic viability of the proposed project was assessed using a standard cost-benefit methodology. Net benefits for the project were calculated by comparing total system costs and benefits for the 'with project' and 'without project' scenarios. Economic costs were estimated based on the preparatory studies developed for the project. The economic benefits for the beneficiaries of the project are estimated on the basis of avoided costs.

88. The economic analysis shows that the project is economically viable without any consideration of environmental externalities. The baseline net present value (NPV) of the proposed project is US$143.2 million (at a 6.75 percent discount rate[27]) with an economic return of 39.8 percent. Upon accounting for the environmental benefits from net GHG emission reductions, the NPV of the project is US$162.3 million and the economic rate of return (ERR) is 43.0 percent when assuming the low social price of carbon and increases to US$181.4 million and ERR of 46.1 percent when assuming the high social price of carbon.

Table 4. Summary of Economic Analysis

Parameters	Value
Discount rate (%)	6.75
Total Cost (US$, thousands)	(292,777)
CAPEX	(35,866)
Operating expenses (OPEX)	(256,911)
Total Benefit	435,970
Grid extension	424,259
Mini-grids	11,711
NPV without environmental benefit (US$, thousands)	143,193
NPV with environmental benefit (US$, thousands) for low and high social price of carbon	162,335 (low) 181,432 (high)
EIRR without environmental benefits (%)	39.8
EIRR with environmental benefits (%) for low and high social price of carbon	43.0 (low) 46.1 (high)
Net emissions reductions (tCO_2)	745,801

B. Technical

89. The proposed project objectives and design are in alignment with the EMP of Lesotho. The project reflects the need for multiple electrification avenues (grid extension, mini-grids, and distributed off-grid solutions) that should be adopted to meet the universal access targets of the country. Geographic zones in Lesotho have been classified into three groups: (a) to be electrified through grid extension; (b) to be electrified through mini-grids; (c) to be electrified through SHS.

[27] Lesotho Central Bank Policy rate is 6.75 percent in December 2018: *http://cb.lesotho.opendataforafrica.org/ajvyuwg/interest-rates-and-share-prices , http://datahelp.imf.org/knowledgebase/articles/484375-what-is-the-central-bank-policy-rate*

90. Under Component 1, the central grid will be extended to peri-urban areas of Lesotho where there is potential for economic growth and development. This project presents no unusual construction and operational challenges as grid extension is well understood and executed regularly by LEC as part of its core business. However, the project introduces new implementation and procurement arrangements to maximize the resources available. The proposed arrangements are based on the lessons learned from World Bank-financed projects in other countries and will be harmonized with the practices of LEC for enhancement and improvement of works and to ensure that no parallel process is created. Additionally, standards specified by LEWA will be used for on- and off-grid investments.

91. Under Component 2, the mini-grid project sites will be selected in agreement with the DoE based on the initial assessment used in the EMP but will be further validated using a comprehensive geospatial analysis as part of the preparatory study for this project. As recommended by the GoL, cost-reflective revenue schemes will be used for the mini-grid projects, which will be subjected to validation by LEWA to ensure affordability of the consumers in a given region. Connection costs are fully covered by the project, and the mini-grid projects will be subjected to the rural electricity service standards issued by LEWA, which at present is the only policy guideline in practice for rural electrification in Lesotho. In addition, anchor loads in the form of community facilities will be harnessed in remote locations where private sector efficiencies can be deployed for supply, installation, and O&M services. While Subcomponent 2A will be implemented by LEC, Subcomponent 2B will be implemented by the DoE. The DoE has executed mini-grid projects before; however, its knowledge and experience is still in infancy. Therefore, it will be supported by a technical consultant to advise during implementation, namely, the preparation of bidding documents and the supervision of construction works.

C. Fiduciary

(i) Financial Management

92. The overall FM arrangements for the project will be with the PIU to be established by the DoE. A suitable qualified FM specialist will be recruited under the PIU to handle the FM arrangements, for which terms of reference will be developed in consultation with the World Bank. The FM specialist will also be responsible for consolidating the project financial reports (including the activities to be implemented by LEC).

93. The funds will be disbursed from the World Bank into a U.S. dollar-denominated Designated Account opened by the DoE and LEC at the Central Bank of Lesotho. Disbursements will be made based on the consolidated six-month expenditure forecast. Each implementing entity will be responsible for submitting its withdrawal application to document expenditures and requesting for replenishment into the Designated Account. Other disbursement options such as reimbursements, direct payments, and special commitments will also be available if the need arises.

94. The consolidated project will be audited by the Office of the Auditor General of Lesotho. The project's annual audit report and the auditors' management letter and management's response are to be submitted to the World Bank within six months of the end of each reporting period, that is, by September 30 each year. The FM arrangements meet the World Bank's minimum requirements under OP/BP 10.02 Financial Management (see annex 1).

(ii) Procurement

95. All procurement to be financed under the project will be carried out in accordance with the Procurement Regulations for IPF Borrowers (dated July 2016), revised November 2017 and August 2018 as may be revised from time to time, and the provisions stipulated in the Legal Agreement. Project procurement for the components implemented by the DoE will be carried out by the single PIU located at the DoE that will execute project activities and will be responsible for overall coordination and oversight of the project procurement. However, the project procurement for the components implemented by the LEC TU shall have a dedicated procurement specialist as part of the team. Project implementation will be carried out in accordance with the 'Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD and IDA and Grants', dated July 1, 2016 (the Anti-Corruption Guidelines).

96. A procurement capacity and risk assessment has been carried out by the World Bank for LEC and the DoE. LEC has good capacity but will require strengthening of its procurement and contract management capacity to fully use the World Bank's Procurement Regulations and tools, and the World Bank team will provide the needed support and training. Similarly, the DoE has limited capacity and no experience with World Bank procurement procedures. The DoE will require strengthening of its procurement and contract management capacities through hiring a qualified and experienced procurement person, monitoring the execution of the Procurement Plan through Systematic Tracking of Exchanges in Procurement (STEP), and putting in place a contract management plan for major contracts.

97. Based on these assessments and considering the roles and responsibilities of the departments responsible for procurement, the procurement risk rating is Substantial.

98. A Project Procurement Strategy for Development (PPSD) has been developed to determine the approach to market, the selection methods, evaluation options, and any other sustainability considerations that may need to be included. While the envisaged contracts are not complex and do not require the adoption of innovative or complex approaches, there is limited capacity in the local market both in numbers and experience of contractors in the deployment of mini-grids through PPPs. There is also a limited number of local contractors for the transmission lines and hybrid systems. There is no local manufacturing base for household connection materials; it is envisaged that these will be imported. The PPSD has considered this and other factors in determining the Procurement Plan, especially the packaging.

99. The implementing agencies have prepared an acceptable Procurement Plan, which will be uploaded in the new STEP system, and a planning and tracking system that will provide data on procurement activities, establish benchmarks, monitor delays, and measure procurement performance.

100. The Lesotho Procurement Regulations of 2007 have been assessed and indicate that the country's regulations are generally consistent with international best practices, although some weaknesses were identified, which should be mitigated through adequate measures that ensure (a) there is adequate advertising in national media; (b) procurement is generally open to eligible firms from any country; (c) contract documents have an appropriate allocation of responsibilities, risks, and liabilities; (d) publication of contract award; (e) the national regulations do not preclude the World Bank from its rights to review procurement documentation and activities under the financing; (f) implementation of an effective complaints review mechanism; and (g) maintenance of records of the procurement process.

D. Safeguards

(i) Environmental Safeguards

101. The project is rated Environmental Assessment Category B as the proposed activities and subprojects are small scale and site specific with minimal environmental footprint. Overall, the project is expected to have positive environmental impacts through the promotion of RE generation. The adverse environmental impacts of subprojects are considered moderate and can be easily mitigated through implementation of application mitigation measures that will be entailed in subproject-specific safeguard instruments such as Environmental and Social Management Plans (ESMPs) developed according to the guidance provided in the Environmental and Social Management Framework (ESMF). In addition, long-term impacts are not anticipated.

102. It is anticipated that the project will enhance the livelihoods of communities who previously had no access to the grid through the electrification of social services such as health care facilities and schools. Investments in RE will also have long-term positive impacts in reducing GHG emissions. Potentially, adverse impacts would be low and include health and safety aspects and production of hazardous waste mainly from the solar PV systems and batteries at the end of their life cycle. The salient physical characteristics are prominent during the construction phase related to grid extension and deployment of mini-grids subcomponents (Components 1 and 2), which will entail excavations and earthmoving operations as well as vegetation clearance.

103. The project triggers the following safeguards policies: Environmental Assessment (OP/BP 4.01) due to the likely localized environmental impacts mentioned earlier; Natural Habitats (OP/BP 4.04) as a result of the likely impacts to natural habitats such as rivers during the rehabilitation and upgrading of the hydro turbine at Semonkong run-of-river mini-hydro station on the Maletsunyane River (Subcomponent 2A); Physical Cultural Resources (OP/BP 4.11) because of the associated civil works that may affect unknown physical cultural resources; and Safety of Dams (OP/BP 4.37) due to the existence of a small weir at the Semonkong mini-hydro station to be supported under Component 2 of the project. Since OP/BP 4.11 is triggered, the ESMF includes chance find procedures for physical cultural resources; related ESMPs to be prepared during implementation must include the same. Similarly, any dam safety issues would be addressed in the ESMP prepared for Semonkong during implementation.

104. Forests (OP/BP 4.36) is not triggered because the project is not expected to support any civil works in forest areas nor open forested areas and plantations. The ESMF includes screening criteria for any potential impacts on forested areas and the subprojects in forested areas will not be eligible under the project. Pest Management (OP/BP 4.09) is not triggered because the project will not finance pesticides, herbicides, or insecticides, and the Projects in Disputed Areas (OP/BP 7.60) policy is not triggered because the project will not be located in any disputed areas.

105. Because details of activities, subprojects, and the exact implementation sites for all project components are yet to be determined and finalized, an ESMF has been prepared jointly by LEC and the

DoE.[28] Potential environmental and social impacts of subprojects selected for support have been identified during preparation of the ESMF, which contains methods and procedures for screening and monitoring the implementation of mitigation measures. In addition, the ESMF will be used for guidance in the preparation of appropriate subproject-specific mitigation and management plans including ESMPs and construction ESMPs and chance find procedures for physical cultural resources where applicable. The ESMF was cleared by the World Bank and disclosed in-country on November 6, 2019, and on the World Bank's external website on November 6, 2019. Construction works will not commence on a subproject location until the ESMPs are consulted upon, cleared by the World Bank, and disclosed in-country and by the World Bank.

106. The project will be implemented by two implementing entities, that is, the DoE and LEC. The two implementing agencies have different safeguard capacities. LEC has an established environmental and social management unit with experience implementing environmental safeguard policies. However, the DoE has no capacity in implementing environmental safeguard policies as it does not have a dedicated qualified and experienced environmental specialist. Therefore, the DoE will need extensive support in providing environmental management oversight to determine the level and degree of environmental risks and impacts of subprojects; prepare subproject-specific safeguards instruments; and ensure that appropriate mitigation measures are implemented, monitored, and reported. Thus, the PIU to be established under the DoE will recruit a dedicated, qualified, and experienced environmental safeguard specialist with an overall environmental safeguards coordination role to screen, prepare, implement, monitor, and report on safeguards requirements.

(ii) Social Safeguards

107. The project is categorized as B as the nature of interventions is not likely to have major social and environmental impacts. Component 1 (Grid Extension to Peri-Urban Areas of Lesotho) and Component 2 (Rural Electrification by Mini-grids) may have limited land acquisition or subsequent loss of assets, income, or restricted access to resources (whether private or communal) related to the construction of MV grid extensions (including substations and MV/LV lines) and the construction of RE-based mini-grids. Therefore, Involuntary Resettlement (OP/BP 4.12) is triggered to address any adverse impacts.

108. **Safeguards instruments.** Because the exact location of the works is not yet known, a Resettlement Policy Framework (RPF) has been prepared and consulted upon and was disclosed in-country on November 6, 2019, and on the World Bank's external website on November 6, 2019. The RPF sets out the principles and objectives governing the preparation and implementation of social risks, impacts, and mitigation measures when the specific impact location(s) of Component 1 and 2 subprojects and associated facilities activities are known. The RPF guides the preparation and implementation of RAPs/Abbreviated RAPs geared toward mitigating the direct social and economic impacts resulting from land acquisition to advance Components 1 and 2 of construction activities. All RAPs will be prepared in a consultative process and will be disclosed thereafter. The RAPs will need to be disclosed before commencement of construction works during project implementation. In case of land acquisition or if

[28] Under Subcomponent 2A, the exact siting of the PV array and batteries, as well as the routing required for the extension of the distribution network to additional households, is not known. Given the lack of site specificity, a framework approach has been taken. Therefore, the entire project and its subcomponents will be included in the ESMF and Resettlement Policy Framework (RPF). Engineering designs will be funded under Subcomponent 2A. Once the designs are finalized, a site-specific ESMP and Resettlement Action Plan (RAP) will be prepared during project implementation but before the commencement of any works.

compensation becomes necessary, the financial implications will be covered by the respective implementing agency.

109. **Broader social impacts.** Implementation of activities under Components 1 and 2 may require external skilled and unskilled labor at project sites to establish labor camps, thus resulting in labor influx into beneficiary communities. Therefore, in addition to land acquisition (temporary or permanent physical displacement, including loss of assets and livelihoods), physical civil works expected to be undertaken during project implementation may also result in broader social impacts including health and safety concerns for workers and surrounding communities; labor/worker influx; and associated concerns such as risk of GBV/sexual exploitation and abuse, illicit behavior, disease transmission, and child exploitation. The project might also experience some social exclusion and likely negative impacts on disadvantaged and vulnerable groups, in particular due to potential exclusion from project benefits. Because details of activities, subprojects, and the exact implementation sites for subprojects to be supported are yet to be determined and finalized for all project components, the project ESMF has been prepared. Potential environmental and social impacts of subprojects selected for support have been identified during preparation of the ESMF, which contains methods and procedures for screening and monitoring the implementation of mitigation measures. The ESMPs (to be developed during implementation) will assess GBV risks. The ESMP findings and the World Bank's GBV risk assessment tool will guide the detection of GBV risks and the consequent development of mitigation and management plans.

110. To minimize these social impacts, the PIU is recommended to use unskilled local labor and reduce labor influx because bringing in outside workers and establishing temporary labor camps could result in social risk to host communities, especially vulnerable groups (women and girls), including the potential for GBV, sex trafficking, adolescent pregnancy, and child abuse. To prevent and address the potential social risks related to the labor influx, codes of conduct on child protection and GBV will be integrated in the bidding documents and in the contracts of all employees, contractors, and consultants engaged in the project and educating the communities on proper conduct. Capacity building for the implementing entities (DoE and LEC) is critical to address and monitor these issues.

111. Initial stakeholder consultations were undertaken during the preparation of the ESMF and the RPF. The consultation processes will be an ongoing activity throughout the project cycle to ensure that stakeholders are fully engaged, especially the vulnerable and disadvantaged groups. The project will develop a detailed communications plan, and the PIU will oversee the ongoing and meaningful consultation in communities. A social assessment will therefore be undertaken during implementation to identify potential social risks, local people's social concerns, and opinions for the social dimension of the project, especially from the vulnerable groups of the society (such as the elderly, disabled, women, orphans, and vulnerable children). The mitigation measures will then be recommended to address the identified potential negative social impacts to local communities. The project will establish a citizen's feedback mechanism and grievance redress system. In addition, to prevent and respond to GBV during project implementation, measures will be taken to sensitize and train the PIU, implementing agencies, and contractors against GBV.

(iii) Gender

112. The gender gap that the project is aiming to address is threefold: (a) women suffer disproportionately from lack of access to clean and modern energy, including with regard to health outcomes and safety; (b) women are often underrepresented and left out of the talent pool in the energy

sector and the energy transition in-country; and (c) women often face barriers to enhance their agency and voice with regard to knowledge and participation in energy sector decision making and productivity and income-generating opportunities related to energy access.

113. By providing access to electricity to off-grid households which are disproportionately rural and disproportionately poor, the project will improve outcomes for women through these channels. Beyond community benefits, tailored interventions on women's employment in the energy sector (both technical and nontechnical roles) will be implemented to ensure better balance and that the talent pool is enhanced. Additionally, under Components 1 and 2, a community awareness campaign will be developed to inform people in target areas of the benefits and costs of electricity services, as well as the payment mechanisms, procedures, and safety practices of the electrification process. Lastly, there will be a focus on closing gender gaps between women and men related to enterprises and livelihoods at the community level. The activity will focus on enhancing the productive uses of electricity to increase the income of women's enterprises and livelihoods (see annex 4 for further details).

114. Indicators will track progress toward closing the gap in women's employment in the energy sector and consumer education with a focus on female heads of households. Specific indicators focused on tracking the percentage of female engineers at LEC with a baseline of 5 percent and a target of 10 percent and completion of an assessment of barriers to female entrepreneurship, and an action plan for mini-grid and RE sector delivered. Other output- and gender-related indicators will be included in the PIM.

(iv) Citizen Engagement

115. As the project deals with providing electricity services to unelectrified consumers, it is key for the project beneficiaries —citizens— to properly understand the benefits, safety aspects and commercial aspects of the new service to be provided. Through the consumer awareness and citizen engagement activities of Subcomponent 3B, the project will inform citizens on the safe use of electricity to reduce misuse and ensure appropriate care of the products, providing beneficiaries with the necessary guidance on how to get the best out of the products in the way they use and maintain them. Gender-sensitive awareness campaign and information dissemination will also be made to inform the citizens on the diverse benefits they can get from the electricity service. The service providers will build on the citizens feedback through these campaigns to better understand and respond to the needs and concerns of their customers. The citizen engagement interventions will be channeled through awareness raising campaigns as well as consultations and face to face two-way dialogue and interaction to reach and respond to various audiences' feedback. To monitor and close the loop on citizens feedback, the project's results framework includes an indicator that measures the grievance received and resolved through the project's Grievance Redress Mechanism (GRM).

(v) Borrower's Institutional Capacity for Safeguard Policies

Capacity and Training

116. A single PIU located at the DoE will execute project activities and have an overall project coordinator who will be responsible for overall coordination and oversight of the project, including monitoring of environmental and social compliance. Within the PIU, LEC will be an implementing agency with autonomy to implement and provide oversight of grid extension (Component 1) and the

rehabilitation and expansion of Semonkong (Subcomponent 2A). Thus, the project will be implemented by two implementing entities, that is, the DoE and LEC.

117. The two implementing agencies have different safeguard capacities. Currently, LEC has adequate safeguards capacity to oversee implementation of the ESMPs and ESMF and associated environmental and social requirements for its associated project components. It has an established environmental and social management unit with experience in implementing environmental and social safeguard policies. However, there is a need for LEC to recruit additional social and environmental safeguards specialists who will be fully dedicated to the project. On the other hand, the DoE has no capacity in implementing environmental safeguard policies as it does not have dedicated, qualified, and experienced environmental and social specialists. The PIU to be established under the DoE will recruit dedicated, qualified, and experienced environmental and social safeguard specialists with an overall environmental and social safeguards coordination role to screen, prepare, implement, monitor, and report on safeguards requirements of their project components. Therefore, the DoE will need extensive support in providing environmental management oversight to (a) determine the level and degree of environmental and social risks and impacts of subprojects; (b) prepare subproject-specific safeguards instruments; and (c) ensure that appropriate mitigation measures are implemented, monitored, and reported. Continuous training will be provided to both implementing agencies to ensure that World Bank safeguard policies are properly applied, and the project activities are implemented and monitored in accordance with the applicable World Bank safeguard policies.

(vi) Other Safeguards

118. **Because most rivers in Lesotho are categorized as international waterways, OP/BP 7.50 on Projects on International Waterways is triggered by Subcomponent 2A (rehabilitation and upgrading of Semonkong mini-hydro site).** However, an exception for notification to riparian countries has been requested and approved by the World Bank Regional Vice President. Even though the project is proposed to rehabilitate an existing 180 kW off-grid run-of-river mini-hydro, it will not adversely change the quantity and quality of water flows to other riparian states. In addition, the ongoing scheme will not be adversely affected by the use of water downstream by the other riparian states[29].

(vii) Grievance Redress Mechanisms

119. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service.

[29] Any mini-hydropower site that would trigger the World Bank Dam Safety Policy will be ineligible for financing under the Project.

For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

120. In addition to the World Bank's standard GRS, the project will set up a project-level GRM building on both traditional conflict-resolution mechanisms as well as project-based steps to ensure that affected communities and all stakeholders have an opportunity and means to raise their concerns or provide suggestions regarding project-related activities. A functional GRM will therefore be established for the project incorporating the use of existing local grievance redress processes available in the community. LEC already has a customer feedback mechanism and this will be improved to ensure accessibility at project sites.

KEY RISKS

121. **The overall risk of the project is assessed as Substantial.** Key risks that might affect the achievement of the PDO relate to (a) macroeconomic; (b) legal and regulatory (sector strategies and policies); (c) political, governance, and institutional capacity; (d) technology; (e) financial; and (f) environmental and social safeguards. Project-related risks and related mitigation measures are presented in the following paragraphs.

122. **Political and governance (High).** Political and governance risk in the sector could raise concerns for the project. The lack of transparent sectoral planning has prevented others from adequately addressing the electricity access problem in Lesotho in the past. The development of the EMP has brought clarity on critical investments for electrification. In addition, ongoing donor support to augment the legal and regulatory framework will clearly define the roles of each institution and policies needed for electricity access expansion. In addition, the proposed project (under Component 3) will deliver, to the MEM and the DoE, training and capacity building for least-cost sector planning, including the establishment of a geospatial planning platform for planning and tracking progress of national electrification programs.

123. Political and reputational risk may arise for activities under Component 1. As project activities under this component will extend the central grid to economic development zones and likely industrial estates, there may be reputational risks related to any businesses or industries that choose to locate in the industrial estate where the industrial estate is deemed (through screening process specified in the ESMF and RPF) an associated facility. To mitigate this risk, the Legal Agreement specifies the potential industries to locate in industrial estates that are consistent with the LNDC Strategic Plan and are on the positive list of industrial activities provided by the GoL. Any sectors/activities outside those targeted would require the World Bank's approval before commencing development under the project.

124. **Macroeconomic (High).** Lesotho's economy faces major challenges over the next two to three years with slower growth and a rising public deficit due to falling Southern African Customs Union revenues. The Government has used its reserves to finance the deficit so far but will eventually have to adjust by reducing its high public wage bill—a difficult challenge given the country's political fragility. These macroeconomic trends will also make it difficult to reduce poverty, income inequality, and unemployment. The proposed project will help offset these trends by extending the power grid to economic development zones and deploying mini-grids to boost jobs and income-generating activities in peri-urban and rural areas of Lesotho. This macroeconomic risk, however, could potentially affect counterpart funds availability for the project.

125. **Sector strategies and policies (Substantial).** The legal and regulatory framework for mini-grids is weak. There are technical rural electricity service provision standards by LEWA; there is also the requirement that mini-grid service providers obtain a license (or license exemption) to operate. However, a more clearly defined legal framework will be required to provide confidence to developers. This creates an uncertain investment climate for potential project developers. UNDP is currently providing support to advance the framework, and this project will complement such efforts and engage the MEM to adopt and operationalize the regulatory framework for mini-grids under Component 3.

126. **Technical design of project (Moderate).** During the implementation and operation phase, substandard RE technologies could be procured as the standards body in Lesotho has yet to become operational. There is also the risk of poorly installed and maintained equipment. Support will be provided to the client to ensure that standard quality equipment is procured for the project. In addition, once construction is complete for both grid extension and mini-grid deployment, LEWA is mandated to verify that technical standards are met before being operationalized.

127. **Institutional capacity for implementation and sustainability (High).** Weak institutional capacity could undermine project implementation. This risk is exacerbated by the significant project size compared to other sources of financing for the sector and by the fact that it is the first multilateral development bank donor-funded investment project to be implemented by the DoE. Energy sector entities have limited experience in coordinating and implementing RE projects except for hydropower, and there is a high turnover of staff. During project preparation and appraisal, the World Bank carefully assessed the capacity of the institutions and identified trainings and technical assistance activities needed to ensure that the entities can effectively manage, coordinate, and implement RE projects.

128. **Fiduciary (Moderate).** Fiduciary risk stems primarily from Subcomponent 2B, which supports the deployment of mini-grids, as the implementing entities have limited capacity and no experience with World Bank procurement and FM procedures. The World Bank will conduct a comprehensive training on the World Bank's FM and disbursement policies and procedures by effectiveness of the Loan Agreement. The DoE will hire a qualified FM specialist in the PIU, whose terms of reference will be developed in consultation with the World Bank. The DoE will also use an off-the-shelf accounting system to record and report on the project expenditures. The FM specialist will be supported by accountants in the department to maintain a healthy internal control environment. Similarly, the PIU will hire a procurement specialist to execute procurement under the DoE-led components and have overall coordination of procurements including the components executed by the LEC TU. The project will also train new and current DoE and LEC staff in the World Bank Procurement Regulations.

129. **Environment and Social (Moderate).** RE projects could negatively affect the surrounding areas or have unintended social impacts during construction or operation. This could be in the form of noise, pollution, land use changes, chemical or other pollutant discharge, foreign or migrant worker inflow, and power dynamics among the local population. However, given the relatively small footprint of the infrastructure to be built under the project, those impacts are expected to be limited. The subprojects selected for development will be identified by transparent criteria described in the PIM, which are fully aligned with nationally endorsed strategies and plans.

130. **Stakeholders (Moderate).** The following risks were identified:

(a) **Access to finance for project developers.** The risk is low because the project will provide grants to private developers.

(b) **Inability and unwillingness of customers to pay.** The risk is moderate due to the subsidies required for low-income customers connected to the mini-grids under Component 2. As part of the preparation work, average electricity expenditures along with average mini-grids costs were assessed and customers would only afford 30 percent of their electricity demand; mini-grid tariffs proposed in the mini-grid tenders must account for this affordability gap.

131. **Private sector participation risks** are moderate and will be addressed through additional incentives for developers reaching out to the remote areas, implementing prepaid energy service, and developing a regulatory framework for de-risking initiatives for private developers if/when the national grid reaches the mini-grid service territory earlier than expected.

VI. RESULTS FRAMEWORK AND MONITORING

Results Framework
COUNTRY: Lesotho
Lesotho Renewable Energy & Energy Access Project

Project Development Objectives(s)

The Project Development Objective is to increase access to electricity in rural and peri-urban areas of Lesotho.

Project Development Objective Indicators

Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
increase access to electricity in rural and peri-urban areas of Lesotho				
Industrial/Economic Zones connected to main grid (Number)		0.00	2.00	6.00
People provided with new or improved electricity service (CRI) (Number)		0.00	8,000.00	22,825.00
People provided with new or improved electricity service - Female (CRI) (Number)		0.00	4,000.00	11,751.00
People provided with access to electricity under the project by household connections (grid or off-grid). (CRI) (Number)		0.00	8,000.00	22,825.00
Renewable energy generation capacity of mini-grids constructed under the project (Megawatt)		0.00	2.00	4.09
Community facilities provided with access to electricity service by mini-grids (Number)		0.00	100.00	245.00

Indicator Name	DLI	Baseline	Intermediate Targets	End Target
			1	
Small and Medium enterprises provided with access to electricity service by mini-grids (Number)		0.00	150.00	490.00

Intermediate Results Indicators by Components

Indicator Name	DLI	Baseline	End Target
Grid Extension to Peri-Urban Areas of Lesotho			
Households provided with access to electricity services by grid extension (Number)		0.00	1,400.00
Medium Voltage Distribution lines constructed or rehabilitated under the project (Kilometers)		0.00	240.00
Low voltage distribution lines constructed or rehabilitated under the project (Kilometers)		0.00	90.00
Distribution substations constructed or rehabilitated under the project (Number)		0.00	6.00
Volume of CO2 emissions reduced from electrification by grid extension per year (Metric tons/year)		0.00	12,064.50
Rural Electrification by Mini-grids			
Mini-grids constructed or rehabilitated under project (Number)		0.00	39.00
Households provided with access to electricity services by mini-grids (Number)		0.00	4,165.00
Health facilities provided with access to electricity service (Number)		0.00	30.00
Schools provided with access to electricity service (Number)		0.00	205.00

Indicator Name	DLI	Baseline	End Target
Agricultural Resource Center provided with access to electricity service (Number)		0.00	10.00
Volume of CO2 emissions reduced from electrification by mini-grids per year (Metric tons/year)		0.00	1,571.00
Volume of additional financing for clean energy investment leveraged (USD) (Amount(USD))		0.00	10,000,000.00
Technical Assistance and Implementation Support			
Independent verification of new connections completed (Yes/No)		No	Yes
Consumer awareness program developed, with a focus on female members of households and businesses (Yes/No)		No	Yes
Assessment of barriers to female entrepreneurship completed and action plan for in mini-grid sector delivered (Yes/No)		No	Yes
Percentage of female engineers employed at LEC (Percentage)		5.00	10.00
Grievances received and addressed (Percentage)		0.00	100.00

Monitoring & Evaluation Plan: PDO Indicators

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
Industrial/Economic Zones connected to main grid	The number of industrial sites or economic zones provided with a medium-voltage connection to the main grid under this project.	Quarterly	Quarterly Report	LEC Project Monitoring	LEC

People provided with new or improved electricity service (CRI)	Number of people provided with new or improved electricity service, calculated as the number of household connections to the central grid and mini-grids under the project multiplied by 4.1 (the average household size in Lesotho).	Quarterly	Quarterly Report	LEC and DoE PIU monitoring	LEC and DoE
People provided with new or improved electricity service - Female (CRI)	Number of people provided with new or improved electricity service - Female.	Quarterly	Quarterly Report	LEC and DoE PIU Monitoring	LEC and DoE
People provided with access to electricity under the project by household connections (grid or off-grid). (CRI)	Number of people provided with access to electricity under the project by household connections	Quarterly	Quarterly Report	LEC and DoE PIU Monitoring	LEC and DoE
Renewable energy generation capacity of mini-grids constructed under the project	Renewable energy generation capacity of mini-grids constructed under the project	Quarterly	Quarterly Report	DoE PIU Monitoring	DoE
Community facilities provided with access to electricity service by mini-grids	Community facilities (schools and health centers) provided with access to electricity service by mini-grids developed under the project	Quarterly	Quarterly Report	DoE PIU Monitoring	DoE
Small and Medium enterprises provided with access to electricity service by mini-grids	Small and Medium enterprises provided with access to electricity service by mini-grids deployed by the project	Quarterly	Quarterly Report	DoE PIU Monitoring	DoE

Monitoring & Evaluation Plan: Intermediate Results Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
Households provided with access to electricity services by grid extension	Households provided with access to electricity services by grid extension funded by project	Quarterly	Quarterly Report	LEC PIU Monitoring	LEC
Medium Voltage Distribution lines constructed or rehabilitated under the project	Medium Voltage Distribution lines constructed or rehabilitated under the project	Quarterly	Quarterly Report	LEC PIU Monitoring	LEC
Low voltage distribution lines constructed or rehabilitated under the project	Low voltage distribution lines constructed or rehabilitated under the project	Quarterly	Quarterly Report	LEC PIU Monitoring	LEC
Distribution substations constructed or rehabilitated under the project	Distribution substations constructed or rehabilitated under the project	Quarterly	Quarterly Report	LEC PIU Monitoring	LEC
Volume of CO2 emissions reduced from electrification by grid extension per year	Volume of CO2 emissions reduced from electrification by grid extension	Quarterly	Quarterly Report	LEC PIU Monitoring	LEC
Mini-grids constructed or rehabilitated under project	Mini-grids constructed or rehabilitated under project	Quarterly	Quarterly Report	LEC (Semonkong) and DoE PIU Monitoring	LEC and DoE
Households provided with access to electricity services by mini-grids	Households provided with access to electricity services by mini-grids under the project	Quarterly	Quarterly Report	DoE PIU Monitoring	DoE

Health facilities provided with access to electricity service	Health facilities provided with access to electricity service by mini-grids developed under the project	Quarterly	Quarterly Report	DoE PIU Monitoring	DoE
Schools provided with access to electricity service	Schools provided with access to electricity service by mini-grids developed under the project	Quarterly	Quarterly Report	DoE PIU Monitoring	DoE
Agricultural Resource Center provided with access to electricity service	Agricultural Resource Center provided with access to electricity service by mini-grids developed under the project	Quarterly	Quarterly Report	DoE PIU Monitoring	DoE
Volume of CO2 emissions reduced from electrification by mini-grids per year	Volume of CO2 emissions reduced from electrification by mini-grids under the project	Quarterly	Quarterly Report	DoE PIU Monitoring	DoE
Volume of additional financing for clean energy investment leveraged (USD)	Volume of additional financing for clean energy investment leveraged (USD) by the project.	Quarterly	Quarterly Report	DoE PIU Monitoring	DoE
Independent verification of new connections completed	Independent verification of new connections completed by project	Quarterly	Quarterly Report	DoE PIU Monitoring	DoE
Consumer awareness program developed, with a focus on female members of households and businesses	Consumer awareness program developed by the project, with a focus on female members of households and businesses	Quarterly	Quarterly Report	DoE PIU Monitoring	DoE
Assessment of barriers to female entrepreneurship completed and action plan for in mini-grid sector delivered	Assessment of barriers to female entrepreneurship completed and action plan	Quarterly	Quarterly Report	DoE PIU Monitoring	DoE

	for in mini-grid sector delivered				
Percentage of female engineers employed at LEC	Percentage of female engineers employed at LEC	Annually	LEC	DoE PIU Monitoring with input from LEC	DoE
Grievances received and addressed					

ANNEX 1: IMPLEMENTATION ARRANGEMENTS & SUPPORT PLAN

COUNTRY: Lesotho
Lesotho Renewable Energy and Energy Access Project

A. Project Institutional and Implementation Arrangements

1. The project will be implemented over seven years under the MEM. The MEM's DoE will implement Subcomponent 2B and Components 3 and 4, while LEC will implement Component 1 and Subcomponent 2A. The IDA credit agreement, SREP loan agreement and SREP grant agreement will be established with the Kingdom of Lesotho. A portion of project funds managed by the DoE for the implementation of Subcomponents 2B and Components 3 and 4 and the other portion being allocated to LEC according to a subsidiary Project Agreement enabling it to implement Component 1 and Subcomponent 2A; a separate subproject account will be established for LEC's management.

2. A single PIU located at the DoE will execute project activities and will have an overall project coordinator who will be responsible for overall coordination and oversight of the project and consolidation of the information related to project implementation, including (a) definition of areas to be electrified based on technical and policy development priorities; (b) aggregation and consolidation of information from implementing entities (DoE and LEC) and broader M&E; and (c) monitor independent verification of project implementation.

3. The project coordinator will use the already established Lesotho Energy Sector Forum to report quarterly on the progress of the project to the energy stakeholders. The project coordinator will also lead the dialogue with the other public institutions (LNDC and LEWA) to ensure coordination of activities with broader government programs on economic growth and job creation, as well as with the enabling environment to be developed for rural electrification scale-up.

4. The PIU will be responsible for M&E of project implementation progress and results indicators, as well as progress toward achievement of the PDO. Therefore, the PIU will have a dedicated M&E officer who will be responsible for M&E and preparing monthly and quarterly progress reports for discussion with the project coordinator and the World Bank during implementation support missions. There will be several midterm (in-depth) reviews of the project; the first one taking place 18 months after project effectiveness.

5. The collection of connection data for both the economic zones and the Semonkong mini-grid will be provided by the LEC TU, while the collection of connection data for other mini-grid installations will be provided by the DoE TU with input from the private mini-grid developers. The TUs will also be responsible for the submission of sex-disaggregated data, where relevant, for presenting progress in key and intermediate indicators. The PIU, using an independent agent, shall verify twice a year completed grid extensions, grid and mini-grid customer connections, and the quality of mini-grid service provision. The PIU shall prepare verification reports for submission to the World Bank. The number of actual extensions and connections will be tracked against disbursements to reduce the risk of extending the network and building mini-grids without providing actual connections.

6. The PIU will also have a dedicated gender and community awareness specialist responsible for informing the public of project objectives and progress, liaising with the LEC and DoE officials in engaging the county governments and communities, and overseeing relevant activities implemented by the DoE TU under Component 3, namely (a) the execution of large-scale community awareness and citizen engagement campaigns and (b) actions focused on women's employment and productive uses of energy. The gender and community awareness specialist will work closely with the CPLO of each TU. The CPLOs will play a critical role in ensuring citizen engagement and accessible (including vulnerable groups) consultations at the local level for all project activities.

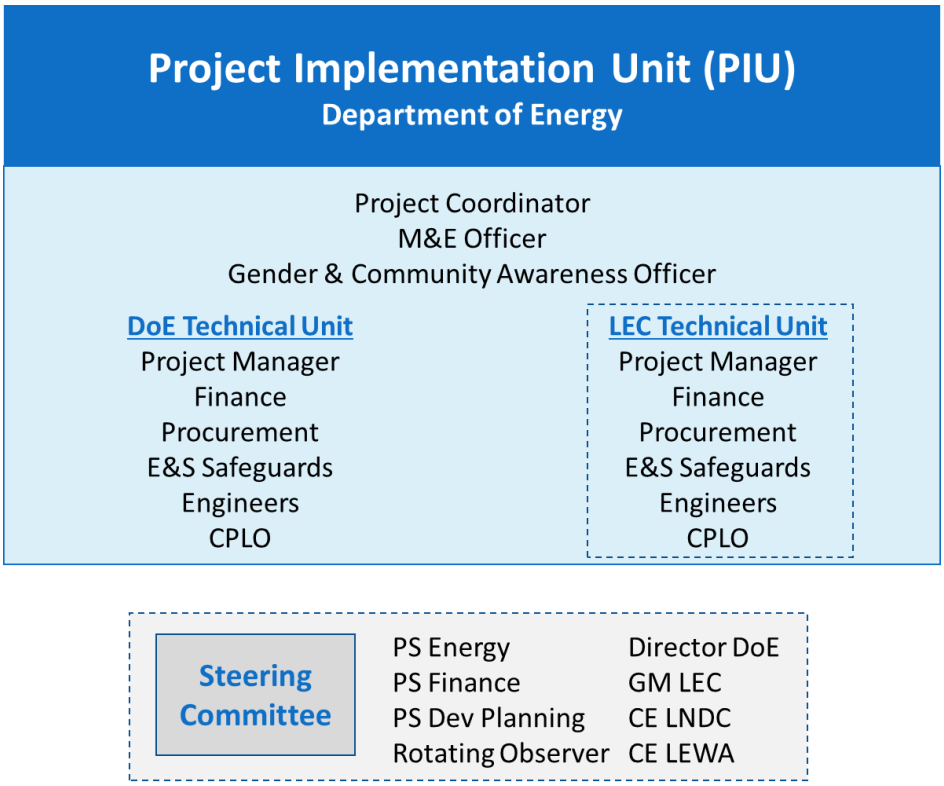
7. Within the PIU, the DoE TU will implement Subcomponent 2B and Components 3 and 4 and will be composed of a project manager, an engineer, a procurement specialist, an FM specialist, and environmental and social specialists. The DoE TU will be responsible for providing due diligence on relevant project activities and evaluating proposals/applications under consideration. Under Subcomponent 2B, the DoE TU will be responsible for (a) land acquisition for the construction of mini-grid sites; (b) implementation and monitoring of environmental and social instruments; (c) preparation of tender documents and management of the procurement process for mini-grid developers; (d) coordination with LEWA to provide license exemptions to successful mini-grid developers and ensure compliance with technical service standards; and (e) monitoring of mini-grid implementation to standard specifications. A transaction adviser will be hired to facilitate the preparation of the tender documents and establish and implement the mini-grid procurement process. Under Component 3, the DoE TU will be responsible for the provision of technical assistance and managing relevant consultancies.

8. Within the PIU, LEC will be an implementing agency with autonomy to implement and provide oversight of grid extension (Component 1) and the rehabilitation and expansion of Semonkong (Component 2A). This LEC TU will have its own project manager, engineer, procurement specialist, FM specialist, and environmental and social specialists tasked with the responsibility of providing technical and financial due diligence on the project and evaluating proposals/applications under consideration. LEC's extensive technical expertise in successfully implementing grid extension projects as well as donor-financed projects[30] will allow the LEC TU to capitalize on the experience accumulated to facilitate implementation and supervision of infrastructure investments of the proposed project.

9. A **Project Steering Committee**, chaired by the Principal Secretary of Energy, will meet twice a year to review progress, provide policy guidance, and resolve any high-level challenges facing the project. The committee should comprise the MEM, the DoE, LEC, LEWA, LNDC, the MoF, the Ministry of Development Planning, and a rotating observer from one of the donor agencies active in the sector.

[30] Recent projects include the Lesotho Urban Power Distribution Rehabilitation Project, which is a US$9.5 million loan from the AfDB to LEC, approved in November 2016.

Figure 1.1. LREEAP Implementation Arrangements



Note: LREEAP = Lesotho Renewable Energy and Energy Access Project; E&S = Environmental and Social.

B. Financial Management and Disbursement Arrangements

10. The World Bank conducted an FM assessment of the DoE and LEC, as required by the World Bank's policy on Financial Management, OP/BP 10.02. The DoE will be the main implementing entity for the proposed LREEAP, with LEC implementing Component 1 and Subcomponent 2A of the project. The main objective of the assessment—which included a review of the budgeting, accounting, internal controls, flow of funds, financial reporting, and auditing arrangements at the DoE and LEC and completion of FM assessment questionnaire by some officials of the entities—was to ensure that acceptable FM arrangements are in place for the implementation of the project.

11. Acceptable FM arrangements ensure that

(a) Funds are used for the intended purposes in an efficient and economical way;

(b) All transactions and balances are correctly recorded to support preparation of regular and reliable financial statements that are subject to auditing arrangements acceptable to the World Bank; and

(c) Internal controls are considered capable of safeguarding the entity's assets.

12. Table 1.1 presents the identified FM risks and the proposed mitigating measures.

Table 1.1. FM Risk Mitigation Assessment

Risk	Rating	Risk Mitigation Measures	Residual Risk	Negotiation/Effectiveness Condition (Y/N)
Entity level The entities responsible for the FM of the project are not familiar with the World Bank and therefore have limited knowledge of the World Bank's FM and disbursement policies and procedures.	S	The World Bank will conduct a comprehensive training on the World Bank's FM and disbursement policies and procedures by effectiveness of the Loan Agreement. Staff in the Finance and the Internal Audit Units will be encouraged to participate in the World Bank's periodic training program in FM and disbursement and in courses organized by World Bank-recognized training institutions.	S	N
Project level Variations to the project scope and supplier price differences might affect the budget estimates. The project will be implemented by two autonomous entities and the coordination of implementation may be adversely affected.	S	Through review of the project scope against the desired objective and sign-off by both parties. Contingent budget provision for unavoidable variations will be set and closely monitored.	S	N
Control risk **Budgeting.** Due to the nature of the project, the risk that budget process may not be based on realistic cost estimates and procedures for approvals and variations may not be clearly laid out.	M	The compliance to approved work plans will be closely monitored to manage any budget variations.	M	N
Accounting The current accounting system (integrated FM information systems) in use by the DoE is not reliable to produce financial reports on time. There is no identified risk with the accounting system at LEC	S	An off-the-shelf accounting system will be procured to record and report on the project expenditures.	S	N

Risk	Rating	Risk Mitigation Measures	Residual Risk	Negotiation/Effectiveness Condition (Y/N)
Internal controls and staffing The risk that accounting policies and procedures may not be followed consistently might weaken the control environment. The initial FM assessment has indicated that the staffing arrangements are still adequate for LEC to manage the project, and the DoE will be strengthened by hiring a suitable qualified FM specialist at the PIU.	M	The PIM will be developed and approved for the implementation, and adherence will be monitored during project supervision and review of management letters.	M	Y
Funds flow No risk identified, each implementing entity will open and manage its own Designated Account.		A transparent arrangement of the flow of funds should be clearly spelt in the subsidiary Project Agreement.		N
Financial reporting The implementation arrangements (of two entities) might delay consolidation of the reports	M	The subsidiary Project Agreement should clearly state the reporting time lines of each entity to allow enough time to prepare accurate consolidated reports.	M	N
Auditing No specific audit risk. The experience with the GoL has been timely on submission of the external audit reports.				N
Overall FM risk rating	S	The overall FM residual risk is 'Substantial'. Both entities identified for implementing the project are not familiar with the World Bank processes. The FM arrangements are not yet tested for main implementing entity; reliance is being placed on proposals.	S	

Note: Risk Rating: H (High), S (Substantial), M (Moderate), L (Low).

13. **Major strength.** The MoF is familiar with the World Bank's requirements; this will facilitate the process of setting up the loan and disbursement arrangements. The largest allocation will be implemented by LEC which has adequate FM systems.

14. **Weaknesses and action plan.** The DoE and LEC have no experience in implementing World Bank-financed projects. The World Bank's FM specialist will deliver workshops on the World Bank's FM and disbursement, policies, and procedures, including reporting requirements. Hand-holding support will also be provided until the implementing entities are conversant with all the required rules.

15. **Budgeting.** The annual budgets will be prepared based on approved work plans and the allocated accountant at LEC and the FM specialist in the PIU will be responsible for coordination and preparation of the budgets. The annual budgets will be presented for approval through the existing governance structures of the respective entities. Budget monitoring will be based on quarterly management reports and approval of variations will follow the approved policies and governance.

16. **Accounting.** The DoE will hire a qualified FM specialist in the PIU, whose terms of reference will be developed in consultation with the World Bank. Due to the current challenges with integrated FM information systems (system not yet stable), the DoE will use an off-the-shelf accounting system to record and report on the project expenditures. The FM specialist and the accounting system will be in place one month after the project effectiveness according to the Financing Agreement. The LEC FM arrangements are considered adequate to manage the project. The Finance Unit is headed by the General Manager Finance, a professional accountant. LEC uses the SAGE accounting software (with the plan to migrate to SAP in September 2019) and the financial statements are prepared in accordance with International Financial Reporting Standards. The systems are adequate to record and report on uses of the project funds. LEC will prepare its financial reports and submit them for consolidation by the DoE.

17. **Staffing.** The DoE will establish a PIU to be staffed, among others, by a qualified FM specialist to manage the financial aspects of the project. The FM specialist will be supported by accountants in the department to maintain a healthy internal control environment. LEC will use its existing staffing arrangements to manage the project. The General Manager Finance will take the overall responsibility for FM arrangements.

Internal Control and Internal Audit Arrangements

18. **Internal control.** The project implementation will be governed by the PIM developed in consultation with the World Bank.

19. **Internal audit.** LEC has an in-house Internal Audit Department and reliance will be placed on it to support the project. Country experience has shown the World Bank that the ministry's internal audit is thinly stretched to cover the World Bank-funded projects. Reliance will be placed on supervision and review of management letters in monitoring the internal control environment.

Financial Reporting

20. The project will produce and submit unaudited interim financial reports (IFRs) to the World Bank on a quarterly basis. These reports are designed to provide detailed and timely information to the project management and will include the following:

(a) A narrative summary of the project implementation highlights

(b) Sources and uses of funds by disbursement categories

(c) Uses of funds by project component/activity, both actual and cumulative

(d) The Designated Account activity statement

(e) Summary of payments made for contracts subject to the World Bank's prior review

(f) Summary of payments made for contracts not subject to the World Bank's prior review

21. The current and proposed accounting systems can produce these quarterly reports. The reports will be submitted to the World Bank within 45 days of the end of the reporting period. Reporting time lines between the DoE and LEC should be agreed and documented in the project Subsidiary Agreement and in the PIM.

Funds Flow and Disbursement Arrangements

22. **Flow of funds.** Upon the signing of the Loan Agreement, the World Bank will open a loan account in its books, in the name of the GoL. Each implementing entity will open a U.S dollar-denominated Designated Account at the Central Bank of Lesotho to receive funds from the World Bank.

23. **Disbursement arrangements**. The project will use the advance disbursement method whereby withdrawals from the loan account will be deposited in the Designated Accounts for payment of the World Bank-financed eligible expenditures. Disbursements from the loan account will be based on quarterly IFR documentation to be prepared and submitted by each implementing entity. The project will also have the option of using (a) the direct payment disbursement method involving direct payment from the loan account on behalf of the project to suppliers of goods and services that have a value above a set threshold; (b) the reimbursement disbursement method, whereby the ministry or the utility makes payments for the World Bank eligible expenditures and submits a withdrawal application for reimbursement; and (c) the special commitment method, whereby the World Bank at the request of each implementing entity, the ministry or the utility, will issue special commitments to suppliers of goods under the World Bank-financed components. Upon the effectiveness of the Credit Agreement and submission of a withdrawal application, the World Bank will disburse an amount equivalent to six months expenditure into the Designated Account of each implementing entity. Subsequent disbursements will be based on a six-month estimated expenditure, taking into account the balance in the Designated Accounts at the end of the reporting period.

Table 1.2. Eligible Expenditure per Category for IDA Credit

Category	Amount of the Credit Allocated (expressed in SDR)	Percentage of Expenditures to be Financed (inclusive of Taxes)
(1) Goods, works, non-consulting services, consulting services, Incremental Operating Costs and Training Costs under Part 1 of the Project	22,000,000	100%

(2) Goods, works, non-consulting services, consulting services, Incremental Operating Costs and Training Costs under Part 2(b) of the Project	7,200,000	69%
(3) Emergency Expenditures under Part 4 of the Project	0	100%
TOTAL AMOUNT	**29,200,000**	

Table 1.3. Eligible Expenditure per Category for SREP Loan

Category	Amount of the Loan Allocated (expressed in USD)	Percentage of Expenditures to be Financed (inclusive of Taxes)
(1) Goods, works, non-consulting services, consultants' services, Training Costs and Incremental Operating Costs under Part 2(a) of the Project	3,500,000	64%
(2) Goods, works, non-consulting services, consultants' services, Training Costs and Incremental Operating Costs under Part 2(b) of the Project	4,500,000	31%
TOTAL AMOUNT	**8,000,000**	

Table 1.3. Eligible Expenditure per Category for SREP Grant

Category	Amount of the Grant Allocated (expressed in USD)	Percentage of Expenditures to be Financed (inclusive of Taxes)
(1) Goods, works, non-consulting services, consulting services, Training Costs and Incremental Operating Costs under Part 2(a) of the Project	2,000,000	36%
(2) Goods, works, non-consulting services, consulting services, Training Costs and Incremental Operating Costs under Part 3 of the Project	2,900,000	100%
TOTAL AMOUNT	**4,900,000**	

Auditing Arrangements

24. **Audited financial statements**. The consolidated project financial statements will be audited by the Office of the Auditor General in accordance with International Standards on Auditing, and the audit

report, together with the management letter and management responses, will be submitted to the World Bank within six months after the financial year end. This will require coordination between the DoE and LEC to prepare the consolidated annual financial statements to present them for the audit.

25. The external auditor will be required to express a single opinion on the project financial statements. In addition, a detailed management letter containing the auditor's assessment of the internal controls, accounting system and compliance with financial covenants in the Financing Agreement, suggestions for improvement, and management's response to the auditor's management letter will be prepared and submitted to the management for follow-up actions.

Table 1.4.Nature and Frequency of Project Audit Reports

Audit Report	Due Date
Project financial statements and management letter	Within six months after the end of the financial year, that is, by September 30

Supervision Plan

26. Based on the project's Substantial FM risk rating, the World Bank will carry out the on-site FM supervision of the project twice a year. In addition, the World Bank's FM specialist will carry out desk-based quarterly review of the IFRs and the annual audit reports.

Governance and Accountability

27. There are no governance issues that have come to the team's attention during the assessment process.

Overall Conclusion

28. Based on the proposed FM arrangements for the DoE and the use of the LEC FM system for accounting and reporting the project receipts, expenditures, and asset management, including commitments, the overall conclusion of the assessment of the system is that the proposed FM arrangements meet the World Bank's minimum requirements for Financial Management under OP/BP 10.02.

C. Procurement

29. All procurement to be financed under the project will be carried out in accordance with the 'Procurement Regulations for IPF Borrowers' (dated July 2016), revised November 2017 and August 2018 as may be revised from time to time, and the provisions stipulated in the Legal Agreement. Project procurement for the components implemented by the DoE will be carried out by the single PIU located at the DoE that will execute project activities and will be responsible for overall coordination and oversight of the project procurement. However, the project procurement for the components implemented by the LEC TU shall have a dedicated procurement specialist as part of the team. Project implementation will be carried out in accordance with the 'Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD and IDA and Grants', dated July 1, 2016 (the Anti-Corruption Guidelines).

30. A procurement capacity and risk assessment has been carried out by the World Bank for LEC and the DoE to review the organizational structure for implementing the project and the interaction between the project's staff responsible for procurement duties and management of the department. LEC has a procurement specialist and the organizational structure in the form of a TU for implementing donor-funded projects. The procurement specialist does not have experience with World Bank procurement procedures, and therefore the unit will require strengthening of its procurement and contract management capacity to fully use the World Bank's Procurement Regulations and tools, and the World Bank team will provide the needed support and training.

31. Similarly, an assessment of the DoE has revealed that it has limited capacity and no experience with the World Bank procurement procedures. Procurement for the DoE is handled by an officer based at the MEM who carries out this task together with his/her ministerial responsibility. The officer has no experience with the World Bank's procurement procedures. The DoE will require strengthening of its procurement and contract management capacities through hiring a qualified and experienced procurement person, monitoring the execution of the Procurement Plan through STEP, and putting in place a contract management plan for major contracts.

32. Based on these assessments and considering the roles and responsibilities of the departments responsible for procurement, the procurement risk rating is Substantial.

33. Risk mitigation measures based on the discussion and assessment for both LEC and the DoE include (a) hiring a procurement specialist under the DoE's single PIU to execute the procurement under the DoE components and have overall coordination of procurements including the components executed by the LEC TU and (b) training new and current DoE and LEC staff in World Bank Procurement Regulations.

34. A PPSD has been developed to determine the approach to market, the selection methods, evaluation options, and any other sustainability considerations that may need to be included. There is limited capacity in the local market both in numbers and experience of contractors in the deployment of mini-grids through PPPs. There is also a limited number of local contractors for the transmission lines and hybrid systems. There is no local manufacturing base for household connection materials; it is envisaged that these will be imported. The PPSD has considered this and other factors in determining the Procurement Plan, especially the packaging.

35. The implementing agencies have prepared an acceptable Procurement Plan, which will be uploaded in the new STEP system, a planning and tracking system that will provide data on procurement activities, establish benchmarks, monitor delays, and measure procurement performance. The Procurement Plan includes (a) a brief description of the activities/contracts to be procured during the first 18 months of project implementation; (b) the approach to market and selection methods to be applied; (c) the cost estimates; (d) time schedules; and (e) the World Bank's review requirements.

36. The Lesotho Procurement Regulations of 2007 have been assessed and indicate that the country's regulations are generally consistent with international best practices, although some weaknesses were identified, which should be mitigated through adequate measures that ensure (a) there is adequate advertising in national media; (b) procurement is generally open to eligible firms from any country; (c) contract documents have an appropriate allocation of responsibilities, risks, and liabilities; (d) publication of contract award; (e) the national regulations do not preclude the World Bank from its rights to review

procurement documentation and activities under the financing; (f) implementation of an effective complaints review mechanism; and (g) maintenance of records of the procurement process.

37. The request for bids/request for proposals document shall require that bidders/proposers submitting bids/proposals present a signed acceptance at the time of bidding, to be incorporated in any resulting contracts, confirming application of, and compliance with, the World Bank's Anti-Corruption Guidelines, including without limitation the World Bank's right to sanction and the World Bank's inspection and audit rights.

38. With the incorporation of the abovementioned provisions, the Lesotho Procurement Regulations will be acceptable to be used under those procurements using open national approach not subject to the World Bank's prior review as agreed with the World Bank in the approved Procurement Plan.

39. **Procurement of works.** Procurement of grid extensions and mini-grids will be done following the supply and installation type of contracts. Some mini-grids will be procured by the PPP model. It is envisaged that the large works packages will be procured through open international approach to the market.

40. **Procurement of goods.** Goods to be procured under this project will include MV and LV distribution infrastructure including secondary substations, solar PV items, office supplies, and equipment. It is envisaged that connection materials will be procured through framework agreements.

41. Procurements while approaching international market will be done using the World Bank's Standard Procurement Documents. Procurements while approaching national market will be done using the National Standard Bidding Documents, subject to incorporation of the abovementioned provisions, with additional annex to address World Bank's Anti-Corruption Guidelines and to ensure universal eligibility.

42. **Procurement of consultancy services.** Consulting services to be procured under the project include hiring of firms to carry out studies, assessments, designs, supervision of works, and related activities. Hiring of individual consultants will be limited to any international consultant(s) required for project implementation.

43. **Operating costs.** These items will be procured using the Borrower national procurement and administrative procedures acceptable to the World Bank including selection of project implementation support personnel.

44. **Record keeping.** All records pertaining to award of tenders, including bid notification, register pertaining to sale and receipt of bids, bid opening minutes, bid evaluation reports and all correspondence pertaining to bid evaluation, communication sent to/with the World Bank in the process, bid securities, and approval of invitation/evaluation of bids would be retained by the respective departments and uploaded in the STEP.

45. **Disclosure of procurement information.** The following documents shall be disclosed: (a) the Procurement Plan and updates; (b) invitations for bids for goods and works for all contracts; (c) requests for expression of interest for selection/hiring of consulting services; (d) contract awards of goods, works,

and non-consulting and consulting services; (e) a monthly financial and physical progress report of all contracts; and (f) actions taken on the complaints received on a quarterly basis.

46. The following details shall also be published in the United Nations Development Business and World Bank's external website: (a) invitations for bids for procurement of goods and works following open international market approaches; (b) requests for expression of interest for selection of consulting services following open international market approaches; and (c) contract award details of all procurement of goods and works and selection of consultants using open international market approaches.

47. **Fiduciary oversight by the World Bank.** The World Bank shall prior review contracts as per prior review thresholds set in the PPSD/Procurement Plan.

48. All contracts not covered under prior review by the World Bank will be subject to post review during implementation support missions including missions by consultants hired by the World Bank or through supreme audit institutions as part of the financial audit. To avoid doubts, the World Bank may conduct, at any time, Independent Procurement Reviews of all the contracts financed under the credit.

49. **Contract management.** The high-risk and high-value procurements have been identified for increased contract management support and indicated in the Procurement Plan. The department will develop key performance indicators (KPI) for such identified contracts and the KPIs would be monitored during actual execution of contracts. The World Bank team will provide additional due diligence and independent review of the contract performance of such identified procurements. A fully staffed PIU of the DoE and LEC will be responsible for overall project/contract management. The team will be ably assisted by a multiskilled project management team that will be engaged to provide overall implementation support and monitor all works, goods, and consultancy contracts.

ANNEX 2: DETAILED PROJECT DESCRIPTION

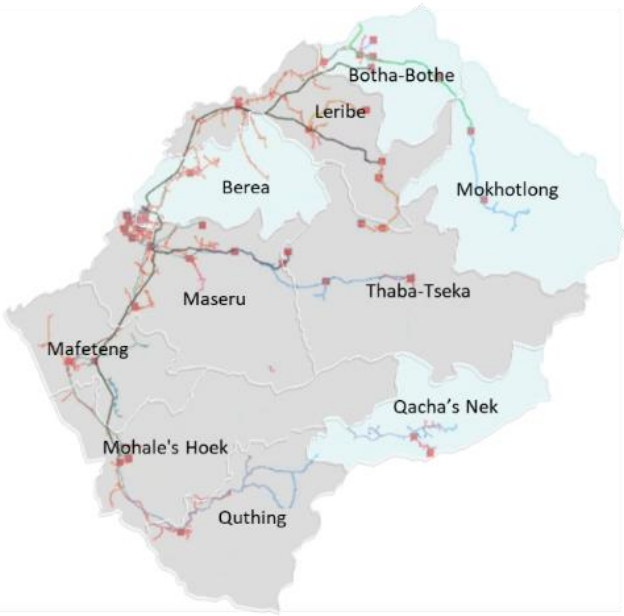
COUNTRY: Lesotho
Lesotho Renewable Energy and Energy Access Project

1. SREP and IDA resources under this LREEAP are proposed to fund the components described in the following paragraphs.

Component 1: Grid Extension to Peri-Urban Areas of Lesotho (IDA US$30 million equivalent)

2. This component, to be implemented by LEC, will finance the design, procurement of materials, and construction works required to mainly electrify the industrial and commercial loads in peri-urban areas of Lesotho (figure 2.1). Potential project areas have been identified by[31] LNDC and those selected for development will be aligned with LEC's current grid extension plan. This component will connect roughly six large industrial sites (which will become the home of approximately 252 companies) along with approximately 1,400 residential customers nearby.

Figure 2.1. Target Areas for Grid Extension (highlighted in blue)



Source: World Bank analysis.

3. The component will contribute toward construction of MV and LV distribution lines (33 kV/11 kV), as well as the upgrading of existing or construction of new substations. Grid connections to the selected

[31] LNDC is the main parastatal of the GoL that is charged with the implementation of the country's industrial development policies. LNDC is wholly owned by the GoL and falls under the Ministry of Trade and Industry, which is responsible for providing overall policy direction on trade and industrialization. LNDC's aim is to initiate, promote, and facilitate the development of manufacturing and processing industries, mining and commerce, to raise the level of income and employment in Lesotho. Its role is to promote Lesotho as an attractive investment location for both foreign and local investors in the areas of manufacturing, agro-industry, RE, and infrastructure.

areas will cater to agricultural productive use such as in Butha-Buthe, industrial loads such as in Mokhotlong and Berea, and electrification in the highlands such as Qacha's Nek, which all have high potential for economic development.

4. Site identification by LNDC is being conducted in consultation with the DoE and LEC based on the potential for job creation and maximizing socioeconomic development in the peri-urban and industrial parts of Lesotho as per the NSDP II. The final selection of the sites will be confirmed and validated by the geospatial electrification analysis based on a least-cost approach.

5. In particular, the following criteria[32] shall be used to select sites to be developed within this project:

(a) Rural areas should be prioritized for development to support government strategy of reducing urbanization.

(b) Sites with the highest population reached by the network with least investment cost, as determined by assessment of investments needed and demand analysis, should be prioritized.

(c) Distance to MV infrastructure (33 kV or above) should be minimized.

(d) Overall project ERR must be positive.

(e) Subproject finance should not duplicate the efforts of other cooperating partners. Complementary efforts are encouraged to increase potential development impact.

(f) The EMP must identify grid extension as a least-cost supply solution for the target site.

(g) Job creation and socioeconomic development should be maximized; this criterion should be measured and assessed considering information as shown below for the two common types of sites.

(i) Industrial/manufacturing sites

- Number of jobs created per U.S. dollar of investment
- Number of businesses provided with electricity per U.S. dollar of investment

(ii) Agricultural production sites or distilleries

- Revenue potential per U.S. dollar of investment
- Number of jobs created per U.S. dollar of investment

6. This component will fund the connection of residential customers living within 600 m of existing and proposed distribution transformers in each zone, which according to LEC will range from US$300 to US$1,000 per connection. The number of connections realized will depend on the sites finally selected for development by the DoE in collaboration with LEC and LNDC.

[32] The PIU project coordinator should work with relevant stakeholders to assess the weighting of these selection criteria to prioritize sites once project is approved by the World Bank Board.

7. Component 1 will introduce new approaches to distribution system design and optimization (for example, the use of geospatial planning practices for grid extension and material selection and procurement of main equipment for cost optimization) to maximize the resources available and efficiently implement the project with the expectation of reducing connection costs. Additionally, this component will fund the preparation of feasibility and engineering design studies as well as a technical advisor and implementation support for LEC, for project management expenses such as the financing of external audit, oversight of implementation of the environmental and safeguards instruments for the investments, and the oversight of the health and safety aspects during construction.

Table 2.1. Potential Sites for Grid Extension under Component 1

No.	Region	Type of Facility	Transmission and Distribution		Power Requirements (MVA)	Potential Customers
			Capacity (kV)	Length (km)		
1	Butha-Buthe	Belo Industrial Park - Factory Shells	33	40	7.5	42
			11	15		
2	Berea	Teyateyaneng Town Industrial Park - Factory Shells	33	40	6	20
3	Mokhotlong	Mokhotlong Industrial Park - Factory Shells	33	30	6	20
4	Qacha's Nek	Qacha's Nek Town Industrial Park - Factory Shells	33	30	6	20
5	Butha-Buthe	Butha-Buthe Distillery	33	40	2	n.a.
			11	15		
6	Maseru	Tikoe Phases 1, 2, and 3				67

Table 2.2. Summary Description of Construction Needs at Potential Sites for Grid Extension under Component 1

No.	Project Name	Region	Type of Facility
1	Belo Infrastructure and Factory Shells - Butha-Buthe; transmission line from Hlotse to Ha Belo; substation at Ha Belo	Butha-Buthe	Belo Industrial Park - Factory Shells
2	Construction of Infrastructure and Factory Shells at TY, Berea District (planned 2019–2023); extension of power line TY to Maputsoe substation; upgrading of Maputsoe substation	Berea	Teyateyaneng Town Industrial Park - Factory Shells
3	Construction of Infrastructure and Factory Shells at Mokhotlong, Mokhotlong District (planned 2019–2023); line from Mapholaneng to Mokhotlong; new substation	Mokhotlong	Mokhotlong Industrial Park - Factory Shells
4	Construction of Infrastructure and Factory Shells at Qacha's Nek (planned 2019–2023); line between Mphaki and Sekake. To avoid voltage drop, the line may need to be upgraded to 132 kV from Mohale's Hoek to Ha Sekake. Alternatively, a 132 kV transmission line would need to be constructed from Mazenod to Ha Sekake, and a step to 33 kV and 11 kV be considered at Semonkong.	Qacha's Nek	Qacha's Nek Town Industrial Park - Factory Shells
5	Establishment of Makeka Mollometsi Liquor Distillery, Bottling Plant and Hospitality Business, Caledonspoort, Butha-Buthe; transmission line from Hlotse to Caledonspoort; substation upgrade at Caledonspoort.	Butha-Buthe	Butha-Buthe Distillery

Table 2.3. Anticipated Activities in Various Economic Development Zones to Which the Grid May Be Extended under Component 1

District	Type of Facility	Activities Intended
Butha-Buthe	Belo Industrial Park - Factory Shells	Automotive components manufacturing, automotive assembly, light engineering, mining/engineering supply park, textile manufacturing, and waste treatment plant
	Muela Special Development Area	A 20,000 ton per year industrial aquaculture development. Onland ponds for breeding and growing of pure salmon. Processing facility and water treatment/recycling plant
Berea	Special Economic Zone	Agro-industrial park for processing of agri-products. Canning, drying, juicing, milling, and possibly cold storage
Mafeteng	Special Economic Zone	Agro-industrial park, light engineering, textile manufacturing with irrigation infrastructure
Mokhotlong	Mokhotlong Industrial Park - Factory Shells	Manufacturing and agro-processing facilities. Possibly wool and mohair scouring plant in the long run
Qacha’s Nek	Qacha's Nek Town Industrial Park - Factory Shells	No activities planned in the short term
Butha-Buthe	Caledonspoort, Butha-Buthe distillery	Aloe (liqueur) distillery with storage. A tourism accommodation and dining facility in the long term
Mahobong	Fruits production	Packhouse, cold chain, and controlled atmosphere facilities
Maseru	Tikoe Phases 1, 2, and 3	Factory shells
Maseru	Vegetables production farm	Establishment of vegetable production anchor farm and outgrower schemes in Masianokeng area. Will have a market center and handling facility
Mokema	Integrated piggery production	Breeding, growing, slaughtering, and processing of pigs
Peka	Dairy farm	Milking parlor, holding yards, calf housing, cooling facilities
Semonkong	Integrated broiler production farm	Breeding, hatcheries, growing, slaughtering, and processing of broiler meat
Ha Matela	Integrated beef production	Feedlots, slaughter facilities, and processing plant
Mohale’s Hoek	Integrated egg production farm	Development of the pilot layer farm and egg packaging facility

Note: a positive list of supported activities has been agreed upon and will be included in the PIM; production of medical cannabis is not permitted.

Component 2: Electrification by Mini-grids (IDA US$10 million equivalent, SREP Loan US$8 million, SREP Grant US$2 million)

8. This component will support the electrification of areas where electricity supply through mini-grids represents the least-cost option from a country perspective, as underpinned by the EMP and geospatial analysis.

9. **Subcomponent 2A: Rehabilitation and Upgrading of LEC Mini-grid at Semonkong (SREP Loan US$3.5 million, SREP Grant US$2 million).** This subcomponent will fund the rehabilitation and upgrading of Semonkong, a hydro-based mini-grid with diesel as an alternative electricity supply source. Semonkong, located 113 km from the heart of Maseru, is operated by LEC. However, due to technical challenges and low hydrology, the hydro turbine is currently inoperable, and the installed capacity (180 kW of hydro and 500 kW of diesel) at the site does not meet the demand[33] of its service area. Therefore, rehabilitation of the turbine, expansion of generating capacity by adding 1.5 MW of solar PV and 500 kWh of storage, and the upgrading of the operational mechanisms for the simultaneous production of electricity by multiple supply sources are required and will be funded by the project. In addition, the expansion of the distribution network and connections to approximately 100 additional customers, both residential and commercial, as well as appropriate metering solutions for new and existing customers will also be funded through the project.

10. There is significant potential for economic growth at Semonkong, a frequently visited tourist hub. The population of Semonkong grows from roughly 1,500 to 3,000 when students and tourists visit the area. There are two high schools, many retail shops, two health clinics, two lodges (one of which runs on diesel), and numerous restaurants. A larger public hospital and elementary school are currently under construction, and there is a need for enhanced public lighting. Additionally, a water treatment plant (of Water and Sewerage Company, WASCO) at Semonkong uses diesel-based self-generation (2 × 250 kW) to provide power; however, if additional and more reliable electricity supply becomes available, WASCO will consume power from the LEC mini-grid since it is already connected.

11. This demonstration project will provide greater understanding of electricity demand in remote areas and contribute to greater economic activity at the site. LEC will share with the DoE all costs (capital and operating) as well as detailed consumption data of its customers served at the site. Thus, this subcomponent will help create a state-of-the-art mini-grid demonstration project that will (a) improve availability of mini-grid market information and (b) improve customer awareness about different tiers of service offered by mini-grids.

12. Feasibility and engineering design studies as well as implementation support for LEC (for oversight of implementation of the environmental and safeguards instruments for the investments as well as the oversight of the health and safety aspects during construction) will be supported under this subcomponent.

[33] Current demand totals 500 kW but does not include suppressed demand and self-generation.

13. **Subcomponent 2B: Mini-grid Deployment under PPP Models (IDA US$10 million, SREP Loan US$4.5 million).** This subcomponent will support the electrification of areas where electricity supply through mini-grids represents the least-cost option from a country perspective, as underpinned by geospatial analysis. In particular, this subcomponent will fund the deployment of several mini-grids using private sector-led business models. As observed from a preliminary mini-grid market assessment, the local state of the art in design and construction of solar mini-grids in Lesotho can be considered incipient and the experience in operating them non-existent. Thus, this subcomponent will help create state-of-the-art projects using mini-grids that will (a) test various PPP business models for service delivery; (b) improve availability of mini-grid market information thereby attracting private sector participants; (c) offer technical support for due diligence and project implementation support activities; and (d) create customer awareness about different tiers of service offered by mini-grids; (e) provision of grid connections to approximately 4,800 customers to link them to the mini-grids supported under the Project; and (f) provision of technical assistance to carry out associated feasibility studies and technical-economic analysis and implementation support activities for addressing technical, procurement, legal, environmental, social and capacity-building matters.

14. Up to 39 mini-grid sites will be selected (a) in agreement with the EMP; (b) based on the high-priority areas proposed by the GoL/DoE (who has already identified 30 potential mini-grid sites), and (c) based on the results of geospatial analysis (which has identified a long list of potential sites for development) (figure 2.2). Care will be taken to select sites in diverse areas of the country, including the highlands; additionally, potential for jobs and economic growth will be taken into account during site selection.

15. In particular, the following criteria[34] shall be used to select sites to be developed within this project:

(a) EMP and geospatial plan identify mini-grid as least-cost supply solution for proposed site
(b) Minimum distance to existing LEC grid: 15 km
(c) Minimum number of building structures (potential customers): 100
(d) At least one school and one health center should be served by the mini-grid
(e) Mini-grid site (and village(s) to be served) must be accessible by road
(f) Existence of some economic activity: Revenue-generating activities (shops, mills, transformation industries, market centers, industrial/commercial buildings)

16. The mini-grids will service all households and community (education, health, agricultural resource) facilities in the specified service area. Commercial customers and other anchor loads will be encouraged to connect as well. Due to their ability to provide reliable electricity, mini-grids can be used to power small industrial machinery such as water pumps and mills for farming/agro-processing, tools needed in welding and carpentry workshops, and so on, and are consequently expected to have a positive impact on local livelihoods. Based on preliminary analysis, it is expected that about 4,800 customers will be connected to mini-grids developed within this subcomponent.

[34] The PIU project coordinator should work with relevant stakeholders to assess the weighting of these selection criteria to prioritize sites once the project is approved by the World Bank Board.

17. Factors such as mini-grid-friendly policies and regulations, cost reductions of RE generation technologies, improvements in billing and monitoring equipment such as controllers and smart meters, mobile money, and geospatial planning tools to improve site selection are catalyzing industry growth, but mini-grids still require concessional financing to enable tariffs—or regular service fees—that are within the willingness and ability to pay of rural customers. For example, one private sector mini-grid operator that has been working in Lesotho for five years estimates that its cost-reflective tariff is M 5 per kWh (about two to three times that of LEC), an equivalent of US¢37 per kWh. There is a gap between this tariff and what is estimated to be the amount rural customers are willing to pay.[35] Therefore, significant funding is needed to scale up deployment of mini-grids and extend electricity access.

Mini-grid Costs

18. The technical focus will be on solar hybrid systems, that is, solar generation with battery storage and diesel backup. Mini-hydro may also be considered on a case-by-case basis given Lesotho's extensive hydro potential throughout the country. The mini-grids will be built to Lesotho's grid code standard to allow for integration to the main grid in the future. Prepaid metering and smart meter systems will be required to mitigate revenue collection risk and enhance the bankability of the mini-grid subprojects.

19. The average capital cost for solar-battery-diesel mini-grid systems is calculated to be US$3,000 per kW as a result of recent declining costs, expertise and efficiencies of private sector, risk reduction, and competition. The cost estimates, as shown in table 2.4, are based on pre-feasibility studies in Lesotho and experience in similar countries.[36] Assuming that 125 customers (85 percent residential, 10 percent commercial, 5 percent industrial) must be serviced by a single mini-grid, the demand can be met with a 55 kWp PV with 15 kW diesel backup mini-grid system, estimated at US$313,375.[37]

Table 2.4. Capital Costs Breakdown of 70 kWp Solar-Diesel Hybrid Mini-grid

Mini-grid Component	Cost
CAPEX: Generation (including storage, powerhouse, and conversion) and distribution (US$/kW)	3,000
OPEX (% of CAPEX)	3
Connection cost (service drop[a] and meters) (US$/connection)	500

Source: World Bank analysis.
Note: a. LEC service drop is estimated to cost US$296 and LV lines, US$7,442 per km.

PPP Model

20. It is expected that the subcomponent will support at least 30 projects. Given the limited number of private developers that are already active in Lesotho, and to catalyze mini-grid deployment at scale and kick-start the market, this subcomponent will be implemented under a market-based approach whereby the private sector develops mini-grids to deliver electricity services on a build-own-operate basis, with financial support offered through a single funding window: minimum subsidy tender. Limited private

[35] Based on the 2017 Household Energy Survey, rural LEC customers spend on average M 73.54 per month on electricity, roughly equivalent to US$5.44 per month for 52 kWh.
[36] Data provided by Trama Tecno Ambiental (TTA) and UNDP.
[37] Assuming value added tax (VAT) of 15 percent.

investment is expected. The DoE will be responsible for providing payments to developers toward CAPEX through a clear and transparent process.

21. For areas that private developers consider too risky although they are not conflict areas, the DoE is considering fully public-financed approaches, with private sector participation in constructing and operating the mini-grid. This could be incorporated as a separate tender under this subcomponent depending on uptake of the minimum subsidy tender and private sector interest to enter these areas. The assessment of this approach will be completed during the first year of the project. Similarly, and more broadly, the mini-grid sites (grouped into lots) will be tendered out in phases to provide the flexibility and ability to assess the performance of earlier tenders and adapt to changing market conditions during implementation.

22. The DoE TU in the PIU will be responsible for providing due diligence on relevant project activities and evaluating proposals/applications under consideration. Selected companies will obtain community and district-level agreement. The DoE will manage land acquisition of sites before tender. Mini-grids must be built to technical standards specified by LEWA; LEWA will grant mini-grid operators licenses or license exemptions once construction is complete and technical standards are verified. Selected companies will operate the mini-grids, providing O&M and retail services to its customers.

23. Up to 39 rural load centers will roughly be divided into three lots to encourage economies of scale in procurement and efficiency in O&M. By increasing the deal size, this window aims to attract some of the international private developers to enter the mini-grid market in Lesotho.

24. Affordability measures will be explicitly reviewed during proposal evaluation. Principles of cost-reflective revenues will be applied, with the flexibility that mini-grid operators can recover costs using a variety of schemes, such as charging customers agreed tariffs or fixed monthly fees for service levels. Therefore, bid packages will give significant commercial choice to the bidders, including specifying the tariff or regular service fees for customers; selecting the technology, subject to minimum technical specifications; client selection, subject to a minimum population that will need to be connected; and promotional sales campaigns, subject to a minimum adoption of productive use appliances. Based on preliminary analysis of electricity demand and supply costs, it is expected that residential customers will pay between US$5 and US$8 per month for service, roughly equivalent to electricity prices between US¢10 per kWh to US¢20 per kWh for households. This approach ensures affordability as the estimated monthly costs are comparable to current energy expenditures.

25. LEWA has rural service standards. However, it is recommended that, in the absence of other renewable resource availability, each load center/village in each lot to be bid out will be matched with one of five economically optimized scalable and modular system designs based on hybrid PV storage-diesel systems. These five standardized mini-grid configurations can be dimensioned with different peak power capacities to meet the demand of a range of load centers. Each standard system can be configured and equipped with a range of different PV and battery sizes, which makes it configurable for all recipient villages. A village would then be assigned to a certain standard size, based upon its peak power demand and then the standard size is configured according to the village's daily energy consumption to deliver the least-cost system that matches the village's needs. Bidders would have the discretion to propose minor modifications to the standard configuration indicated for each mini-grid but will have to comply with the major parameters to allow comparison and evaluation of bids. This approach would require further

feasibility studies and demand assessments at the start of project implementation by the DoE; however, it would also lessen the burden on the technical evaluation committee, and ideally decrease evaluation period, once proposals are submitted.

26. For each lot, bidders will therefore compete to demand the lowest amount of subsidy to build, own, and operate a portfolio of mini-grids that serves the load centers with the design configuration that best fits the demand profile. To reduce collection risk, the mini-grids will be required to include prepaid metering systems and smart meters to enable effective load management. Given that LEWA regulations permit cost-reflective tariffs with approval, the bidders' financial proposals will be assessed on the basis of minimum subsidy requirement provided that technical specifications comply with the parameters defined in the bid documents.

Sustainability

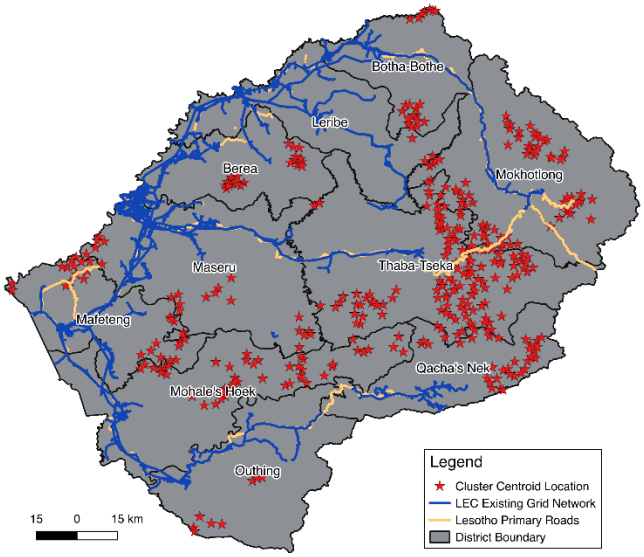
27. It is expected that lessons learned from mini-grids deployed early during project implementation can be used to better inform the deployment model of mini-grids deployed later during project implementation. The mini-grids developed under this subcomponent will help improve availability of market information on demand profile (customer types, consumption, productive use potential), willingness to pay, demand growth rate, relevance of LEWA's rural service standards, and so on, which is crucial for private developers to enter and operate in this nascent market. Under this subcomponent, selected service providers will be required to conduct comprehensive M&E of these projects and make data and information available to the public, which is essential for market scale-up.

28. Successful implementation of these mini-grids will create an ecosystem of quality mini-grid electricity supply and a demand for those services thus helping the market to further scale up during and beyond the life of this project by leveraging private sector investment.

29. This subcomponent will be complemented by extensive technical assistance to (a) confirm the sites through further feasibility studies and techno-economic analysis; (b) promote productive and efficient use of energy by users; and (c) provide technical, legal, and procurement support to effectively design the bidding documents, evaluate proposals, and supervise the construction of the mini-grid assets.

30. While the project will invite international companies, the project also aims to increase local capacity and therefore companies will be provided training and other technical support and, in parallel, awareness campaigns will be conducted for the community members. The development of the enabling environment for mini-grids, namely, the establishment of the legal and regulatory framework, is important for the long-term sustainability of the project. Other donors are providing the DoE extensive support in this area. However, additional support for the establishment of the framework will be provided to complement and accelerate the efforts of donors.

Figure 2.2. Potential Mini-grid Sites with More Than 100 Customers and Located >15 km from Existing MV Infrastructure



Source: World Bank Analysis.

Component 3: Technical Assistance and Implementation Support (SREP Grant US$2.9 million equivalent)

31. Given that the market is nascent, the technical assistance component will play a critical role in upstream and downstream capacity building. More specifically, the fund will be used to finance activities including, but not limited to, activities described in the following paragraphs.

32. **Subcomponent 3A: Project Implementation and Coordination Support (SREP Grant US$2.5 million).** This support will include the following:

(a) Selection and hiring of an IVA tasked with ensuring that companies meet their obligations to customers of both mini-grids and grid extension

(b) Hiring of a dedicated M&E officer, who will be responsible for M&E during project implementation

(c) Management of certification program for all companies, excluding LEC, funded by project

(d) Establishment and funding of the PIU within the DoE

(e) Support for the development and endorsement of a suitable regulatory framework for off-grid electrification (under preparation by other donors), including product standards and fiscal exemptions for clean energy products

(f) Establishment of a geospatial planning platform for planning and tracking progress of national electrification programs

(g) Hiring of a gender expert to drive the actions under the project, especially on women's employment, female entrepreneurship, consumer education, and productive uses of energy

(h) Capacity building for the implementing entities (DoE and LEC) on mitigating and managing social risks related to the labor influx (sexual exploitation, GBV, human trafficking, teenage pregnancies)

33. **Subcomponent 3B: Women's Employment, Female Entrepreneurship, Consumer Education and Citizen Engagement, and Productive Uses of Energy (SREP Grant US$0.4 million).** The subcomponent will fund the following activities.

34. First, the subcomponent will fund the technical assistance work centered on enhancing women's employment in the energy sector focused on key stakeholders such as the MEM, the DoE, and LEC. Limited sex-disaggregated data are available, but global data indicate that women are underrepresented in both technical and nontechnical roles and that the sector is male dominated. For example, total female employment at LEC sits at 116 out of a total of 502 employees indicating that female labor force participation is at around 23 percent. When looking at the data for women employed in technical areas, female employment drops to around 5 percent, with only 12 engineers out of the total of 212 being female at LEC. In the MEM, gaps between men and women are smaller with women representing 45 percent of the workforce (10 out of 22 staff) and 56 percent (22 out of 38 staff) within the DoE. However, many of the roles are administrative versus technical and the representation of women in engineering roles drops to 29 percent in the DoE (2 females and 5 males).

35. The technical assistance will focus on assessing the barriers a graduate would face in reaching the labor market and aspects around recruiting, retaining, and promoting women in the energy sector. These include legal barriers preventing women from entering an industry or advancing to certain roles, limited transport and insufficient workplace infrastructure, inadequate institutional sexual harassment policies and reporting mechanisms, regressive organizational culture, gender pay gaps resulting from occupational segregation and unequal pay for equal work, and a lack of care services. The study will also look at employment barriers and opportunities for women in the sites where mini-grids will be built and operated, with a special focus on skills development through the design of a solar O&M program. Interventions may include, among others, institutional policy design and adoption, data collection, human resource reforms, tailored recruitment strategies and communication efforts, and skills development of rural women and senior female leaders. A specific focus will be placed on assessing challenges faced by female engineers in Science, Technology, Engineering, and Mathematics (STEM)-focused positions and identifying the opportunities to overcome the barriers. The intervention will closely collaborate with the National Manpower and Development Secretariat, which is focused on allocating loan bursaries to students wishing to pursue higher education and training. It will also collaborate with the Women Empowerment Through Energy Access Project by UNDP to ensure cross-institutional learning.

36. Second, the subcomponent will address gaps in entrepreneurship in the mini-grid sector through the completion of an assessment of the barriers and the preparation of an action plan to address these issues under Subcomponent 2B that will be led by the DoE. Women entrepreneurs often lack information about access to finance options in the country. In addition, development of enterprises requires technical assistance support tailored to women's needs. Partnering with female entrepreneurship networks is key to creating awareness about the opportunities in the sector, for example, the grants for mini-grid

developers, and addressing skills gaps could enhance the credit worthiness of women entrepreneurs within the overall scale-up of access to finance procedures and requirements. Once the assessment for the sector has been completed, key indicators will form part of the action plan to ensure progress toward more equitable business opportunities in the mini-grid sector.

37. Third, the subcomponent will also fund the development and execution of a community awareness campaign, developed to inform people in target areas of the benefits and costs of electricity services, as well as the payment mechanisms, procedures, and safety practices of the electrification process. The campaign will also promote the productive and efficient use of energy by all customers. This is particularly important as DHS data from 2014 indicate a gap between MHHs and FHHs in access to energy services. An estimated 25 percent of all FHHs have access to electricity and an estimated 30 percent of MHHs have access to electricity in Lesotho in 2014. The program will target both MHHs and FHHs and will also pay particular attention to the poorer community members in rural areas that may be reluctant to take advantage of the electrification opportunity or face barriers to access information. The activities supported under this subcomponent will provide recurring opportunities for consumers to interact with service providers to share their feedback and concerns and strengthen the electrification agenda through tackling issues around affordability.

38. Fourth, the subcomponent will focus on closing gender gaps between women and men related to enterprises and livelihoods at the community level. The activity focuses on enhancing the productive uses of electricity to increase the income of women's enterprises and livelihoods. Key will be mapping out entry points under the activities under Component 2 with links to enhancing agro-processing, such as grain milling, various manufacturing/industrial industries, such as carpentry and tailoring, and the service sector, for example, in catering, bars, and restaurants that use electricity for lighting, sound systems, and refrigeration, as well as for charging mobile phones.

Component 4: Contingent Emergency Response Component (CERC) (IDA US$0 million)

39. A CERC with zero allocation may be used to partially cover emergency response through implementation of key activities by the appropriate agencies to respond to the emergency. The CERC could also be used to channel additional funds should they become available as a result of an eligible emergency. For the Lesotho energy sector, emergency conditions may arise subsequent to droughts, flooding, or energy import shortage.

40. The CERC mechanism will be further defined in a CERC Operational Manual attached to the PIM, which will include triggers and conditions for the use of funds. This manual will clearly outline the triggers, eligible expenditures, and procedures for tapping into the CERC. Should the CERC be triggered, all expenditures will be made in accordance with paragraph 11 of World Bank IPF Policy and will be reviewed and accepted by the World Bank before any disbursement is made. In accordance with paragraphs 11 and 12 of World Bank IPF Policy, this component would provide immediate, rapidly disbursing support to finance goods (positive list agreed with the Government), works, and services needed for response, mitigation, and recovery and reconstruction. Operating costs that are eligible for financing would include the incremental expenses incurred for early recovery efforts arising from the impact of a major crisis.

Project Cost

41. The breakdown of project costs and financing by component is given in table 2.5. In addition, it is expected that the GoL will cover the costs of preparing and implementing[38] all required safeguards instruments during project implementation. These costs are estimated to be US$5 million.

Table 2.5. Project Cost and Financing by Component

Project Components	IDA Financing	SREP Loan	SREP Grant	Total
Component 1: Grid Extension to Peri-Urban Areas of Lesotho	30.0			30.0
Component 2: Rural Electrification by Mini-grids	10.0	8.0	2.0	20.0
Subcomponent 2A: Rehabilitation and Upgrading of LEC Mini-Grid at Semonkong		3.5	2.0	5.5
Subcomponent 2B: Mini-grid Deployment under PPP Models	10.0	4.5	0.0	14.5
Component 3: Technical Assistance and Implementation Support			2.9	2.9
Subcomponent 3A: Project Implementation and Coordination Support			2.5	2.5
Subcomponent 3B: Women's Employment, Female Entrepreneurship, Consumer Education and Citizen Engagement, and Productive Uses of Energy			0.4	0.4
Component 4: Contingent Emergency Response Component	**0**			**0.0**
Total project cost	**40.0**	**8.0**	**4.9**	**52.9**

[38] This includes costs of compensation and resettlement assistance, implementation supervision, monitoring, training, consultations, disclosures, communication, and GRM operating costs for each subproject.

ANNEX 3: ECONOMIC ANALYSIS

1. This annex discusses the rationale for public financing of the project and the value added from World Bank support and presents the economic analysis of the project's development impact in terms of expected benefits and costs. The evaluation of the components is confined to the activities that generate benefits for which an economic value can be clearly identified and measured, notably benefits associated with investments under Components 1 and 2. Component 3 (technical assistance) and Component 4 (CERC) are excluded because of the difficulty in valuing the outcomes of technical assistance.

Rationale for Public Sector Provision/Financing

2. Achieving the GoL's goals of universal electrification by 2040 or earlier requires substantial scale-up of resources in the off-grid space in rural communities. Public financing of this project is necessary to leverage private sector financing, support and foster rapid access to electricity to develop industrial zones, considerably de-risk opportunities, and build capacity for the private sector to operate in a market that is traditionally considered commercially unattractive. Grid connectivity is required to provide access to peri-urban areas that are expected to grow into commercial and industrial zones to reinforce economic development. Because of the high cost of infrastructure, public financing is required to ensure affordable costs of connection and service.

3. On the other hand, communities living in the remote highlands are characterized by low population density and acute levels of poverty, and thus grid connectivity in these areas is not economically feasible. The private sector footprint in these areas is extremely limited as there are only a few mini-grids and solar off-grid private players. Therefore, public resources will be used to harness private sector efficiencies by creating appropriate incentives to mitigate the risks of doing business in these areas deemed commercially unattractive by the private sector. Finally, public support is necessary to demonstrate the applicability of innovative business models that maximize public and private sector strengths.

Value Added of the World Bank's Support

4. The World Bank—with its ability to design a customized electrification program drawing from decades of global experience and harness recent technological advancements to provide reliable, affordable, and sustainable energy services to consumers in remote rural areas—is well placed to assist Lesotho in designing and implementing a successful energy access program. The proposed project presents an unparalleled opportunity to reach out to a large part of the country bereft of modern energy services.

Methodology and Assumptions

5. The economic viability of the proposed project was assessed using a standard cost-benefit methodology. Net benefits for the project were calculated by comparing total system costs and benefits for the 'with project' and 'without project' scenarios. Economic costs were estimated based on the preparatory studies developed for the project. The proposed project is also expected to have a number of additional benefits which are either uncertain or difficult to quantify such as (a) employment generation; (b) health benefits derived from the displacement of some sources of energy for lighting, such

as kerosene or wood; (c) improvements in the provision of education and health services; and (d) a range of environmental and social externalities. The results of the economic analysis can be considered a conservative estimation of the total economic benefits for the society.

6. Table 3.1 presents a summary of the macroeconomic assumptions used in the economic and financial models.

Table 3.1. Macroeconomic Assumptions

Variable	Value	Comment and Source
Exchange rate	M 13.64/US$	
U.S. inflation	n.a.	Modeled in real U.S. dollar
Diesel price (base year - market price)	US$0.90/L	European Research Council
Diesel price (base year - economic)	US$0.73/L	World Bank based on European Research Council data
Crude oil price (base year)	US$61.5/bbl	World Bank Group Commodity price forecast January 2017
Economic discount rate	6.75%	

Project Costs

7. For this analysis, grid extension to Butha-Buthe is used as a representative grid extension subproject to estimate the economic returns associated with all the subprojects under Component 1. It is assumed that the project will support approximately six industrial sites under Component 1. The CAPEX for this representative project includes 40 km of 33 kV transmission line, 15 km of 11 kV distribution line, and 2 × 10 MVA substations. The total CAPEX of this representative project is estimated at US$4.42 million. The annual O&M costs are assumed to be 2 percent of the CAPEX. The operating cost of the subproject also accounts for the levelized cost of generation of the additional energy that will be supplied through this newly built connection.

8. The project will also invest in providing off-grid electricity solutions to those areas in Lesotho where the provision of grid electricity services is not economically or technically feasible in the medium term. Therefore, this project will support the development of approximately 30 solar-battery mini-grids including backup diesel generation sets as well as distribution lines and connections for an average village of 125 customers, which would include approximately 85 percent households (both Tier 2 and Tier 3), 10 percent commercial or productive load, and 5 percent institutional load. Replacement cost of approximately 10 percent of the CAPEX is accounted for every five years.

9. The estimated economic capital investment costs (CAPEX) of the components and the yearly economic cost for the O&M (OPEX) activities for each individual project component are summarized in table 3.2.

Table 3.2. Estimated Economic Costs Per Project Component

		Mini-grids	Grid Extension
Description		70 kW solar-diesel-battery hybrid mini-grid including 125 connections	Extension to Butha-Buthe with 7.5 MVA estimated demand
CAPEX	**US$**	313,375	4.42 million
	Number	39	6
OPEX (per unit per year)	**Fixed**	3 percent of CAPEX	2 percent CAPEX
	Fuel consumption (l)	865	—

10. The total economic cost of the investment component is assumed to be disbursed over a seven-year period across the different project components. The economic cost of the CAPEX and the OPEX has been estimated on an individual (per project component) basis; however, for the project implementation, it is expected that the different components will be bundled and tendered based on geographical clusters as this will maximize the economies of scale in the provision of the installation and maintenance activities, therefore, representing a conservative cost estimation.

Economic Benefits

11. The benefit calculation for the grid extension subproject assumes that 70 percent of the total estimated demand in the project site is currently met through diesel generators with unit cost of US$0.25 per kWh and 30 percent of the demand are currently unserved, meaning they are either met through manual labor or low energy intensity sources with a unit cost of US$0.1 per kWh. With provision of the new grid extension, the project site will be connected to the main grid thus replacing the expensive high carbon intensity diesel generators.

12. The mini-grid component of this project aims at providing electricity access to remote areas of Lesotho hosting the rural poor population. The economic benefits for the beneficiaries of the project are conservatively estimated on the basis of avoided costs. With this methodology, the estimated economic benefits for households are defined by the amount that they currently spend for energy services that can be substituted by electricity. For businesses, schools, health centers, and other institutions that are not electrified or that currently use diesel generators, the benefit would be estimated as the avoided economic cost of generating electricity using diesel generators.

13. While the current consumer demand and willingness to pay assessment is under development, for this analysis it was assumed that that households located in small towns or communities connecting to a mini-grid will replace electricity alternatives for an estimated US$5 per month for Tier 2 systems and US$8 for Tier 3 systems over the lifetime of the project. The recent household energy survey also indicates that rural households with electricity more than halve monthly expenditures on biomass (equivalent to US$11 per month). Total avoided costs for households range from US$16 to US$19. Businesses, schools, health centers, and other institutions will replace or would need to replace (if not electrified) the use of diesel generators. The levelized cost of diesel generation largely depends on the fuel price scenario assumed for which the oil price forecast prepared by the World Bank Group (Commodity Price Forecast

October 2016) has been used. Assuming standard parameters for small diesel generators, the avoided cost of diesel generation is estimated at US$0.44 per kWh for the base year.

GHG Accounting and Climate Co-Benefits

14. GHG accounting has been undertaken for this project, which will result in significant GHG emission avoidance by replacing (a) current use of diesel generators for commercial and small-scale industrial load in the peri-urban areas; (b) household usage of firewood, candles, and kerosene[39] fuels; and (c) small diesel gensets in community facilities and farms in the rural areas. Baseline annual emissions for Tier 1 and Tier 2 systems are assumed to be 0.374 tCO_2 and 0.6275 tCO_2 per user, respectively.[40] The net GHG emission reduction from six representative grid extension subprojects and approximately 30 mini-grids is 745,801 tCO_2.

15. While they are difficult to quantify, co-benefits of the project include, but are not limited to, the following:

(a) Increased employment opportunities derived from additional service hours, solar supplies, and service opportunities, with a special focus on women;
(b) Better integration of rural households by facilitating communications and enhancing access to information;
(c) Improved health benefits owing to the reduction of indoor air pollution due to the decrease in the use of firewood and kerosene, which increases the incidence of general ailment and respiratory disease; and
(d) Improved educational outcomes by enabling children to study for additional hours in the evening.

Economic Analysis

16. The economic analysis shows that the project is economically viable without any consideration of environmental externalities. The baseline NPV of the proposed project is US$143.2 million (at a 6.75 percent discount rate) with an economic return of 39.8 percent. Upon accounting for the environmental benefits from net GHG emission reductions, the NPV of the project is US$162.3 million and ERR is 43.0 percent when assuming the low social price of carbon and increases to US$181.4 million and ERR of 46.1 percent when assuming the high social price of carbon.

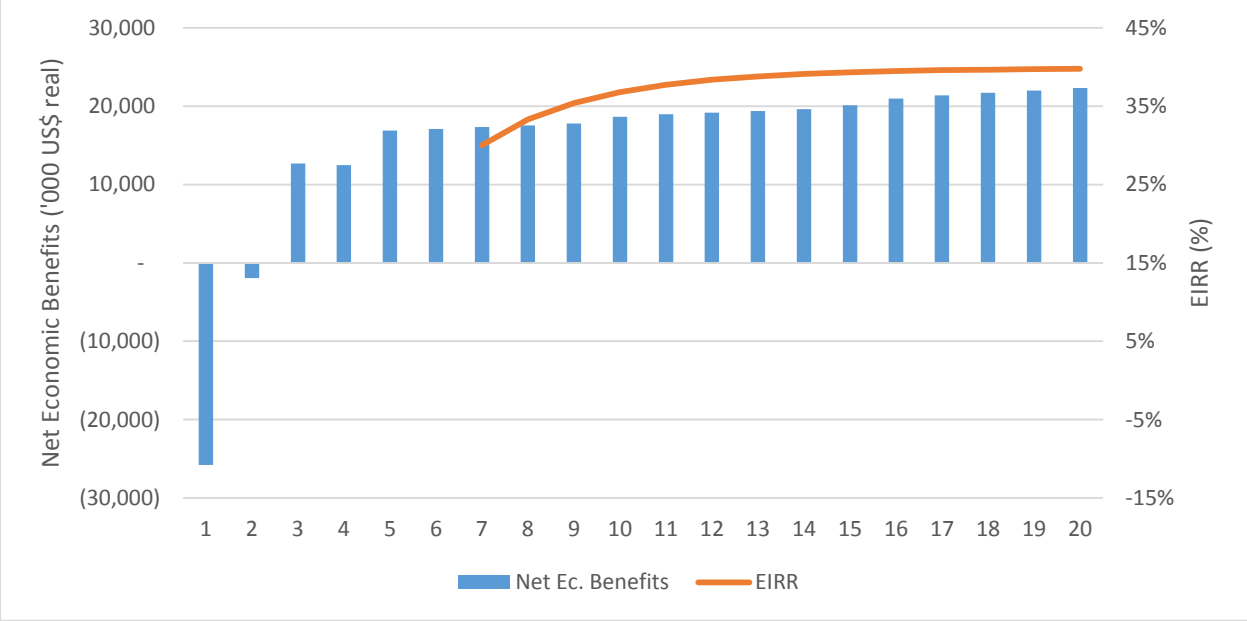
Table 3.3. Summary of Economic Analysis

Parameters	Value
Discount rate (%)	6.75
Total Cost (US$, thousands)	(292,777)
CAPEX	(35,866)
Operating expenses (OPEX)	(256,911)
Total Benefit	435,970

[39] There will be health benefits owing to the reduction of indoor air pollution due to the decrease in the use of firewood and kerosene.
[40] GHG Accounting Methodology for Energy Access Investment Operations https://worldbankgroup.sharepoint.com/sites/Climate/SitePages/Greenhouse%20Gas%20Accounting%20-%20Energy.aspx.

Grid extension	424,259
Mini-grids	11,711
NPV without environmental benefit (US$, thousands)	143,193
NPV with environmental benefit (US$, thousands) for low and high social price of carbon	162,335 (low) 181,432 (high)
EIRR without environmental benefits (%)	39.8
EIRR with environmental benefits (%) for low and high social price of carbon	43.0 (low) 46.1 (high)
Net emissions reductions (tCO_2)	745,801

Figure 3.1. Project's Net Economic Benefits and EIRR Evolution (Low Social Price of Carbon)



Source: World Bank analysis.

ANNEX 4: GENDER GAP ANALYSIS AND ACTION PLAN

Rationale: Why a Focus on Gender in Energy Matters

1. Access to reliable household energy, clean and efficient cookstoves, and public lighting can reduce energy poverty and give women and men additional income-earning opportunities. Women can earn income and gain employment from production, distribution, retail, and maintenance of solar appliances and the provision of after-sales services. Off-grid technologies can also support income-earning activities by extending the working day or setting up small businesses that depend on energy access. Labor-saving mechanized community services such as electric water pumping and grain grinding yield time savings and can also allow women to set up their own small enterprises. Key considerations include the following:

- **Product preferences.** Women and men may have different preferences when it comes to off-grid technologies and services. In the small business sector, there are indications that women who use off-grid lighting have slightly different preferences than men; the types of businesses women tend to operate drive these preferences.

- **Key buyers.** Women hold a significant sway in household decisions related to the purchase of lighting technology (20–50 percent depending on the country[41]), which underscores the importance of reaching women with marketing and educational messages.

- **Health concerns.** Increased awareness of the indoor air pollution health risks caused by use of unmodern energy sources is stimulating demand for clean alternatives in many countries. The issue could be used as a key message in marketing and consumer education campaigns.

- **Financing gap.** Access to finance—with a focus on women's finance—is a key to the development of the off-grid market. Financing opportunities and frameworks are often different for women than for men with opportunities for women often relying more on informal networks and lending groups.

- **Entrepreneurship.** Women entrepreneurs play a critical role in economic development by boosting growth and creating jobs, particularly for the poorest 40 percent of the population. Yet, women entrepreneurs face numerous challenges including legal and policy obstacles to business ownership and development.

- **Employment.** Integrating women into value chains can potentially lead to more effective clean energy initiatives.[42] Women are more than passive users of energy at the household and enterprise levels, so with proper capacity building they can be empowered to expand access to RE products and services, thereby creating jobs and reducing poverty.[43] There is increased evidence that a diverse salesforce can lead to better results; for example, data indicate that female sales agents in clean energy enterprises have a higher sales

[41] IFC (International Finance Corporation). 2011. "Expanding Women's Role in Africa's Modern Off-Grid Lighting Market."
[42] In a recent survey, 72 percent of companies that involve women in their supply chains stated that their investments in women were already increasing profits or are expected to do so soon. http://cleancookstoves.org/resources_files/scaling-adoption-womens-empowerment.pdf.
[43] IFC (International Finance Corporation). 2011. "Expanding Women's Role in Africa's Modern Off-Grid Lighting Market."

performance than their male peers, along with a greater ability to build and maintain relationships in local communities.

Lesotho Gender Gap Analysis

2. **To gain insights into key gender gaps, a preliminary analysis was conducted for the overall energy sector.** The aim was to summarize gender gaps in the energy sector across multiple data sources available for Lesotho and investigate the existence of a link between key gender gaps and the energy sector:

- **Head of household.**[44] Nationwide, 35 percent of households are headed by women. FHHs are slightly more likely than MHHs to live in urban areas; of all MHHs, 29.5 percent are in urban areas, and the rest are in rural areas. Of the total FHHs, 30.1 percent are in urban areas and the rest are in rural areas.

- **Electricity access and household spending.**[45] While in all the quintiles of household spending, MHHs have higher levels of access to electricity than FHHs (around 5 percent higher), the disparity is higher in the lower quintiles compared to higher quintiles.

- **Cost of getting electricity.**[46] The cost of getting an electricity connection is high and amounts to over three months of GNI for a household in the bottom 40 percent of the population.

- **Cost of subsistence electricity every month.**[47] The subsistence electricity consumption of 30 kWh per month costs US$2.8 per month for an average household in Lesotho, which is over 6 percent of the monthly gross income for a household in the bottom 40 percent of the population. Expenditure of over 5 percent of the monthly spending on subsistence electricity is considered unaffordable.

- **Access to cooking fuels.**[48] FHHs have higher levels of access to clean cooking fuels compared to MHHs. About 29 percent of FHHs use electricity and LPG for cooking compared to 26 percent of MHHs. The percentage of FHHs and MHHs that use kerosene for cooking is 5 percent and 6 percent, respectively, while it is 49 percent and 53 percent, respectively, for wood.

- **Access to finance.**[49] About 46.46 percent of the female population has an account with a financial institution or a mobile-money-service provider compared to 44.6 percent of the male population.

[44] Lesotho Standard DHS 2014.
[45] Global Monitoring Database [Sub-Saharan Africa] [TSD]/World Bank - latest available year.
[46] Lesotho Electricity Company. https://www.lec.co.ls/services.
[47] Regulatory Indicators of Sustainable Energy 2018.
[48] Lesotho Standard DHS 2014.
[49] Lesotho Standard DHS 2014.

- **Income.**[50] UNDP's Human Development Report derives the GNI per capita of male and female members of the population based on the ratio of female to male wages and female and male shares of economically active population. In Lesotho, the GNI per capita for the average female member at US$2,608 is lower than that of the average male member at US$3,904.

- **Labor.**[51] According to International Labor Organization data from 2018, only 35.6 percent of the total female population is employed, while the male population employment rate is 49.7 percent. In the energy sector, initial data reveal gaps between women and men in labor force participation. For example, total female employment at LEC sits at 116 of the total 502 employees indicating that female labor force participation is at around 23 percent. The data for female employees in technical roles show that the gap increases to around 5 percent, with only 12 engineers of the total 212 being female at LEC.

- **Entrepreneurship.**[52] The Enterprise Survey 2016 collected data on 150 firms from the manufacture and service industries that can be disaggregated by owner/manager gender. In Lesotho, 39 percent of firms have female participation in firm ownership, and 9 percent of the firms had majority female ownership, with 36 percent of the firms having women in top management positions. The survey also showed that female workers made up 48 percent of the full-time workforce.

- **Manufacturing.**[53] In manufacturing firms, 45.6 percent of the workforce is female in production activities and 50.1 percent is female in non-production activities.

- **Agricultural land ownership.**[54] About 36 percent of owned agricultural land is held solely or jointly by women, with sole ownership by women totaling only 7 percent of agricultural land, which could have implications for collateral requirements and so on.

Entry Points and Actions

3. **Enhancing women's employment in the energy sector (Components 1 and 2).** Limited sex-disaggregated data are available, but global data that are available indicate that women are underrepresented in both technical and nontechnical roles and that the sector is male dominated. For example, a study by the U.S. Agency for International Development of 14 electricity distribution utilities found that women made up about 13 percent of the workforce, ranging from 1 percent in Pakistan to 30 percent in Ukraine. In the RE subsector (wind, solar, and wave power), women represent 35 percent of the workforce according to a recent IRENA study in 2019.[55] The project will focus on assessing the barriers a graduate would face in reaching the labor market. These include legal barriers preventing women from entering an industry or advancing to certain roles, limited transport and insufficient workplace

[50] Human Development Report. http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/LSO.pdf.
[51] ILO (International Labor Organization). 2018. "ILOSTAT Database." www.ilo.org/ilostat.
[52] Enterprise Survey. http://www.enterprisesurveys.org/data/exploreeconomies/2014/burundi#gender.
[53] Enterprise Survey. http://www.enterprisesurveys.org/data/exploreeconomies/2014/burundi#gender.
[54] Food and Agricultural Organization. http://www.fao.org/gender-landrights-database/data-map/statistics/en/?sta_id=1164.
[55] IRENA (International Renewable Energy Agency). 2019. *Renewable Energy: A Gender Perspective*. https://www.irena.org/publications/2019/Jan/Renewable-Energy-A-Gender-Perspective.

infrastructure, inadequate institutional sexual harassment policies and reporting mechanisms, regressive organizational culture, gender pay gaps resulting from occupational segregation and unequal pay for equal work, and a lack of care services. The study will also look at employment barriers and opportunities for women in the sites where mini-grids will be built and operated. Interventions will be implemented across project Components 1 and 2 and focus on the following:

- Supporting country gender baseline assessments for the energy sector, that is, collecting key baseline data for each, specifically related to employment in the sector, sexual harassment policies, mapping women's engagement in the mini-grid and RE sector, and so on.

- Assessing skills needed in the energy sector from a demand and supply perspective and relevant human resource policies for promoting women's employment (with a focus on engineering and STEM fields) in the energy sector with key stakeholders such as the DoE, LEC, and so on.

- Designing comprehensive approaches that cut across the life cycle from the school-to-work transition to mid-career and broader issues around retention and promotion.

- Interventions will be tailored to project realities and in-country context and may include, for example, increasing girls' and young women's exposure to jobs in the RE sector, providing vocational programs, conducting unconscious bias trainings, providing career choice guidance, addressing child care service gaps, institutionalizing GBV prevention and response mechanism, establishing women's professional networks, and ensuring access to upskilling and training/scholarship opportunities. The intervention will also closely collaborate with the National Manpower and Development Secretariat which is focused on allocating loan bursaries to students wishing to pursue higher education and training and will also collaborate with the Women Empowerment Through Energy Access Project by UNDP to ensure cross-institutional learning.

- For the work on women's employment in mini-grids and RE, specific focus will need to be placed on the context of the project sites and the possibility of developing a solar maintenance program for women and the ability for project developers and the private sector businesses to drive forward interventions focused on employment opportunities for women.

4. **Creating more equitable business opportunities in the mini-grid sector.** Women entrepreneurs often lack information about access to finance options and face tangible barriers, including collateral constraints, skills gaps, limited networks, explicit and implicit biases, and time constraints (care burden and so on) among other aspects. Given these issues, the development of enterprises requires targeted technical assistance support tailored to address female business owner needs and constraints. Interventions will be implemented under Subcomponent 2B and focus on the following:

- Mapping gaps in entrepreneurship in the mini-grid sector through the completion of an assessment of the barriers and the design of an action plan to address these issues under Subcomponent 2B, which will be led by the DoE.

- Once the assessment for the sector has been completed, key indicators will form part of the action plan to ensure progress toward more equitable business opportunities in the mini-grid sector.

- Interventions may include partnering with female entrepreneurship networks and creating awareness about the opportunities in the sector, for example, the grants for mini-grid developers. Other interventions may include addressing skills gaps to enhance the credit worthiness of women entrepreneurs within the overall scale-up of access to finance procedures and requirements. Targeted interventions will be designed to assess how the grants for developers can be used to foster further participation of female entrepreneurs in the sector.

5. **Enhancing women's agency and voice through energy education.** Given how closely women's gendered responsibilities within the home are connected to their underrecognized role as energy consumers and producers (as well as energy entrepreneurs), utilities and mini-grid operators have an incentive to enhance women's participation in electrification to increase sustainability of operations. With a focus on enhancing the participation of women, the activity will fund the development and execution of a community awareness campaign, developed to inform people in target areas of the benefits and costs of electricity services, as well as the payment mechanisms, procedures, and safety practices of the electrification process. The campaign will also promote the productive and efficient use of energy by all customers. The program will target both MHHs and FHHs but will pay particular attention to the poorer community members who may be reluctant to take advantage of the electrification opportunity or face barriers to access information. The activities supported under this subcomponent will provide recurring opportunities for consumers to interact with service providers to share their feedback and concerns and strengthen the electrification agenda.

6. **Closing gaps in productivity.** The subcomponent will focus on closing gender gaps between women and men related to enterprises and livelihoods at the community level by enhancing knowledge of the productive uses of electricity to increase the income of women's enterprises and livelihoods. Key will be mapping out entry points under the activities under Components 1 and 2 with links to enhancing agro-processing such as grain milling; various manufacturing industries such as carpentry and tailoring; and the service sector, for example, in catering, bars, and restaurants that use electricity for lighting, sound systems, and refrigeration, as well as for charging mobile phones. Key activities will include

- Supporting country baseline assessments, that is, defining the target group and obtaining data for sites;

- Assessing the drivers of productivity gaps and relevant possible interventions to enhance women's livelihoods through energy access;

- Designing and implementing comprehensive approaches that enhance the productive uses of energy in agricultural, industrial, and service sectors by, for example, enhancing the knowledge and skills of small and micro-businesses, households, and farmers on how to use newfound electrical and motive power for profitable enterprise; and

- Exploring partnerships with in-country agricultural associations, micro-business support entities, aid agencies and donors, governments, nongovernmental organizations, private sector firms, and researchers.

ANNEX 5: SCALING UP RENEWABLE ENERGY PROGRAM

Table 5.1. Results Framework[56]

Indicator	SREP/IDA Project[a]	Scaled-up Phase[b]
Capacity (direct/indirect) from RE (MW), as a result of SREP interventions	4.1	30
Number of people, businesses, and community services benefitting from improved access to electricity and modern energy services, as a result of SREP interventions:		
Women	8,791[c]	64,324
Men	8,285[c]	60,626
Businesses	490	3,585
Community facilities	245	1,792
Increased public and private investments in targeted subsectors as a result of SREP interventions	US$20 million (US$10 million each from IDA and other public and private investment)	US$150 million
SREP leverage ratio	1:1.6	1:12
GHG emissions reduced or avoided		
• Tons per year (tCO_2eq per year)	1,571[d]	4,001
• Tons over 20-year lifetime (tCO_2eq)	39,432	144,043
Co-benefits	• Increased employment opportunities derived from additional service hours, solar supplies, and service opportunities, with a special focus on women • Better integration of rural households by facilitating communications and enhancing access to information • Improved health benefits owing to the reduction of indoor air pollution due to the decrease in the use of firewood and kerosene, which increases the incidence of general ailment and respiratory disease • Improved educational outcomes by enabling children to study for additional hours in the evening	

Note: a. Refers to Components 2 and 3 of the LREEAP. A total of US$12.9 million of SREP funding (US$4.9 million in grants, US$8 million in concessional financing) would be used to leverage US$10 million in financing from the World Bank and US$10 million in investment from other public and private sector investors in micro-grids.
b. Refers to targets under Lesotho's Energy Policy 2015–2025, including 75 percent electricity access and 200 MW of installed RE generation capacity. Based on the Lesotho SREP Investment Plan, it is estimated that renewable mini-grid capacity can reach 30 MW.
c. This corresponds to 4,165 households at an average size of 4.1 persons per household with the population comprising 51.48 percent of women and 48.52 percent of men.
d. This value is a conservative estimate of avoided annual GHG emissions assuming that not all mini-grids will be deployed in the first year but will rather be deployed over time. Once all mini-grids are deployed under the project, it is expected that average annual avoided emissions resulting from the mini-grid component of this project is 2,188 tCO_2 per year.

[56] Outcomes estimated in Annex 5 have been extracted from the SREP Investment Plan prepared in 2017, and may differ from overall project targets in the main document.

A. Introduction

(a) Country and Sector Context

1. The Kingdom of Lesotho is a mountainous country in Southern Africa. Roughly 80 percent of Lesotho's land is more than 1,800 m above sea level; the average elevation is 2,161 m.[57] Lesotho has a population of 2 million, of which more than 99 percent are ethnic Basotho.[58] About 64 percent of Basotho live in the districts of Berea, Leribe, Maseru, and Mafeteng, in the arable lowlands. The remaining population lives in six districts that include the Senqu River Valley and comparatively more mountainous land. Population growth has slowed since the early 1990s, from 2 percent a year to slightly more than 1 percent. Most people live in rural areas, but the share of the urban population has increased substantially, from 14 percent in 1990 to 27 percent in 2015.

2. Lesotho's economy has changed structurally; once based on remittance and agriculture, the country's economic growth is now driven by value-added output in the service sectors such as wholesale and retail trade and in manufacturing sectors such as textile manufacture and mining. Economic growth is steady but has slowed down since 2011. As a result, unemployment and poverty levels are high. In 2015, the broad unemployment rate was 28 percent and 43 percent among the youth (ages 15 to 24).[59] The national poverty rate was 56 percent, among the highest in Africa.

3. Lesotho's energy sector is characterized by a reliance on biomass (wood and dung) and imported coal and petroleum. As of 2016, electricity, which makes up only 4 percent of Lesotho's energy balance, is supplied to 38 percent of the population[60] with generation from the Muela hydropower plant (72 MW), and imports from Mozambique and South Africa. The rest of the population relies on multiple fuel sources to meet their energy needs. In rural areas, biomass is used for cooking and heating, and candles and paraffin are used for lighting. In urban areas, households rely less on biomass and more on paraffin and gas for heating and cooking. For lighting, urban households rely on a combination of electricity, paraffin, and candles.

4. The GoL recognizes low access to modern energy sources as a barrier to the country's development and has established targets to increase electricity access to 75 percent by 2022 and increase the use of RE sources by 200 MW by 2020. Current access rates have been achieved largely due to the recent push by the Government to accelerate electrification through an annual budget for electrification and funding from the UAF[61] managed by LEWA. Almost all those with access to electricity are grid connected. However, the majority of the country is mountainous with low population densities, making grid extension to these areas very difficult, hence the need for off-grid electrification efforts to complement on-grid electrification efforts.

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[57] GoL (Government of Lesotho). 2017. *2016 Population and Housing Census Preliminary Results Report*.
[58] "World Development Indicators," World Bank, accessed January 25, 2017. The term 'Basotho' also refers to the demonym for Lesotho.
[59] The broad unemployment rate includes discouraged workers.
[60] Electricity access stands at 60 percent for urban and peri-urban households and 18 percent for rural households.
[61] The UAF collects roughly M 18 million annually used to promote national electrification. The UAF is currently funding only on-grid electrification efforts mainly grid extensions to the existing LEC network. The GoL sets annual electrification targets for LEC of 15,000 connections, which LEC has been successfully achieving by extending its grid. To date, LEC customer connections are at 235,000.

(b) Lesotho's SREP Investment Plan

5. Lesotho's SREP Investment Plan describes investments that would contribute to the achievement of these targets, including the installation of micro-grids and other distributed RE technologies to provide about 38,000 new household connections in peri-urban and rural areas that are not identified for grid extension in the EMP currently in development.

6. On December 14, 2017, the GoL endorsed the SREP Investment Plan, which proposed up to US$18.5 million of SREP funding to implement an RE program with the support of the AfDB and World Bank. Prepared under the leadership of the GoL, represented by the Ministry of Energy, the SREP Investment Plan consists of two core components: (a) On-grid RE technologies and (b) Distributed RE Solutions.[62] The SREP Investment Plan is presented in table 5.2.

Table 5.2. Lesotho SREP Investment Plan

SREP Project	SREP	WB	AfDB Private Window	AfDB	Government of Lesotho	Other DFIs	Private Sector / Sponsor Equity	Total
On-Grid RE								
Investment in Utility-Scale Solar PV Plant	5		10[i]		0.6	TBD[ii]	14.4[iii]	30
RE Integration Study	0.6							0.6
Resource mapping study						1.4[iv]		1.4
Project Implementation Support + Site Studies				1.5[ii]				1.5
Subtotal: On-Grid RE	*5.6*		*11.5*		*0.6*	*1.4*	*14.4*	*32.1*
Distributed RE Solutions								
Investment in microgrids	8	6			4.1	3.2[iv]	15	36.3
Investment in distributed RE technologies	4	4			1.8	2.6[v]	5	17.4
Small Hydropower plants (SHPP) technical support	0.9							0.9
Subtotal: Distributed RE Solutions	*12.9*	*10*			*5.9*	*5.8*	*20*	*54.6*
Grand Total:	**18.5**	**10**	**11.5**		**6.5**	**7.2**	**34.4**	**86.7**

Note: DFIs = Development finance institutions. i. Financing instrument/AfDB window has yet to be determined. Two options being considered are to provide direct project financing through the AfDB private sector window or use an AfDB PRG to attract other private sector or DFI financing. ii. Project implementation support and site studies will be funded through a grant from the AfDB-managed Sustainable Energy for Africa (SEFA) Fund. iii. Total private sector contribution includes sponsor equity (US$7.5 million). The remaining US$6.9 million could come from a private financial institution or DFI. iv. Government of Italy. v. EU US$2.3 million + UNDP-GEF US$0.9 million. vi. EU US$2.3 million + UNDP-GEF US$0.3 million.

7. At the time of preparing the SREP Investment Plan, a greater emphasis was put on providing solar lanterns and pico PV lighting systems as solutions to provide access to electricity. Taking into account the fact that true transformation is achieved through the ability to support business' and households' socioeconomic needs, by providing electricity services of the desired quality, the focus is placed on mini-grids to provide improved quality of electricity services to the target population.[63]

[62] The activities envisaged under the Distributed RE Solutions component are reflected in Components 2 and 3 of this project.
[63] The SREP Investment Plan envisaged 9,000 household connections to mini-grids, assuming total funding of US$33.1 million, whereas LREEAP (following project preparation) anticipates 4,165 household connections through mini-grids with total funding of US$14.5 million. If LREEAP mobilizes US$10 million in private sector investment, an additional approximately 4,000 household connections are expected to be connected to mini-grids.

8. When the Investment Plan was endorsed in December 2017, the SREP Subcommittee approved a US$0.9 project preparation grant (PPG) for the World Bank-led Distributed RE Solutions component. The PPG was expected to fund pre-feasibility studies for small hydropower plants. However, in 2018, the LHDA embarked on a national hydropower potential assessment, which included mini-hydropower sites. This caused the DoE to put on hold the preparation of the pre-feasibility studies envisaged for the PPG to avoid financing duplicate assessments with government resources. LHDA studies were completed in Q3-2018 while the DoE was completing its EMP and preparing the LREEAP with the World Bank. The current preparation stage of the LREEAP and the need for grant funds to help increase attractiveness of remote off-grid RE projects prompted the DoE to request a change in use of the PPG, to be integrated in the grant portion of the proposed project. This is reflected in this Project Appraisal Document.

B. Project Description

9. The LREEAP aims to increase RE-based off-grid electrification and increase access to electricity in rural and peri-urban areas of Lesotho. It consists of four main components:

- **Component 1: Grid Extension to Peri-Urban Areas of Lesotho (IDA US$30 million).** It will finance the design, procurement of materials, and construction works required to electrify select industrial and commercial loads in peri-urban areas of Lesotho, as well as provide connections to residential customers nearby. This component will create roughly 6 new connections to large industrial sites (the home of roughly 252 companies) along with approximately 1,400 residential customers nearby. Grid connections to the selected areas will cater to agriculture productive use such as in the Butha-Buthe industrial site, industrial loads such as in Mokhotlong and Berea, and electrification in the highlands such as Qacha's Nek, which all have high potential for economic development.

- **Component 2: Rural Electrification by Mini-grids (IDA US$10 million, SREP Loan US$8 million, SREP Grant US$2 million).** It will support the electrification of areas where electricity supply through mini-grids represents the least-cost option from a country perspective. Semonkong, a hydro-based mini-grid with diesel as an alternative electricity supply source, will be rehabilitated and upgraded. The works will comprise the repair of the turbine, the expansion of generating capacity by adding 1.5 MW of solar PV and 500 kWh of storage, and the upgrade of the operational mechanisms for the simultaneous production of electricity by multiple supply sources, which is required and will be funded by the project. In addition, the expansion of the distribution network and connections to approximately 100 additional customers, both residential and commercial, as well as appropriate metering solutions for new and existing customers, will also be funded through the project. This component will also fund the deployment of approximately 30 additional mini-grids using private sector-led business models and help create state-of-the-art projects using mini-grids that will (a) test various PPP business models for service delivery; (b) improve availability of mini-grid market information, thereby attracting private sector participants; (c) offer technical support for due diligence and project implementation; and (d) create customer awareness about different tiers of service offered by mini-grids.

- **Component 3: Technical Assistance (SREP Grant US$2.9 million).** This component will play a critical role in upstream and downstream capacity building given the early market

development stage. More specifically, the fund will be used to finance activities including, but not limited to, the following:

- Subcomponent 3A: Project Implementation and Coordination Support (SREP Grant US$2.5 million)
- Subcomponent 3B: Women's Employment, Female Entrepreneurship, Consumer Education and Citizen Engagement, and Productive Uses of Energy (SREP Grant US$0.4 million)

- **Component 4: Contingent Emergency Response Component (IDA US$0 million).** It may be used to partially cover emergency response through implementation of key activities by the appropriate agencies to respond to the emergency. The CERC could also be used to channel additional funds should they become available as a result of an eligible emergency. For the Lesotho energy sector, emergency conditions may arise subsequent to droughts, flooding, or energy import shortage.

10. Please see section II and annex 2 for more details.

11. **Use of SREP funds.** SREP funds will be used for the development of mini-grids for rural electrification and technical assistance. By supporting higher impact interventions (for example, through productive and community uses and higher-tier household access), the project will contribute to potential job creation and the development of much needed economic opportunities in the rural parts of the country. Through the proposed technical assistance, the project will help establish enabling environment for both micro/mini-grids and distributed RE technologies (such as SHS and solar lanterns), provide capacity building to private mini-grid operators, and contribute to the institutional strengthening of the DoE.

12. The direct project beneficiaries of the SREP-funded components are (a) currently connected rural households and businesses at Semonkong, which will benefit from more reliable supply and expanded service hours; and (b) rural consumers who will gain new access to electricity under the project through mini-grids.

13. **Transformative impact.** The project proposes a comprehensive investment and capacity-building program to expand electricity access and improve the quality of electricity services through the deployment of RE-based technologies, by leveraging both public and private sector resources, thereby unlocking the most promising RE investment opportunities. The proposed project will contribute to the transformation of Lesotho's electricity sector by demonstrating the feasibility of solar PV battery storage-based mini-grids and will at Semonkong demonstrate the added benefit of combining hydro, solar PV and storage. There is only one operational (hydro-based) mini-grid in Lesotho; one solar-based mini-grid pilot is under construction. The successful implementation of the mini-grids component will provide a road map to scale up the deployment of mini-grids in the country. The technical assistance and capacity building will further support the transformation by contributing to the development of an enabling policy and regulatory framework for private sector participation in RE investments and rural electricity service provision over the medium to long term.

14. To date, mini-grids in Lesotho have been operated by LEC and the REU.[64] The REU[65] currently operates a mini-grid as a small power distributor in the southern border of Lesotho by purchasing power in bulk from ESKOM in South Africa and distributing electricity to roughly 300 customers. As the bulk supply costs were originally lower than the LEC tariff paid by customers, the REU was able to recover costs of service provision. However, recent increases in ESKOM's prices means that the REU cannot recover costs and must draw funding from the GoL. On the other hand, LEC's isolated mini-grids were either diesel-based or hybrid hydro-diesel-based systems. The diesel mini-grids served only domestic consumers; however, due to extremely high fuel and operating costs, the diesel generators were decommissioned and eventually connected to LEC's main network. The other mini-grid operated by LEC,[66] the 180 kVA run-of-river micro-hydro site in Semonkong, is now being supplied by a 350 kVA diesel genset due to increasing demand and the seasonality of the water flow. The quality of service has been limited to 14 hours per day, and the system consumes approximately 14,000 liters of diesel fuel per month, which is transported to the site on vans. Domestic customers pay the normal LEC tariff of M 1.47 per kWh, but the high cost of service provision, estimated to exceed M 9.84 per kWh,[67] is a burden to LEC.

15. The project will install up to 4.1 MWp of generation for mini-grids and will contribute to the achievement of the country's electricity access target of 75 percent by 2022. It will deploy mini-grids where they are least-cost from the country perspective, based on detailed geospatial analysis and Lesotho's EMP and, more importantly, will offer an alternative to the current models by demonstrating that electricity supply costs to customers in rural areas in Lesotho can be reasonably affordable using private sector-led hybrid mini-grids based on solar PV and even more affordable if complemented by other renewable technologies such as hydro (as would be the case at Semonkong). The SREP-cofinanced subprojects will help reduce initial investment costs and improve the operators' capacity to operate and maintain the facilities, and the demonstrational impact will be essential to achieve standardization of relevant PPP business models and scaling-up of hybrid mini-grids in rural areas.

16. The proposed standardization will lead to higher access to energy, potentially reduce the consumption of fossil fuels by large customers (such as the water treatment facility at Semonkong) that currently supply electricity needs using diesel gensets, and reduce indoor air pollution and therefore lower GHG emissions in homes using kerosene for lighting. Increased connectivity would further eliminate health risks to women and children arising from use of kerosene and wood fuels.

17. Furthermore, the project will accompany a transformative impact by facilitating the mobilization of new sources of financing for the sector. By testing mini-grid business models, the SREP will provide momentum to strengthen and attract private operators. Other subsectors and infrastructure, including water, health, agriculture, education, and information and communication technology, will benefit from greater access to energy services as well, which will positively affect rural communities.

[64] The REU of the DoE.
[65] LEC helps the REU with metering of customers, that is, revenue cycle services.
[66] The REU was engaged in a management contract for the micro-hydro mini-grid; however, the REU was insufficiently staffed to maintain operations and the contract was terminated after one year and returned to LEC for O&M.
[67] Thamae, L. Z. 2018. "Simulation and Optimization of Renewable Energy Hybrid Power System for Semonkong, Lesotho." In *Africa-EU Renewable Energy Research and Innovation Symposium* 2018 (RERIS 2018), edited by M Mpholo, D Steuerwald, and T Kukeera.

18. **Rationale for SREP financing.** The proposed SREP intervention will directly contribute to a transformational scale-up, increasing and strengthening of rural electrification efforts, and accelerating deployment of mini-grids at scale in Lesotho by helping create an enabling environment and demonstrating successful business models for private sector participation in rural electricity service provision. In its absence, the current deployment efforts are likely to remain uncoordinated and mainly unfunded (the only other DFI involved in the subsector is providing US$600,000 for investment in mini-grid infrastructure), and lack of adequate understanding of the rural energy market (demand as well as ability and willingness to pay for electricity and relevant PPP models for service delivery) will continue to prevent private investment, further hindering access expansion. In particular, the former LEC/REU-based deployment model in its existing format will continue to stagnate as LEC and the REU are not able to recover extremely high costs, and the capacity to operate mini-grids remains low. Private companies with interest in the market may be discouraged from entering due to the lack of economies of scale and limited knowledge of affordability.

19. Given the largely mountainous terrain and low population density in remote villages, electrification using grid extensions is not financially viable in many parts of the country in the near to medium term. The project would help demonstrate the viability of RE-based mini-grids as the best alternative for electrification in these areas. While diesel has become more expensive and solar PV and other renewables have become a more affordable option, investment costs for hybrid mini-grids based on solar PV remain high with economic rates of return that are somewhat low. Due to this, the weak regulatory framework, and the fact that there is little experience operating these isolated networks in Lesotho, investors are hesitant and cautious to enter the market. The use of SREP grant funding would therefore be critical to lowering the high upfront costs of solar-based RE generation in these remote locations, thereby making end customer tariffs more affordable. SREP support for technical assistance would allow for upstream work (legal and regulatory framework) to be developed to attract additional private sector investment going forward. Given these factors, SREP funding will be essential for leveraging additional funding, accelerating the adoption of hybrid technology for rural electrification, achieving a critical mass of mini-grids, and establishing PPP model(s) for effective and efficient rural service provision.

C. Assessment of Proposed Project with SREP Investment Criteria

(a) Increased Installed Capacity from RE Sources

20. Current mini-grid-based RE-generating capacity stands at 0.18 MW. The proposed project will support an additional installed capacity of about 4.09 MW from RE as a result of the SREP intervention.

(b) Increased Access to Energy through RE Sources

21. The project will help the GoL achieve its goal of 75 percent access to electricity by 2022. In particular, the project will provide mini-grid connections to 4,165 households, 490 small and medium enterprises, and 245 community facilities (schools, health clinics, and agricultural resource centers).

(c) Low Emission Development

22. The development of the mini-grids will promote the utilization of sustainable energy by providing electricity generated from solar. The mini-grids will reduce GHG emission by replacing the inefficient fossil

fuel-run (diesel) gensets that would have otherwise produced higher quantity of GHG emission. GHG accounting has been undertaken for this project, which will result in significant GHG emission avoidance by replacing household usage of candles and kerosene fuels as well as small diesel gensets in community facilities and farms in the rural areas. Baseline annual emissions for Tier 1 and Tier 2 systems are assumed to be 0.374 tCO_2 and 0.6275 tCO_2 per user, respectively.[68] Annual GHG emission reduction from approximately 30 mini-grids is 1,571 tCO_2 per year, with GHG emission reduction over a 20-year lifetime totaling 39,432 tCO_2.

(d) Affordability and Competitiveness of Renewable Sources

23. Affordability is essential for increasing access and for ensuring the development of the long-term RE market in Lesotho. SREP funding specifically reduces the barriers to adoption of RE-based off-grid service provision by lowering the capital costs of solar hybrid mini-grids, thereby reducing connection costs for rural consumers and making ongoing user tariffs more affordable to the average rural household.

24. **Lower connection costs for rural customers.** The current cost of grid-based access is estimated at roughly US$300 per service drop for urban customers within 50 m of distribution transformer; this connection cost is subsidized so that customers pay only US$140 per connection. The costs rise tremendously for peri-urban and rural areas because of (a) increasing distance and falling density of households and (b) the prohibitive costs of substation and step-down transformation compared to the level of demand; in this case, customers bear the full cost of connection. Given the remoteness of rural areas targeted under the project, the distribution costs for mini-grids should be significantly lower than the cost of grid connection, and these capital costs will be even further reduced using SREP funds.

25. **More affordable user tariffs.** International prices for solar PV modules have dropped dramatically over the last years, and the total system prices of solar-based mini-grids have declined, especially if solar and hydro complement one another. Although these mini-grids are a lower cost alternative to diesel-based mini-grids, the ongoing O&M costs remain high, rendering user tariffs less affordable. While no affordability survey has been undertaken, the average household in rural areas spends M 73 per month on electricity. With a user tariff at M 5 per kWh (such as that of OnePower, the only solar mini-grid pilot under construction in Lesotho currently), customers would only be able to afford 14–15 kWh per month, much lower than the current average consumption of 52 kWh per month in rural areas. Therefore, the SREP funds play a vital role by providing a cost buy-down subsidy that will make service from hybrid PV-based mini-grids more affordable to customers.

(e) Productive Use of Energy

26. Past experiences in Lesotho (for example, Semonkong) have shown that the availability of energy services stimulates new income-generating activities. Hybrid mini-grids have the potential to drive the creation of local businesses by extending the quality of service with longer availability of the service and potentially reducing the cost of energy. Therefore, a part of the technical assistance deployed under the project will focus on women's employment, consumer education and citizen engagement, and productive uses of energy. The activity will focus on enhancing the productive uses of electricity to increase economic

[68] GHG Accounting Methodology for Energy Access Investment Operations.
https://worldbankgroup.sharepoint.com/sites/Climate/SitePages/Greenhouse%20Gas%20Accounting%20-%20Energy.aspx.

opportunities by linking new electricity connections to enhancing agro-processing, such as grain milling, various manufacturing/industrial industries, such as carpentry and tailoring, and the service sector, for example, in catering, bars, and restaurants that use electricity for lighting, sound systems, and refrigeration, as well as for charging mobile phones.

(f) Economic, Social, and Environmental Development Impact

27. The project aims to link economic, social, and environmental benefits in a single paradigm of sustainable development and poverty reduction. This will enhance, in an integrated way, business start-ups, reduce local pollution, and improve the livelihoods and living conditions of the local communities.

28. Specific economic, social, and environmental benefits include (a) increased access to modern electricity services in rural areas not only for rural households but also for small businesses and community facilities;[69] (b) improved quality of social services, particularly health and education services in the rural areas which cannot afford individual generators; (c) improved air quality through the reduction of GHG emissions; (d) increased economic opportunities by creating new income-generating activities and jobs in the RE subsector and involving the private sector; (e) strengthened national private sector's capacity for mini-grid development and operations; (f) mobilization of domestic and foreign private funding for RE and off-grid service provision; and (g) improved rural livelihoods (especially for women and young people).

(g) Economic and Financial Viability

29. The deployment of mini-grids is economically viable. The expected ERR for the mini-grid component alone is estimated at 3.8 percent including environmental benefits.[70] Benefits are calculated as avoided costs, that is, the amount that is currently spent for energy services that can be substituted by electricity. The analysis is based on relatively conservative cost assumptions and the potential for added benefit is significant, including (a) employment generation; (b) health benefits derived from the displacement of some sources of energy for lighting, such as kerosene or wood; (c) improvements in the provision of education and health services; and (d) a range of environmental and social externalities. Mini-grids remain the least-cost supply option for the desired level of rural service provision. At this stage, the findings of the economic and financial analysis are preliminary and will need to be fine-tuned based on the capacity of the specific mini-grids to be selected, the final investment needs, and confirmation of the various assumptions used in the models (see section IV and annex 3 for more details).

(h) Leveraging of Additional Resources

30. SREP funds of US$12.9 million will leverage an IDA credit of US$10 million and up to an additional US$10 million from the private sector, which leads to a leverage ratio of at least 1:1.6. The SREP IP had

[69] The project aims to provide mini-grid connections to 4,165 households, 490 small and medium enterprises, and 245 community facilities.

[70] This jumps to 6 percent assuming a high social price of carbon. The overall expected ERR for all components of the proposed project (including the on-grid electrification activities) is estimated at 39.8 percent excluding global environmental benefits and 43 percent and 46.1 percent including global environmental benefits, assuming a low and high social price of carbon, respectively.

foreseen significant (tentative) contributions from other sources; further discussions with relevant stakeholders must be initiated to assess further funding potential.

31. Over the medium term, the project will help raise additional funds by demonstrating successful PPP business models for the deployment of RE-based mini-grids. In particular, SREP funding will act as a key anchor for funding transformational technical assistance activities (on establishment of legal and regulatory framework) as well as vital subsidies to buy-down costs and make mini-grids more affordable to private operators and poor, rural households. This is likely to attract the interest of other donors and private operators. The EIB and the Abu Dhabi Fund for Development have already expressed interest in the project.

(i) Gender

32. The importance of women in electricity service provision is tremendous. First, women hold significant sway in household decisions related to the purchase of lighting technology (20–50 percent depending on the country[71]), which underscores the importance of reaching women with marketing and educational messages. Second, increased awareness of the indoor air pollution health risks caused by use of unmodern energy sources is stimulating demand for clean alternatives in many countries, thereby improving health outcomes. Lastly, women entrepreneurs play a critical role in economic development by boosting growth and creating jobs, particularly for the poorest 40 percent of the population, and integrating women into value chains has the potential to lead to more effective clean energy initiatives.

33. Under its technical assistance component, the project seeks to strengthen the capacity of women to be active participants in the economic sector and avoid negative impacts on women. A particular emphasis will be put on enhancing women's employment in the energy sector. Limited sex-disaggregated data are available, but global data indicate that women are underrepresented in both technical and nontechnical roles and that the sector is male dominated. The project will assess the employment barriers a graduate would face in reaching the labor market and identify opportunities for women in the sites where mini-grids will be built and operated. Interventions may include, among others, human resources reforms, tailored recruitment strategies, and communication efforts and skills development of rural women and senior female leaders. Additionally, specific actions will be implemented to close the gender gap between women and men related to enterprises and livelihoods at the community level (see annex 4 for more details).

(j) Co-benefits of RE Scale-Up

34. Rural electrification can be a significant driver for income-generating activities when combined with community awareness and citizen engagement plus targeted training and capacity building. It can considerably improve the livelihoods of men and women within rural communities and women's organizations that may be using manual labor or time-intensive activities that can benefit from mechanization. The proposed project is expected to have a number of environmental, economic, health, and educational co-benefits, which will provide both global and local benefits, including the following:

- **Environmental benefits.** From the SREP Investment Plan assessment, it was calculated that

[71] IFC (International Finance Corporation). 2011. "Expanding Women's Role in Africa's Modern Off-Grid Lighting Market."

over a 20-year lifetime 83,421 tCO_2 of emissions can be avoided.

- **Economic benefits.** Increased employment opportunities derived from additional service hours and new appliances supply chains and service opportunities; electricity access will also lead to better integration of rural households by facilitating communications using cell phones and access to information derived from radio and television use.

- **Health benefits.** The project will also improve health by avoiding the use of firewood and kerosene, which produce indoor air pollution caused by particulate emissions that can increase the incidence of general ailment and respiratory disease.

- **Educational benefits.** Improved educational outcomes by enabling children to study for additional hours in the evening.

- **Community and safety benefits.** With available public lighting, villagers will be able to carry out a whole range of activities that were previously limited. Shops and markets can be open in the evening for business; social ceremonies and events can be extended to the nighttime. In addition, public lighting could result in improved public safety.

D. Monitoring and Evaluation

35. The PIU will be responsible for monitoring of project implementation progress and results indicators, as well as progress toward achievement of the PDO, as described in the Results Framework (section VI). Within the PIU, a dedicated M&E officer will be responsible for collecting information from the implementing entities (DoE and LEC), M&E, and preparing quarterly and annual progress reports for discussion by the GoL technical working group and the World Bank during implementation and support missions. LEC already has an M&E specialist for ongoing donor-funded projects. Under the technical assistance component, the project will strengthen the DoE's capacity for M&E.

36. Data collection will be under the responsibility of (a) LEC for the rehabilitation and the upgrading of the Semonkong mini-grid and (b) the DoE, with inputs from the private mini-grid developers, for the other mini-grid installations and the activities financed by the technical assistance. LEC and the private mini-grid developers will also be responsible for the submission of sex-disaggregated data, where relevant, for presenting progress in key and intermediate indicators. Reports will include procurement and financial summary reporting as well.

37. Some of the outcomes expected from the project (for example, impact on income-generating activities, job creation, and gender impacts) cannot be monitored on a regular basis. Therefore, a baseline study of targeted sites for mini-grids will be undertaken before the tendering process and before project closing to characterize the impact of mini-grid development on local activities at the site. The baseline study methodology will be inspired by the Multi-Tier Framework survey methodology for measuring access. This evaluation will complement monitoring indicators and help provide a better assessment of the impact of rural electrification.

E. Implementation Readiness

38. Although LEC has experience operating mini-grids and implementing other donor-financed projects, the DoE has limited experience managing mini-grid deployment. SREP grant resources will be used to strengthen the capacity and the implementation readiness of the DoE and other partners, by supporting technical design studies for hybrid mini-grids, site selection, preparation of bidding documents, project management and coordination activities including procurement, safeguards, M&E, training, and capacity building (refer to annex 1 for more information).

ANNEX 6: STATUS OF OFF-GRID SOLAR MINI-GRIDS IN LESOTHO

1. The off-grid RE market in Lesotho is nascent. While there is a recognized disparity between urban and rural electrification rates, the majority of rural electrification efforts are being driven by the Government through grid extension efforts captained by LEC. The private sector efforts that do address rural communities' off-grid electrification needs are small in scale and not effectively tailored to community needs. No major studies have been done to map demand and willingness to pay in conjunction with off-grid energy services. However, this exercise is being undertaken on a small scale through one of the EU's project implementers. The Bureau of Standards was only recently created, so there is no regulatory framework governing the importation of solar products. Because of this, a range of noncertified products from China, India, and South Africa exist in the market. This coupled with a poorly designed and managed off-grid access pilot in 2014 through the DoE's REU has ensured low demand for off-grid energy services. In a market with low supply, unchartered demand, and a burgeoning regulatory environment, multiple interventions will be required to increase supply, rebuild consumer trust, and carefully regulate the market.

2. In the case of solar mini-grids, the local state of the art in design and construction in Lesotho can be considered incipient and the experience in operating them is nonexistent. There is one small mini-grid pilot project under construction by the firm OnePower in Makebe, and the firm MOSCET has also expressed interest to enter this market. These pilot projects are testing not only the technology but also the business model for long-term sustainability of the service. OnePower reported its plan to charge M 5 per unit but details on its financial model are not disclosed. There are a significant number of solar installers, but their experience has been limited to individual PV plants and solar water heaters.

3. Off-grid electricity demand in Lesotho is low, particularly in the highlands where the consumption needs center around lighting and cell phone charging. Villages that are already interconnected pose some challenges to LEC because they are managed and serviced from district service centers that are distant, the revenue is very low compared to the operating costs, and they operate at loss. The grid solutions are oversized with respect to the demand and LEC expressed that an off-grid approach that was sustainable would relieve it from public pressure to provide this service and allow it to concentrate on its core business. Less expensive and smaller integrated systems such as Tier 1 and Tier 2 are recommended for distributed solutions for household service.

4. However, for communities that have a population density and a demand for electricity for productive uses and institutional facilities, a RE-based mini-grid is a more cost-effective alternative to grid extension-based electrification. Services provided by a mini-grid can range from Tier 2 to Tier 4 to serve up to a few hundred connections, including community facilities, small businesses, and households. Solar mini-grids have a high potential in Lesotho, but the limited absolute size of the market, scattered villages, and difficult geography may limit the presence of the major international players. Considering the high value and clear needs of the market and, at the same time, the very low level of institutional and supply chain maturity in Lesotho, there is the opportunity to guide the market and framework into a sustainable model, building on the lessons learned internationally, through local pilots and demonstration projects. Additionally, well-designed capacity building and certification phase in the LREEAP could build up the capacity of local firms.

5. The overall regulatory framework for the RE-based rural electrification is not very strong in Lesotho. In the case of mini-grids, there are technical rural electricity service standards and cost-reflective tariffs are acceptable subject to review by LEWA and agreement by the community. However, the regulatory environment will require a great deal of investment to ensure that the public and private sectors are aligned on priorities, target locations, and supportive sector initiatives. Additional points on the legal framework are summarized as follows:

(a) **Value-added tax (VAT) and import duty.** Applicable to all solar products but waved for solar panels used in local manufacturing. Import Duty not applied for solar products imported from South Africa.

(b) **Import requirements.** No quality verification standards implemented. Bureau of Standards has been operational for only one month.

(c) **Off-grid electrification strategy.** There is no language specific to mini-grids. There is no standard definition of the level of service considered for households to be “electrified”.

(d) **Off-grid financing.** Public Funds are used for REU and DoE. The UAF could be used for electrification through off-grid solutions.

6. Despite the lack of regulation, there is buy-in from the Government that the private sector will be an important ally in achieving universal electrification by 2030. Therefore, the LREEAP aims to deploy a mini-grid model with public ownership and private operation that has additional ongoing incentives to connect more clients through a mix of public investment and results-based financing.

ANNEX 7: KEY ELECTRICITY SECTOR LEGISLATION, REGULATION, AND GUIDELINES

1983

The Fuel And Services Control Act empowered the Minister to impose and collect a levy on fuel, except paraffin.

2002

The Lesotho Electricity Authority Act established the Lesotho Electricity Authority as regulator for electricity sector.

2006

The Lesotho Establishing and Vesting Act, Established the Lesotho Electricity Corporation as the Lesotho Electricity Company, vested with all of its assets, liabilities, rights, and obligations as the national electricity transmission and distribution Company.

LEA Amendment Act, Amended LEA Act (2002) regarding composition of Board, funding, powers to enter and use land for regulated activities, and acquisition of land required for regulated activities

2009

Electricity Price Review and Structure Regulations Regulated reviews of tariff structure and prices.

License Fees and Levies Regulations, Regulated funding Regulator activities via licensing fees and customer levies.

2010

Resolution of Disputes Rules Regulated dispute resolution between licensees and between licensees and customers.

2011

UAF Rules Established a fund for electrification and sets administrative rules.

LEA Amendment Act Amended LEA Act (2002) to give the Authority power to regulate Lesotho's water and sanitation sector and renaming the regulator as the Lesotho Electricity and Water Authority.

2012

Application for Licenses Rules Sets procedures and requirements for license applications and exemptions.

ANNEX 8: MAP

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