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Report No: PAD4005

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED GRANT IN THE AMOUNT OF SDR 54.60 MILLION (US\$75.00 MILLION EQUIVALENT)

AND A

PROPOSED CREDIT IN THE AMOUNT OF JPY 8.08 BILLION (US\$75.00 MILLION EQUIVALENT)

AND A

PROPOSED GRANT IN THE AMOUNT OF US\$10 MILLION FROM THE ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAM MULTI DONOR TRUST FUND

TO THE REPUBLIC OF RWANDA

FOR THE

RWANDA ENERGY ACCESS AND QUALITY IMPROVEMENT PROJECT

August 25, 2020

Energy and Extractives Global Practice Eastern and Southern Africa Region

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CURRENCY EQUIVALENTS

Exchange Rate Effective June 30, 2020

Currency Unit =	Rwandan Franc (RWF)
US\$1=	RWF 955.54
US\$1=	JPY 107.74
US\$1=	SDR 0.73
FISCA	AL YEAR

July 1 – June 30

ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
AFD	Agence Française de Développement (French Development Agency)
BRD	Banque Rwandaise de Développement (Development Bank of Rwanda)
CCF	Clean Cooking Fund
CMS	Commercial Management System
COVID-19	Coronavirus Disease 2019
Ci-Dev	Carbon Initiative for Development
CPF	Country Partnership Framework
CRI	Corporate Results Indicator
DP	Development Partner
DPO	Development Policy Operation
E&S	Environmental and Social
EAPP	East Africa Power Pool
EARP	Energy Access Rollout Program
EAQIP	Energy Access and Quality Improvement Project
ECCH	Efficient, Clean Cooking and Heating
EDCL	Energy Development Corporation Limited
EICV	Enquête Intégrale sur les Conditions de Vie (Integrated Household Living Conditions
	Survey)
EnDev	Energising Development
E-GP	Electronic Government Procurement
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
EPC	Engineering, Procurement, and Construction
ERP	Economic Recovery Plan
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework

ESIA	Environmental and Social Impact Assessment
ESMAP	Energy Sector Management Assistance Program
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESRS	Environmental and Social Review Summary
ESS	Environmental and Social Standards
ESSP	Energy Sector Strategic Plan
eSWAP	Energy Sectorwide Approach
EU	European Union
EUCL	Energy Utility Corporation Limited
FIRR	Financial Internal Rate of Return
FM	Financial Management
GBV	Gender-Based Violence
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic Information System
GIZ	Gesellschaft für Internationale Zusammenarbeit (German International
	Cooperation)
GNI	Gross National Income
GoR	Government of Rwanda
GRM	Grievance Redress Mechanism
GRS	Grievance Redress Service
НАР	Household Air Pollution
HPP	Hydropower Project
IBMS	Integrated Business Management Solution
ICB	International Competitive Bidding
IEG	Independent Evaluation Group
IFMIS	Integrated Financial Management Information System
IFR	Interim Financial Report
IPP	Independent Power Producer
IPSAS	International Public Sector Accounting Standards
IRMS	Incidents Recording and Management System
ISO	International Organization for Standardization
KPI	Key Performance Indicator
LCPDP	Least-Cost Power Development Plan
LMP	Labor Management Plan
LODA	Local Administrative Entities Development Agency
LPG	Liquified Petroleum Gas
LV	Low Voltage
M&E	Monitoring and Evaluation
MDB	Multilateral Development Bank
MEIS	Monitoring and Evaluation Information System
MINECOFIN	Ministry of Finance and Economic Planning

MININFRA	Ministry of Infrastructure
MTF	Multi-Tier Framework
MV	Medium Voltage
NDC	Nationally Determined Contribution
NEP	National Electrification Plan
NPV	Net Present Value
NST1	National Strategy for Transformation
OAG	Office of the Auditor General
OHS	Occupational Health and Safety
OSC	Off-Grid Solar Company
OPEC	Organization of the Petroleum Export Countries
OPRC	Operational Procurement Review Committee
PAYG	Pay As You Go
PCU	Program Coordination Unit
PDO	Program Development Objective
PFM	Public Financial Management
PIU	Project Implementation Unit
PPSD	Project Procurement Strategy for Development
PSC	Program Steering Committee
PV	Photovoltaic
RAP	Resettlement Action Plan
RBF	Results-Based Financing
REF	Renewable Energy Fund
REG	Rwanda Energy Group
RESSP	Rwanda Energy Sector Strengthening Project
RETF	Recepient-executed Trust Fund
RISE	Regulatory Indicators for Sustainable Energy
RPF	Resettlement Policy Framework
RPP	Revenue Protection Program
RPPA	Rwanda Public Procurement Authority
RSB	Rwanda Standards Board
RUEAP	Rwanda Universal Energy Access Program
RURA	Rwanda Utilities Regulatory Authority
SCD	Systematic Country Diagnostic
SDG	Sustainable Development Goal
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SFD	Saudi Fund for Development
SHS	Solar Home System
SPD	Standard Procurement Document
STEM	Science, Technology, Engineering, and Mathematics
STEP	Systematic Tracking of Exchanges in Procurement
SWAp	Sectorwide Approach
SWG	Sector Working Group

ТА	Technical Assistance
VAC	Violence Against Children
VPT	Voluntary Performance Target
WTP	Willingness to Pay

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DATASHEET

BASIC INFORMATION

Country(ies)	Project Name	
Rwanda	Rwanda - Energy Access and Quality Improvement Project	
Project ID	Financing Instrument	Environmental and Social Risk Classification
P172594	Investment Project Financing	Substantial

Financing & Implementation Modalities

[] Multiphase Programmatic Approach (MPA)	[] Contingent Emergency Response Component (CERC)
[] Series of Projects (SOP)	[] Fragile State(s)
[] Performance-Based Conditions (PBCs)	[] 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)	[] Hands-on Enhanced Implementation Support (HEIS)

Expected Approval Date	Expected Closing Date
17-Sep-2020	31-Dec-2026
Bank/IFC Collaboration	
No	



Proposed Development Objective(s)

Improve access to modern energy for households, enterprises, and public institutions and enhance the efficiency of electricity services in the Republic of Rwanda.

Components

Component Name	Cost (US\$, millions)
Increasing Access to Grid Electricity	90.00
Enhancing the Efficiency of Electricity Service	30.00
Increasing Access to Off-Grid Electricity and Clean Cooking Solutions	32.00
Technical Assistance, Institutional Capacity Building and Implementation Support	8.00

Organizations

Borrower:	Republic of Rwanda
Implementing Agency:	Energy Development Corporation Limited
	Development Bank of Rwanda

PROJECT FINANCING DATA (US\$, Millions)

SUMMARY

Total Project Cost	288.00
Total Financing	288.00
of which IBRD/IDA	150.00
Financing Gap	0.00

DETAILS

World Bank Group Financing



International Development Association (IDA)	150.00
IDA Credit	150.00
Non-World Bank Group Financing	
Trust Funds	10.00
Energy Sector Management Assistance Program	10.00
Other Sources	128.00
FRANCE: French Agency for Development	88.00
OPEC FUND	20.00
SAUDI ARABIA: Saudi Fund for Development	20.00

IDA Resources (in US\$, Millions)

	Credit Amount	Grant Amount	Guarantee Amount	Total Amount
Rwanda	150.00	0.00	0.00	150.00
National PBA	150.00	0.00	0.00	150.00
Total	150.00	0.00	0.00	150.00

INSTITUTIONAL DATA

Practice Area (Lead)

Contributing Practice Areas

Energy & Extractives

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	 Moderate
2. Macroeconomic	 Substantial
3. Sector Strategies and Policies	Moderate
4. Technical Design of Project or Program	 Substantial
5. Institutional Capacity for Implementation and Sustainability	 Substantial
6. Fiduciary	Moderate
7. Environment and Social	 Substantial
8. Stakeholders	Moderate
9. Other	 Substantial
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



Environmental and Social Standards Relevance Given its Context at the Time of Appraisal

E & S Standards	Relevance
Assessment and Management of Environmental and Social Risks and Impacts	Relevant
Stakeholder Engagement and Information Disclosure	Relevant
Labor and Working Conditions	Relevant
Resource Efficiency and Pollution Prevention and Management	Relevant
Community Health and Safety	Relevant
Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Relevant
Biodiversity Conservation and Sustainable Management of Living Natural Resources	Relevant
Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Not Currently Relevant
Cultural Heritage	Relevant
Financial Intermediaries	Not Currently Relevant

NOTE: For further information regarding the World Bank's due diligence assessment of the Project's potential environmental and social risks and impacts, please refer to the Project's Appraisal Environmental and Social Review Summary (ESRS).

Legal Covenants

Sections and Description

EDCL will submit annual project financial audits to the Association within six months after the end of each financial year.

Sections and Description

EDCL will prepare and Submit to the Association not later than forty-five (45) days after the end of each calendar



quarter, interim unaudited financial reports for the Project covering the quarter, in form and substance satisfactory to the Association.

Sections and Description

The Recipient shall cause EDCL, no later than 90 days after receipt, to deposit into the Electricity Connections Contributions Account the cash contributions for new electricity connections related to the Project.

Conditions	
Type Effectiveness	Description The Recipient has established the Steering Committees, as referred to in Section I.A of Schedule 2 of the Financing Agreement, in form and substance satisfactory to the Association.
Type Effectiveness	Description EDCL has appointed the Program Manager and the Project Coordinator, as referred to in Section I.A of Schedule 2 of the Financing Agreement, with qualifications, experience and under terms of reference acceptable to the Association.
Type Effectiveness	Description EDCL has prepared and adopted the EDCL-Operations Manual, as referred to in Section I.B of Schedule 2 of the Financing Agreement, in form and substance satisfactory to the Association.
Type Effectiveness	Description BRD has prepared and adopted the BRD-Operations Manual, as referred to in Section I.B of Schedule 2 of the Financing Agreement, in form and substance satisfactory to the Association.
Type Effectiveness	Description The Subsidiary Agreements, as referred to in Section III.C of Schedule 2 of the Financing Agreement, have been executed between the Recipient and the Project Implementing Entities in form and substance satisfactory to the Association.



Туре	Description
Disbursement	No withdrawal shall be made for payments under Category 2(a) unless and until the Recipient has to the satisfaction of the Association: (1) Submitted to the Association a revised written audit report of the Ntaruka HPP, its appurtenance and its performance history, prepared and completed by qualified independent experts, including at least one hydrologist ("Ntaruka HPP Audit Report"); (2) Agreed with the Association on a remedial action plan to rehabilitate the Ntaruka HPP based in part on the recommendations contained in the Ntaruka HPP Audit Report (the "Ntaruka Action Plan"); and (3) Disclosed and consulted with stakeholders in accordance with ESS 10 regarding the Ntaruka HPP Audit Report and Ntaruka Action Plan. Such consultations shall be conducted in a manner appropriate under the circumstances of a possible ongoing COVID-19 pandemic.
Туре	Description
Disbursement	No withdrawal shall be made for payments made under Category 3(b), unless and until Category 1 of the ESMAP Grant under the Grant Agreement has been fully disbursed.



I. STRATEGIC CONTEXT

A. Country Context

1. Rwanda is recognized as a leading reformer in Sub-Saharan Africa but remains one of the least developed countries in the world and still requires significant infrastructure investments for its socioeconomic development. Rwanda has been a frontrunner among African economies in the Doing Business indicators, moving from a global rank of 148 in 2008 to 38 in 2020, which is second in Sub-Saharan Africa after Mauritius.¹ Although Rwanda's annual gross domestic product (GDP) growth has averaged 7.2 percent in the last decade, Rwanda remains one of the poorest countries in the world. Infrastructure gaps, including in electricity, remain substantial. Indeed, Rwanda ranks 111 in the world when it comes to infrastructure quality according to the 2019 Global Competitiveness Report (World Economic Forum 2019).²

2. Poverty has declined substantially in the past two decades but remains high in rural areas, where access to public services such as electricity is still low. According to the latest Integrated Household Living Conditions Survey (the fifth *Enquête Intégrale sur les Conditions de Vie*, EICV5), between 2001 and 2017, poverty as measured by the international poverty line fell from 77.2 percent to 55.5 percent, and by the national poverty line from 58.9 percent to 38.2 percent. Poverty has also become less severe, with a shrinking gap between average consumption of the poor and the poverty line. However, despite Rwanda's good record in poverty reduction, the fifth Integrated Household Living Conditions Survey (*Enquête Intégrale sur les Conditions de Vie*; EICV5) showed that poverty reduction stagnated between 2014 and 2017 owing to droughts, a slowing down of the structural transformation and rural to urban transition, and a weakening of the job-creating potential of Rwanda's recent growth. Over 90 percent of the poor in Rwanda live in rural areas (mainly in the Southern, Western, and Eastern provinces). There is a high correlation between poverty and the lack of access to public services, including electricity. Even though electricity access increased from 9 percent to 15 percent within rural households between 2013/14 and 2016/17, it remains far too low for Rwanda's development ambitions.

3. **Rwanda's development strategy is laid out in its latest seven-year plan, the National Strategy** for Transformation (NST1) for 2017–2024, prioritized by the three pillars of economic transformation, social transformation, and transformational governance. The NST1 aims to lay the foundation for achieving upper-middle-income country status by 2035 and high-income status by 2050. It is guided by the Sustainable Development Goals (SDGs), the Africa Union Agenda 2063 and its first 10-year Implementation Plan 2014–2023, and the East African Community Vision 2050. Electricity is a cross-cutting area of focus under both the economic transformation pillar and the social transformation pillar, where targets in generation, electricity quality and reliability, and access are outlined.³

¹ https://www.doingbusiness.org/en/rankings?region=sub-saharan-africa.

² http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf.

³ NST1 (2017–2024): Economic Transformation Pillar, Priority Area 2, No. 11, "...public lighting will be installed on all major national and district roads..."; Economic Transformation Pillar, Priority Area 4, No. 23, "...scale up electricity generation and improve quality, affordability and reliability"; Social Transformation Pillar, Priority Area 5, No. 69, "...access to electricity will be scaled up to all from 34.5 percent (estimation in 2017) to 100 percent in 2024".

4. Before the coronavirus disease 2019 (COVID-19) pandemic, Rwanda was in the midst of an economic boom. In 2019, the economy expanded by 9.4 percent, the highest growth rate on the continent and well above Rwanda's average growth of the past 10 years. Investments were the main driver of growth, expanding by 23.3 percent and supported by strong public investments. Private consumption also grew by 9 percent. The contribution of net exports to growth was negative because the growth had been led by domestic demand. Fiscal transfers to the electricity sector remained below 2 percent of GDP, with over 90 percent taking the form of grants for public investment, mainly for electrification. As of December 2019, public and publicly guaranteed debt reached 58.5 percent of GDP. Rwanda's debt remains sustainable and the risk of debt distress has shifted from low to moderate as a result of the COVID-19 pandemic (Debt Sustainability Analysis of June 2020).⁴

5. The Government of Rwanda (GoR) has put together an Economic Recovery Plan (ERP) to respond to the COVID-19 pandemic, which includes a doubling down on electrification investments to accelerate digitization of the economy and integration of rural households into the modern economy. Because of the COVID-19 pandemic, Rwanda's economic growth rate for 2020 is expected to decelerate to about 2 percent, with significant downside risks depending on the extent of COVID-19's spread in Rwanda and any delays in recovery of international flow of goods, services and people. The GoR has taken prompt actions to mitigate the impact of the pandemic, including launching an ERP, which provides a blueprint for recovery in the hardest hit sectors, resumption of productive activity, and safeguarding of employment (see box 1). The ERP takes infrastructure development as a critical sector that could catalyze broader economic recovery through boosting productivity and has the potential to contribute significantly to creation of immediate jobs. The ERP includes a strong focus on further investment in energy access including connecting 350,000 households to grid electricity during the period of FY2020/21, more than double the recent rate of connections, and connecting 100,000 households using off-grid solutions. The ERP cost is estimated at around US\$900 million in additional financing in 2020 and 2021.⁵

Box 1. Rwanda's Economic Recovery Plan

The ERP, covering the period May 2020–December 2021, aims at guiding the Government on required key interventions across sectors that would provide support to households and boost employment and growth toward recovery. The priorities for economic recovery are the following:

- (a) Priority 1: Contain the pandemic and strengthen the health system (infrastructure, human resources, and information technology systems).
- (b) Priority 2: Mitigate the impact of the COVID-19 economic crisis on households' income by scaling up social protection.
- (c) Priority 3: Ensure food self-sufficiency by increasing agricultural production.
- (d) Priority 4: Support businesses and protect jobs.
- (e) Priority 5: Ensure a coordinated multisectoral response of the Government to quickly start and boost economic activity.

Source: Ministry of Finance and Economic Planning (MINECOFIN).

⁴ https://www.imf.org/en/Publications/CR/Issues/2020/06/18/Rwanda-Request-for-Disbursement-Under-the-Rapid-Credit-Facility-Press-Release-Staff-Report-49523

⁵ The GoR's response to the COVID-19 pandemic is supported by the World Bank through a supplemental development financing of US\$100 million (P173882) to the Third Energy Sector Development Policy Financing (P169040).



B. Sectoral and Institutional Context

Recent Progress in Electricity Access and Electricity Service Delivery

6. **Rwanda has electrified its population at one of the fastest rates in the world over the past decade, with access to electricity rising from 6 percent in 2009 to an estimated 54 percent in March 2020**. Rwanda's progress in electrification during 2010–2016 ranked 11th globally and 3rd in Africa. Among the 20 least-electrified countries, none made more progress than Rwanda during that period.⁶ Investments in grid extension have increased grid connections from 6 percent in 2009 to 39 percent in 2020, while off-grid access has more than doubled since 2016, and is estimated at 15 percent in 2020 (see Figure 1). Grid access of public institutions is remarkably high, reaching, as of March 2019, 100 percent of hospitals, 93 percent of health centers (compared to only a third on average in Sub-Saharan Africa), and 80 percent of primary and secondary schools (compared to a quarter for Sub-Saharan Africa on average). Rwanda's strong performance is reflected in the World Bank's Regulatory Indicators for Sustainable Energy (RISE) Framework, where Rwanda is among the top performers in East Africa and has particularly high scores in indicators associated with renewable energy and energy access.⁷

7. **Rwanda's power generation capacity tripled from 76 MW in 2010 to 225 MW in 2020 and the country has successfully reduced its reliance on oil-fired generation through investments in zero-carbon resources, halving the greenhouse gas (GHG) emissions intensity of electricity.** The share of oil-fueled power in Rwanda's power generation mix has declined from about 45 percent in 2013 to less than 20 percent in 2018 having been replaced by hydropower, lake methane-based power,⁸ and to a smaller extent by solar power and peat-fueled power. As a result, the GHG intensity of power generation, which is largely driven by the share of oil in the fuel mix in Rwanda, has declined from about 308 gCO₂ per kWh in the first quarter of 2013 to 134 gCO₂ per kWh in the final quarter of 2018. As most of the future least-cost power generation is expected to be from clean sources of power, the GHG intensity is expected to improve further. Rwanda has also managed to attract direct investment of over 17 IPPs, and the capacity expansion over the past decade has been largely financed by the private sector. As of 2018, 52 percent of capacity is under private ownership, one of the highest shares in Sub-Saharan Africa.

⁶ The World Bank. 2018. *Tracking SDG7: The Energy Progress Report*. http://trackingsdg7.esmap.org/data/files/download-documents/tracking_sdg7-the_energy_progress_report_full_report.pdf.

⁷ Developed by the World Bank Group, the Regulatory Indicators for Sustainable Energy (RISE) is a tool for policy makers to compare national policy frameworks for sustainable energy and identify opportunities to attract investment. RISE assesses countries' policy support for each of the three pillars of sustainable energy—access to modern energy, energy efficiency, and renewable energy. See http://rise.worldbank.org/.

⁸ Lake methane, which is the naturally occurring methane in Lake Kivu, is considered as a zero-carbon source of energy because, if not burned, the methane would gradually emit into the atmosphere.





Source: Rwanda Energy Group (REG); Ministry of Infrastructure (MININFRA) 2019

8. **Rwanda is also among the top performers in East Africa in terms of quality of electricity service delivery.** This has been achieved by investments in infrastructure improvements, financed by the Government, development partners, and the World Bank (under the Rwanda Energy Sector Strengthening Project [RESSP], P150634). System losses have also resumed their declining trajectory, after a period of increase because of the rapid expansion of low-voltage (LV) and medium-voltage (MV) lines (which are associated with higher losses) under the electrification program, and in 2018 dipped below 20 percent for the first time since 2010. The decline in system losses can be attributed to the measures undertaken by the utility to strengthen the grid and to reduce electricity theft, including the RESSP-financed Revenue Protection Program (RPP), which financed advanced metering infrastructure and systems for medium and large customers of the Energy Utility Corporation Limited (EUCL) (who account for less than three percent of the total customer base but represent around 50 percent of total sales), to protect EUCL's revenues. The utility is now able to provide accurate, reliable and timely billing information, thus promoting greater billing transparency to these customers, resulting in fewer consumption disputes, while also reducing network theft.

Institutional Modernization of the Power Sector

9. **Rwanda has undertaken several waves of institutional reforms in the energy sector over the last decade, the most recent of which was supported by a programmatic energy Development Policy Operation (DPO) series.** The most recent set of reforms during 2017–2019 were supported by the World Bank through an energy DPO series (Rwanda Energy Sector Development Policy Loan [P162671]; Second Rwanda Energy Sector Development Policy Operation [P169040]), to ensure that the further expansion of electricity services remains fiscally sustainable. Key reforms included: (a) tariff and connection pricing reforms; (b) multiyear fiscal planning for the energy sector; (c) institutionalization of least-cost planning for generation and transmission investments; (d) a new legal and regulatory framework for public-private partnerships in the energy sector; (e) institutionalization of least-cost, geospatial electrification planning; and (f) a new framework of regulations and investment procedures for off-grid solar power and mini-grids.

10. A decade ago, the GoR pursued a new systematic mechanism to expand access, called Energy Access Rollout Program (EARP) underpinned by a sectorwide approach (SWAp), to coalesce donor support around a common framework. Such an approach, adopted in many sectors, including energy, provided the GoR with a vehicle to steer away from fragmented development fund delivery. Both the framework and the process were anchored by national priorities, alignment, harmonization, and joint accountability in managing results. Sector working groups (SWGs), which include government departments, development partners, private sector, nongovernmental organizations, and civil society organizations, were set up in each sector to implement their respective SWAps. The EARP in the energy sector pooled a total of around US\$360 million between 2009 and 2018 from the Arab Bank for Economic Development in Africa, the Government of Japan, the Government of Netherlands, the OPEC⁹ Fund for International Development (the OPEC Fund), the Saudi Fund for Development (SFD), the World Bank, the Belgian Government, and the African Development Bank (AfDB). It was under this arrangement that Rwanda's success in its access agenda was achieved. The EARP's robust design and implementation has facilitated the recent success in electrification and is being highlighted as best practice globally by the World Bank's Independent Evaluation Group (IEG).¹⁰

11. The Rwanda Energy Group (REG) is a commercially operated state-owned enterprise, with a mandate to develop and operate all public sector energy sector infrastructure and be the interface of all private investments in the sector. The most recent organizational restructuring in 2014 separated the electric utility from the water utility, forming the REG and its two independent subsidiaries, EUCL and the Energy Development Corporation Limited (EDCL). The separation allowed for better governance and clear financial accountability between revenue-generating service functions (EUCL) and nonrevenuegenerating infrastructure development (EDCL). The holding company, REG, as well as its affiliated companies are governed under company law as opposed to public service law, which entails stricter requirements in terms of transparency and management accountability. REG is overseen by MININFRA and regulated by the Rwanda Utilities Regulatory Agency (RURA), an independent regulator. RURA evaluates the revenue requirements of REG and proposes electricity tariffs accounting for affordability constraints. The cash deficit of REG for both investment and operational purposes is provided through electricity sector subsidies by MINECOFIN. The Development Bank of Rwanda (Banque Rwandaise de Développement, BRD), among its services, provides financing support to the off-grid sector through the Renewable Energy Fund (REF), which is one of the main vehicles of the Government in promoting private investment in off-grid energy. The REF offers loans and results-based grants to households and small businesses for procuring off-grid solar devices, as well as credit lines to private sector off-grid solution providers. MINECOFIN issues budget transfers to the energy sector, while the Economic Cluster of the Cabinet has oversight over higher-level sector policy decisions (Figure 2).¹¹

⁹ OPEC = Organization of the Petroleum Export Countries.

 ¹⁰ The World Bank and IEG. 2014. World Bank Group Support to Electricity Access, FY2000-2014: An Independent Evaluation. Washington, DC: World Bank. https://ieg.worldbankgroup.org/sites/default/files/Data/reports/Electricity_Access.pdf.
 ¹¹ The Economic Cluster is a subgroup of the Cabinet formed for the effective implementation and monitoring of the

Government's priorities.







Source: World Bank Staff.

Note: T&D = Transmission and Distribution; eSWAp = Energy Sector-wide Approach

12. The capacity of REG has been strengthened to enable the company to support the required continued improvements in sector performance. Following the formation of REG, the company embarked on improving the capacity of the newly created sector institutions. REG revamped the organization by strengthening the human resource and technical capacity of EUCL and EDCL, led by their common Board of Directors. In addition, the World Bank-funded RESSP financed a management information system to support the company's critical business processes, including (a) enterprise resource planning to support management of corporate resources, (b) a commercial management system (CMS) for all commercial functions, (c) an incidents recording and management system (IRMS) for management and resolution of outages and other incidents in electricity supply to EUCL's customers, and (d) a geographic information system (GIS) to build and keep permanently updated reliable customers and network assets databases. The Integrated Business Management Solution (IBMS) is now fully implemented and includes the ability to directly produce comprehensive and reliable utility financial reports, full integration of the CMS and IRMS to the GIS, and development of the interface between the meter data management software of advanced metering infrastructure system and the CMS.

13. The GoR put in place a strong policy and regulatory framework for off-grid electricity access delivered through the private sector, and over a dozen companies are active in the market for quality-certified solar home systems (SHSs), selling close to 100,000 systems per year on average. Off-grid solutions are promoted as transitionary solutions in areas where extending the grid is not financially viable in the short term, and the Government has laid the foundation for the off-grid solar sector to grow by creating financing mechanisms, enforcing quality standards, and establishing an enabling policy framework. Solar companies operating in Rwanda have enjoyed tax exemptions on solar energy

equipment and appliances since 2015. The BRD has created credit lines for off-grid solar financing in local currency, both directly to companies as well as indirectly through financial institutions for purposes of promoting off-grid electrification. Strong barriers to entry in the form of quality standards enforced at customs have significantly reduced the number of counterfeit products in the Rwandan market. This has resulted in a higher market concentration of quality-certified products than in the rest of East Africa. As a result, the Rwandan market has not been saturated by low-performance products and counterfeits. The commitment of the Government to high quality off-grid solutions, of Tier 1¹² and above, was also manifested in the development and adoption of the Ministerial Guidelines on Minimum Standards Requirement for Solar Home Systems in June 2019. The guidelines establish quality and minimum service-level requirements for products imported into Rwanda. Lighting Global has followed the adoption of the guidelines with the design of a tool for the identification of off-grid technologies complying with the requirements outlined in Article 5, to assist the GoR, private sector companies, and development partners, in their implementation. Lastly, there is robust demographic data available which will aid the design of future concessional finance programs.

Remaining Challenges: Providing Electricity Access to Lower-Income Households

14. **Grid electricity access remains concentrated in higher income quintiles.** According to EICV4 and EICV5, between 2013 and 2017, connections almost doubled for rural households (from 9 percent to 15 percent) and for the bottom 40 percent (from 3 percent to 5 percent for Q1 and from 7 percent to 10 percent for Q2). Nonetheless, connectivity¹³ remains higher in urban and rich areas. During 2016–2017 up to 76 percent of urban households had access to the grid, compared to 71 percent in 2013–2014. Within quintiles, ranked by total household expenditure per capita, variation has remained large. Similarly, for 2016–2017, there is a large variation by Ubudehe category (see footnote for details)¹⁴ (Figure 3).

15. **Gaps in electricity access persist between men and women, as female-headed households have lower access to both grid and off-grid electricity.** As per EICV5, as of 2016/17, only 20 percent of female-headed households had access to electricity, compared with 29 percent of male-headed households. Quality of electricity also presents gender gaps, where 80 percent of female-headed households and 70 percent of the male-headed households have Tier 0 electricity, meaning their lighting needs are covered by traditional sources of lighting such as candles and kerosene lamps. Connected single-headed households are mostly concentrated in grid-connected urban areas with Tier 1–5 technologies. However,

¹² As defined by the Multi-Tier Framework (MTF) developed by the World Bank Energy Sector Management Assistance Program (ESMAP). MTF classifies energy services in tiers—starting from Tier 0 (no service) to Tier 5 (full service). For electricity, Tier 1 provides a basic service level, such as lighting and cell phone charging. For more information kindly see "Bhatia, Mikul, and Niki Angelou. 2015. *Beyond Connections: Energy Access Redefined. ESMAP Technical Report;008/15*. Washington, DC: World Bank. ¹³Treating households that use EUCL electricity as main source of lighting as households with a grid connection.

¹⁴ Rwanda's tradition of community and team-work is reflected in the Government's categorization of 'Ubudehe'. The categories reflect the level of support each household receives from the GoR in the form of the social protection program. The categories separate population by vulnerability and range from abject poor, who have no land or livestock, to money rich, a group with land and livestock, and often salaried jobs. The categories are useful to delineate household poverty but are not completely equivalent to other welfare assessments. Notably, this categorization is based on the consumption level and not income/cash level. For low-income households, significant consumption may come from non-cash consumption. Not all households in the EICV5 are assigned an Ubudehe.

female-headed households are unlikely to have grid connections due to affordability constraints in covering connection fees and monthly bills and are therefore more likely to resort to simple and cheaper off-grid solutions such as solar lanterns.





Figure 3. Grid Electricity Access 2013–2014 and 2016–2017

Source: EICV4 and EICV5.

Note: *Houses that use electricity as their main source of lighting.

16. Average consumption of electricity for all quintiles remains very low—within the first tier of household tariff categories: 0–15 kWh per month. With the increase in flat rate tariff between 2013–2014 and 2016–2017, and subsequent increase in tariff for higher-tier consumers, more households decreased consumption to the first tier,¹⁵ and this trend is likely to continue with the tariff increment in 2020. Among the few households in the poorest quintile which consume electricity, 97 percent consumed 15 kWh or less a month in 2016–2017.

17. **The poor spend more on electricity as share of their household budget than the rich.** On average, electricity consumers (those who reported positive spending on electricity for the last four weeks) spent 1 percent of their budget on electricity in 2016–2017, an improvement from the 1.59 percent for 2013–2014. The share of electricity expenditure increases as household income decreases, even though consumption increases with income. The poor spent 1.5 percent of their income in grid electricity while for the richest quintiles, the percentage was less than 1 percent for 2016–2017 (EICV5).

¹⁵ Tariff reforms in recent years: In 2015, a tariff reform changed the price of electricity from RWF 134 to 150 per kWh, followed by another tariff reform in 2016 that increased the flat rate to RWF 182 per kWh for all residential and nonresidential customers. In 2017, the tariff scheme changed from the flat rate to a block structure. For residential usage less than 15kWh per month, the price was set at RWF 89 per kWh; for residential usage between 15 kWh and 50 kWh per month, the price was set at RWF 182 per kWh; and, for residential usage higher than 50 kWh, the price was RWF 189 per kWh. In August 2018, tariff reforms, blocks 1 and 2 stayed the same while block 3 tariffs increased by RWF 21 per kWh to RWF 210 per kWh. In the latest tariff reform in January 2020, there was an increase of the second and third tier tariffs to RWF 212 and RWF 249 respectively.

18. **Affordability constraints have recently led to a slowdown of the market for SHSs.** While the pace of grid electrification has increased, off-grid access expansion has slowed down despite the GoR providing debt financing through the BRD and the implementation of a strong policy and regulatory framework. The off-grid market slowed down from about 100,000 SHSs sold in 2016/17 to around 85,000 systems sold in 2017/18 and 75,000 in 2018/19 (through April). Of all the solar lighting products sold in 2018, 8 percent were sold to Ubudehe 1, 41 percent to Ubudehe 2, and 51 percent to Ubudehe 3. Additionally, only 13 percent of the solar lamps and 5 percent of SHSs sold in 2018 were bought by Ubudehe 1, displaying only few households in Ubudehe 1 category can afford SHSs. Very similar challenges are prevalent in the market for clean cooking solutions.

Remaining Challenges: Efficiency of Electricity Service Delivery

19. System losses remain relatively high at 19 percent and outages and system reliability issues remain common, creating service constraints and barriers to further sector modernization and regional integration into the East Africa Power Pool (EAPP). An MTF survey conducted by the World Bank suggests that only about 56 percent of households have power more than 22 hours per day on average, and many are using backup solutions to cope with insufficient hours of service and power outages (the survey results showed that the main backup sources for lighting are mostly candles [66 percent] and torches/flashlights [24 percent]). A total of 92 percent of households responded that they do not use any backup solutions for their larger appliances. Similarly, at 19 percent, the electricity transmission and distribution losses in Rwanda still illustrate poor operational efficiency and are also a direct source of lost revenues through unbilled electricity. Poor quality of electricity services hinders economic growth and undermines consumer confidence in the utility, making application of cost-reflective tariff rates difficult and, in effect, harming financial sustainability of the power sector. The frequent fluctuations in voltage and frequency also create barriers to Rwanda taking advantage of lower-cost power imports from the EAPP.





Remaining Challenges: Clean Cooking

20. With nearly 80 percent of the households using firewood for cooking, progress toward cleaner cooking solutions has been much slower, limiting improvements in health outcomes and deforestation. Firewood accounts for about 93 percent of the fuel used for cooking in rural areas and 26.3 percent in urban areas, with charcoal accounting for another 65.1 percent (EICV5). With solid biomass such as

Source: The World Bank 2017.

firewood and charcoal so prevalent in Rwanda, the use of traditional cooking technology to meet cooking needs is also common. More than half of the households use three-stone fires for cooking. Rwanda's high population growth and density has exerted pressure on natural resources especially forests. Additionally, unsustainable production of charcoal contributes to deforestation, forest degradation, and air pollution. In Rwanda, most charcoal (86 percent) is produced inefficiently and by use of traditional earth mound kilns with average thermal efficiency of about 12 percent. Fuel switching from traditional biomass toward alternative modern fuels and modern biomass energy technologies can help alleviate some of this huge burden, and the associated costs of health care, productivity loss, and reduced quality of life.

21. While three-stone fires are common, there are households at all consumption levels using efficient stoves indicating a potential savings on fuel expenditures. Households with low consumption levels in quintiles 1 and 2 are dependent on traditional cooking technology such as three-stone fires (about 74 percent and 67 percent respectively) and self-built stoves (13 percent and 15 percent respectively) as their primary cooking device (figure 5). As households move to higher consumption levels, the share of three-stone fires goes down while the use of self-built stoves increases. A noteworthy point is that households across all consumption quintiles are using efficient stoves, between 10 percent and 16 percent of each consumption quintile. The use of efficient stoves is also seen equally across urban areas (14 percent) and rural areas (13.4 percent). Efficient stoves reduce the amount of fuel households require and thus result in saving time or the money a household spends on fuel. Manufactured stoves are less common; only 4.7 percent of high-consumption households in quintile 5 have switched to such stoves.



Figure 5. Primary Source of Cooking Fuel for Households

Source: EICV5 2016–2017.

22. Access to clean cooking is still a significant bottleneck in improving the health and well-being of **Rwandan households.** The huge dependence on biomass coupled with traditional stoves for cooking causes major health issues and deforestation. Household air pollution (HAP) from solid fuel use is the fourth leading risk factor for morbidity and mortality in Rwanda, and respiratory infection the leading cause of life lost.¹⁶ It is estimated that more than 7,383 premature deaths in Rwanda are attributable to

¹⁶ Institute for Health Metrics and Evaluation. Country Profile: Rwanda. http://www.healthdata.org/rwanda (accessed Jan 26, 2018).

HAP annually with the total welfare losses of US\$674 million per year.¹⁷ About 76 percent of households spend on average 7 hours acquiring fuel, either by collecting or purchasing it, and preparing the fuel for their stoves, with a disproportionate burden on households using firewood. Women and girls disproportionately spend more time engaging in cooking-related activities and bear the burden of drudgery. Women and children are more susceptible to HAP, and chores relating to cooking take a considerable amount of their time, which otherwise could have been used for other productive areas such as employment.

23. The market for efficient and clean cooking solutions is small and nascent but has potential to grow and expand. The local production process for improved cookstoves is artisanal with limited manufacturing and scale. This is mainly due to a lack of promotion or incentives to entrepreneurs, dedicated support to clean cooking enterprises, and limited financing options and high interest rates. However, there are some opportunities that can help support private enterprises to move forward and scale. Cooking enterprises are eligible for value added tax and import duty exemptions. There are a few clean cooking promotion activities and ongoing pilots to test new products and business models. Thus, there is a need to promote technology development, technology transfer, and localization based on local cooking culture and to provide financing and knowledge support.

The National Strategy for Transformation, Energy Sector Strategic Plan, and Rwanda Universal Energy Access Program

24. The NST1, 2017–2024, aims to make Rwanda among the first countries in Africa to achieve universal electrification, with investments guided by an advanced geospatial National Electrification Plan (NEP), and the first to achieve less than 50 percent reliance on traditional cooking fuels. The NST1 identifies the importance of universal energy access for achieving the envisioned social transformation and aims at expanding electricity access to 100 percent of households by 2024. Electrification investments under the NST1 are being guided by an advanced geospatial NEP prepared in 2019, which lays out the areas to be electrified by the grid by 2024 and those where off-grid solutions will step in before the grid arrives (48 percent off-grid and 52 percent grid connections; see Table 1). Furthermore, to improve the quality and reliability of electricity services, the Energy Sector Strategic Plan (ESSP) sets out targets for reducing power interruptions and expanding electricity access to productive users. Recognizing the harmful health and economic impacts of using biomass in traditional cookstoves, the ESSP also aims to reduce the number of households using traditional cooking fuels from 79.9 percent in 2016/17 to 66.6 percent by 2020/21 and 42 percent by 2024 by replacing wood and charcoal with clean cooking options.

¹⁷ World Bank and Institute for Health Metrics and Evaluation, 2016. *The Cost of Air Pollution: Strengthening the Economic Case for Action.* Washington, DC: World Bank.



ESSP Objectives	Baseline (2017)	Target (2023/24)
Achieve universal electrification (Tier 1 or more)	40.7 percent (29.7	100 percent (52
	percent on-grid, 11	percent on-grid, 48
	percent off-grid)	percent off-grid)
Reserve margin	n.a.	15 percent
Average number of interruptions per year	265	92
Average total duration of interruptions per year	44 hours	14 hours
Reduce transmission and distribution network losses	22 percent	15 percent
Expand electricity access to productive users ^a	72.6 percent	2020/21: 100 percent
Households using traditional cooking technologies	83 percent	42 percent

Table 1. Rwanda's Objectives for the Energy Sector under ESSP (201	017/18-2023/24)
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Source: MININFRA 2018.

Note: a. According to the ESSP, productive users use energy for activities that enhance income and welfare and include health and education facilities, public infrastructure, and industry.

25. The achievement of the NST1 targets will require a substantial acceleration of electrification efforts—from about 230,000 connections per year (including both grid and off-grid access) to over 500,000—and the creation of new markets for clean cooking, both requiring a combination of public and private investment. Public investment is estimated to be in the order of US\$1.06 billion (see Table 2), which will require concerted efforts in financing from the GoR and development partners. Public investment will focus on grid electrification, transmission and distribution grid reinforcement, utility operations, and measures to catalyze private investment in off-grid electrification and clean cooking, especially for areas with poor affordability that are not attractive to the private sector. An estimated US\$370 million of private finance is expected to be mobilized between now and 2024 to support the implementation of off-grid solutions. Private funding will be the main driver in development of power generation, off-grid electrification, and clean cooking.

	ESSP Objective	Initiative	2019/20	2020/21	2021/22	2022/23	2023/24	Total
Increase grid- electricity access.11 <t< td=""><td>Increase grid- electricity access. Increase grid-access</td><td>Grid- connected households</td><td>96.30</td><td>104.30</td><td>112.80</td><td>121.90</td><td>131.70</td><td>567.00</td></t<>	Increase grid- electricity access. Increase grid-access	Grid- connected households	96.30	104.30	112.80	121.90	131.70	567.00
	Productive users	10.00	10.00	1.10	1.10	1.10	23.00	
Enhance the efficiency of	Distribution network investment	7.27	3.27	7.15	5.50	0.70	24.00	
	electricity service delivery	Transmission network investment	39.03	7.20	54.42	23.16	22.00	146.00

Table 2. Investment Requirements for the ESSP Objectives Relevant to the Program (US\$, millions)



	ESSP Objective	Initiative	2019/20	2020/21	2021/22	2022/23	2023/24	Total
3a	Off-grid electricity access. Increase off- grid-access to electricity to 48 percent	Solar home systems and mini-grids	22.00	27.10	25.50	27.40	29.40	131.00
3b	Clean cooking: Halve the number of households using traditional cooking technologies	Provision of improved cookstoves	29.30	31.50	33.9	36.40	39.10	170.00
	Total investment requirement		203.90	183.37	234.87	215.46	224.00	1,062.00

Source: Rwanda's ESSP.

Note: These exclude the objectives associated with generation expansion, street lighting, and development of oil and gas strategic reserves.

26. The Rwanda Universal Energy Access Program (RUEAP) is the GoR's multi-donor program to achieve the objectives of the NST1 and ESSP, and the GoR has solicited donor support around a common framework that builds on experiences and lessons learned from past electrification projects in the country. The preliminary donor commitment so far amounts to a total of more than US\$674 million to be mobilized toward the achievement of the ESSP objectives as far as possible (Table 3). The ESSP requirement for on-grid access is US\$590 million, against the mobilization of public funds under the program of US\$366 million, which leaves a gap of approximately US\$224 million. The amount of public funds raised for improving the reliability of electricity supply and reducing transmission and distribution losses includes investments planned under the ESSP as well as beyond. For off-grid electrification and clean cooking, the RUEAP aims to leverage private investment through targeted subsidy schemes.

27. The proposed Energy Access and Quality Improvement Project (EAQIP), which includes financing from IDA, the World Bank-administered Clean Cooking Fund (CCF), the French Development Agency (Agence Française de Développement; AFD), OPEC Fund, and SFD, encompasses part of the activities of the RUEAP, with the remainder expected to be covered by a second donor group led project financed by the AfDB and EIB. The GoR has allocated funding between the donor partners in a manner aimed at ensuring adequate coverage across the different targets of the ESSP (Table 3). All donors to the multi-donor program were allocated districts across Rwanda in which to support grid access to electricity which, in accordance with the ESSP budgets, requires the bulk of funding. In addition, the World Bank funding addresses the off-grid and clean cooking segment, and a small portion of the transmission and distribution stabilization segment, while the AfDB funding addresses most of the transmission and distribution stability and reliability segment (Table 3). Although the funding mobilized through the program may not meet the needs of the ESSP in its entirety, the program will go a long way in contributing to the targets of the ESSP.

28. As part of the larger multi-donor RUEAP, the proposed EAQIP supports the GoR's strategy to implement a 'last push' to reach universal electrification, make a step-change in access to clean cooking, and enhance efficiency of electricity services for all consumers. Access to modern energy service in the bottom 40 percent of the income distribution, while growing, is still limited. Only about 5 percent of the lowest income quintile households have electricity access (compared to 61 percent of the highest income



quintile) and the electricity access rate in rural areas is about 15 percent (compared to about 76 percent in urban areas). Even the consumers who use electricity cope with unreliable supply (see Figure 4). Targeted government interventions are needed to catalyze private solutions in reaching poorer segments of the population. The affordability of energy services provided by the private sector however remains a major challenge, especially in the remote rural areas. The market for off-grid solar solutions has slowed down in recent years as higher-income segments have been saturated.



Program Components	World Bank-led Project (EAQIP) m Components With proposed cofinancing ¹⁸ by AFD, OPEC Fund, and SFD		Ċ	AfDB-led Project Cofinanced by EIB	Total Donor Financing	Financing Gaps Compared to the ESSP	
1. Increasing Access to	World Bank	90.0	AfDB	64.7			
Grid Electricity	AFD	85.4	EIB	85.4	— ЭСЭ Г	226.5	
	OPEC Fund + SFD	38.0			- 303.5		
	Subtotal	213.4	Subtotal	150.1	_		
2. Enhancing the	World Bank	30.0	AfDB	207.5			
Efficiency of Electricity	AFD	0.0	EIB	21.9	- 259.4	n.a.	
Services	OPEC Fund + SFD	0.0					
	Subtotal	30.0	Subtotal	229.4	_		
3. Increasing Access to	World Bank	32.0	AfDB	0.0		252.0	
Off-grid Electricity and	AFD	0.0	EIB	0.0	- 22.0		
Clean Cooking Solutions	OPEC Fund + SFD	0.0			- 32.0	269.0	
	Subtotal	32.0	Subtotal	0.0	_		
4. Technical Assistance,	World Bank	8.0	AfDB	5.0			
Institutional Capacity	AFD	2.2	EIB	2.2	-		
Building and	OPEC Fund ¹⁹	2.0			- 19.4	n.a.	
Implementation Support	Subtotal	12.2	Subtotal	7.2	_		
Total		287.6		386.7	674.3	495.5	

Table 3. Structure of Multi-Donor RUEAP and Constituent Development Partner Projects (US\$, millions)

 $^{^{\}mbox{\tiny 18}}$ Subject to approval from the respective institutions.

¹⁹ The exact allocation from OPEC Fund to Component 4 is yet to be confirmed.

C. Relevance to Higher Level Objectives

29. Increasing access to energy and enhancing the efficiency of electricity service delivery is aligned with the objectives and targets of the NST1 of the GoR. The NST1 is anchored on three pillars, namely The Economic Transformation Pillar, The Social Transformation Pillar, and The Transformational Governance Pillar. The NST1 recognizes availability and access to quality, affordable, and reliable energy as fundamental to Rwanda's economic growth and assigns specific targets to the continued development of the energy sector, for example,

- (a) The Economic Transformation Pillar, Priority Area 4, Objective No. 23 states that the Government will scale up electricity generation and improve electricity quality, affordability, and reliability;
- (b) The Economic Transformation Pillar, Priority Area 7, Objective No. 47 states that the Government aims to halve the number of households depending on firewood as a source of energy for cooking from 79.9 percent (2016/17) to 42 percent by 2024; and
- (c) The Social Transformation Pillar, Priority Area 5, Objective No. 69 states that access to electricity will be scaled up to all from 34.5 percent (estimation in 2017) to 100 percent in 2024 in collaboration with the private sector to reach off-grid areas and investments in grid expansion.

30. The proposed project is fully aligned with the World Bank Group's twin goals of ending extreme poverty and promoting shared prosperity as well as with the World Bank Group Country Partnership Framework (CPF)²⁰ for FY21–FY26 for Rwanda which was developed and finalized jointly with the GoR in the context of the COVID-19 pandemic and was discussed by the Board of Executive Directors on July 11, 2020. The proposed project is reflected in the CPF and directly contributes to the objective of 'Expanded Access to Infrastructure and the Digital Economy'. By improving households' livelihoods through access to modern energy, including in rural and peri-urban areas, which are home to a disproportionate share of Rwanda's poor and vulnerable, the supported intervention contributes to the World Bank's twin goals of eliminating extreme poverty and promoting shared prosperity. Objective 3 of the CPF reads 'Expanded Access to Infrastructure and the Digital Economy'. The CPF highlights the economic and developmental importance of accessible and reliable energy service delivery to the households, businesses, and public institutions in Rwanda. Affordable, reliable, and accessible energy service is crucial for the country's private sector development as the productivity and competitiveness of the private sector are hampered by high electricity prices and frequent power outages. The CPF explicitly outlines the proposed project to address these constraints through providing needed investments in energy access and quality improvement and collaborating with other development partners to achieve Rwanda's universal electrification target.

31. The proposed project's activities are aligned with the higher-level goals for Rwanda as set out in the Systematic Country Diagnostic (SCD, June 2019). Among the priorities and associated action areas identified in the World Bank's SCD for Rwanda, published in June 2019, are (a) addressing cross-cutting constraints on private sector development, and (b) engaging the private sector for infrastructure sustainably. The proposed project promotes private sector involvement in the off-grid electrification and clean cooking solutions segments. The project will also contribute to a more sustainable and balanced approach toward investment in Rwanda, by supporting sector expansion through the least-cost methods defined in the NEP, use of competitive procurement procedures, and leveraging private investment

²⁰ The World Bank Group. 2020. The Country Partnership Framework for The Republic of Rwanda for the Period FY21–26.



through strategic use of concessional financing. The project is in alignment with the SCD for the promotion of gender equality, including promotion of employment and entrepreneurship and access to finance for women.

The proposed project is aligned with two of the six reform priorities for high growth identified 32. in the joint report of the GoR and the World Bank: Future Drivers of Growth in Rwanda (2020).²¹ Reform Priority 4 under the report is to 'Enable the Emergence of Competitive Domestic Enterprises'. The report calls out the high cost of electricity as an important input to production and one of the cross-cutting constraints to export growth of Rwanda's products. Reliability of electricity supply is pointed out as a constraint to production, as almost a third (31.5 percent) of firms participating in the Integrated Business Enterprise Survey reported access to reliable electricity as a major challenge.²² The report also views increase in reliability of electricity as one of the factors that could increase the competitiveness of electricity for electricity trade with neighbouring countries. The project addresses Reform Priority 4 by pursuing electrification in the most cost-effective manner following the NEP, targeting productive users for electrification, promoting the participation of private sector firms in expanding electricity access and clean cooking, and financing strengthening of the distribution network. Reform Priority 6 of the report is to 'Develop Capable and Accountable Institutions of Governance'. The project tackles this priority by financing technical assistance (TA) and building capacity of the resources in REG and other relevant public agencies and institutions working on the energy sector.

33. The proposed project will contribute to maximizing financing for development through targeted support to the private sector. According to the ESSP, the private sector is taking the lead in investments in off-grid and clean cooking segments. Therefore, the project is set up to provide targeted, results-based subsidies to make off-grid and clean cooking solutions provided by the private sector affordable to end-users.

34. The project will finance some of the most important mitigation actions under Rwanda's revised nationally determined contribution (NDC), and it is expected to benefit from results-based payments through the purchase of emission reduction credits by the Carbon Initiative for Development (Ci-Dev), a World Bank-administered trust fund that makes payments based on avoided GHG emissions. The NDC defines Rwanda's contribution as emission reductions compared to a counterfactual, business-as-usual scenario. In the energy sector, the NDC's mitigation measures relevant to EAQIP include the promotion of grid-connected hydropower generation (supported by Component 2a of the EAQIP), off-grid solar electrification (Component 3a), as well as clean and efficient cook stoves (Component 3b). The Results-based Financing (RBF) from Ci-Dev, if accessible to the project, would complement the output- and outcome-based payments being made for off-grid and/or clean cooking solutions (delivering a robust set of resources available to the sector throughout the output-outcome-impact value chain). Ci-Dev funds would only be able to be negotiated after Board approval due to the need to operationalize the trust fund's forthcoming post-2020 Paris Agreement Framework and obtain donor approval of the final terms, and as such are expected to be processed as Additional Investment Project Financing later.

²¹ World Bank and Government of Rwanda. 2020. Future Drivers of Growth in Rwanda: Innovation, Integration, Agglomeration, and Competition. Washington, DC: World Bank. doi:10.1596/978-1-4648-1280-4. License: Creative Commons Attribution CC BY 3.0 IGO

²² National Institute of Statistics of Rwanda. 2017. Integrated Business Enterprise Survey in Rwanda 2017.

35. **The proposed project will further Rwanda's progresse towards achieving SDG7**. The SDG7 tracking report released in 2019 noted that between 2010 and 2017, Rwanda's pace of expanding electricity access was the fastest among the least-electrified countries. The current project will provide a substantial push to Rwanda's progress toward achieving SDG7. By financing grid densification and last mile connectivity, helping improve grid reliability, enhancing the affordability of international standard off-grid SHSs, and facilitating the transition from firewood-based cooking to modern cooking solutions, EAQIP will offer comprehensive support to the GoR's endeavors in expanding access to affordable, reliable, sustainable, and modern energy services.

36. The proposed project is well-timed to continue the support that the World Bank has provided over the last decade toward the GoR's energy sector agenda, as it will directly support the GoR's final push toward universal electricity access by 2024, and will help kick-start the move toward universal access to clean cooking by 2030. The grid electrification and off-grid access components of the project will help materialize the GoR's final push toward universal electrification, and the clean cooking component of the project will help create a market and targeted subsidy mechanisms to achieve universal access to cleaner cooking solutions by 2030 (with the interim target of halving the number of Rwandans using inefficient traditional cooking methods). The project scope and timing are also important in supporting the GoR in meeting its efficiency and performance targets in 2024. Further, through its support to distribution network enhancements, the project will prepare Rwanda in a timely manner for regional interconnection with the EAPP.

The project design is aligned with the GoR's COVID-19 ERP and the World Bank Groups's COVID-37. 19 Crisis Response Approach. The Government's COVID-19 ERP, approved during May 2020, recognizes infrastructure, including electricity, as important to supporting economic recovery.²³ The ERP, in consideration of the slowdown of electrification projects under implementation, focuses on continuing rollout of grid and off-grid access to boost productivity and promote immediate job creation, and targets connection of 350,000 households to grid electricity and 100,000 households using off-grid solutions during the fiscal year 2020/21. Following the grid connection road map while rolling out connections to households, administrative centers, health centers, educational facilities, and trade centers will add much needed support to the ability of public facilities to provide services to the more vulnerable populations in the rural areas, further supporting the social protection nets outlined in the ERP and the World Bank Group's Crisis Response Approach. The ERP also envisages that implementation of these projects will contribute to immediate job creation and improve the livelihood of citizens. By financing the expansion of electricity access, the project directly contributes to the GoR's ERP. Additionally, the World Bank Group's COVID-19 Crisis Response Approach, approved on June 2020, aims to preserve past economic gains and support resilient, inclusive and sustainable economic and social recovery through the following four pillars: 1) saving lives, 2) protecting poor and vulnerable people, 3) saving livelihoods, preserving jobs, and ensuring more sustainable business growth and job creation, and 4) strengthening policies, institutions and investments. By supporting the electrification of health centers, financing electrification of remote and low-income areas, creating employment opportunities through the project works and through supporting off-grid electricity and clean cooking companies, and providing capacity building to

²³ Economic Recovery Plan: "Infrastructure development is a critical productive sector that catalyzes broader economic growth by boosting productivity and has the potential to contribute significantly to creation of immediate jobs during the recovery phase".



concerned government agencies, the project supports all pillars of the World Bank's COVID-19 Crisis Response.



II. PROJECT DESCRIPTION

A. Project Development Objective

38. The Project Development Objective (PDO) is to increase access to modern energy for households, enterprises, and public institutions and enhance the efficiency of electricity services in Rwanda.

39. **PDO Level Indicators**

- (a) People provided with new or improved electricity service (CRI²⁴; Number²⁵);
- (b) Enterprises provided with new or improved electricity service (Number);
- (c) Public institutions (clinics, schools, and administrative centers) provided with new or improved electricity service (Number);
- (d) People provided with new or improved access to clean cooking solutions (Number);
- (e) Reduced voltage fluctuations in Rwanda's backbone transmission lines (Percentage);
- (f) Generation capacity of energy constructed or rehabilitated (CRI; MW);
- (g) Reduction of net CO₂ emissions through off-grid electrification and clean cooking solutions (tCO₂eq).²⁶

B. Project Components

40. The project consists of four components reflecting distinct groups of project activities, as summarized in Table 4.

Area/Investment Need	Details	Estimate (US\$)				
1. Increasing Access to Grid E	1. Increasing Access to Grid Electricity					
Grid access	Grid connections for households, commercial, and industrial	90,000,000				
	consumers, and public institutions. World Bank Group/AFD districts: Gicumbi, Musanze, Rulindo, Burera, Ngororero, Nyabihu, Rubavu, Karongi, Rusizi, Rutsiro, and Nyamasheke.	85,432,639				
	OPEC Fund and SFD districts: Gakenke, Muhanga, and Kamonyi.	38,000,000				
	Subtotal	213,432,639				
2. Enhancing the Efficiency of Electricity Service						
Rehabilitation of the Ntaruka HPP	Ensure availability of low-cost renewable energy generation in Rwanda, through the rehabilitation of the Ntaruka HPP.	11,000,000				

Table 4. Proposed Project Components and Funds Allocation Under the Project

²⁴ CRI - Corporate Results Indicator.

²⁵ Assuming household size of 4.3 people per household as per EICV5.

 $^{^{26}}$ The emission factors used to arrive at CO₂ emissions reduction are indicated in Table 3.1 in Annex 3: Economic and Financial Analysis.



Area/Investment Need	Details	Estimate (US\$)
Installation of automatic voltage regulator on 220kV system networks, Installation of power system stabilizers and governing systems on main generators	To reduce voltage rises due to low loading on 220 kV; improve network responses to fluctuations and load loss; prepare regional interconnection for the Eastern Africa Power Pool (EAPP).	8,500,000
Building of GIS	Building of Rwanda's power system GIS.	6,000,000
Installation of smart meters	Completing installation of smart metering for all distribution transformers and medium/large customers. Identify and curb sources of commercial/technical losses and phase imbalances.	4,500,000
	Subtotal:	30,000,000
3. Increasing Access to Off-grid Electricity and Clean Cooking Solutions		
RBF for off-grid solar and cooking solutions.	RBF for (a) off-grid solar connections to reach poorer and more remote areas and (b) clean cooking solutions, with business models and financing instruments yet to be determined.	25,000,000
Recepient-executed Trust Fund (RETF) grant from the CCF	Matching grant for RBF for clean cooking	7,000,000
	Subtotal:	32,000,000
4. Technical Assistance, Institutional Capacity Building and Implementation Support		
ТА	Address sector performance improvements; forward-looking options for sector development including clean cooking.	1,000,000
Capacity building	Planning, skills development, audit and compliance (and others to be identified).	2,000,000
Implementation Support	Support EDCL Program Coordination Unit (PCU) functions (staff); Support the SWG secretariat staff.	4,000,000 + EUR 2,000,000
RETF grant from the CCF	Market development and TA for the clean cooking sector	3,000,000
	Subtotal:	US\$12,190,100
	Total:	US\$287,622,739

Note: HPP = Hydropower Project

Component 1: Increasing Access to Grid Electricity (IDA: US\$90 million equivalent; AFD: EUR 78 million; OPEC Fund/SFD: US\$38 million)

41. **Rwanda's ambition, outlined in the NST1, is to achieve a grid access rate of 52 percent by 2024.** This will require a financing of US\$590 million to connect all households and productive users between 2019/20 and 2023/24. It is against this background that REG has targeted an annual connection rate of 200,000 between 2020 and 2024 (including households and enterprises). It is estimated that the average unit connection cost, including backbone infrastructure, is around US\$603–US\$758, projecting an annual financing need ranging between US\$120 million and US\$150 million. This component will provide continued support to Rwanda's electricity access program, the EARP. The component provides financing toward grid connections of new consumers, including financing of grid extensions and consumer connections.

42. Electrification investments under the NST1 are being guided by an advanced geospatial NEP prepared in 2019, which lays out the areas to be electrified by the grid by 2024 and areas where off-grid solutions will be required before the grid arrives. During 2017 –2018, the GoR developed the NEP, which defines a combination of extension and densification of the national grid and deployment of off-grid solutions throughout the country to expand electricity access while optimizing the costs of access expansion (Figure 6). The NEP considers the country's unique geography, high population density, and existing grid coverage, and uses geospatial electrification planning algorithms to find cost-efficient ways of expanding electricity access. Considering the 2024 target of 52 percent on-grid and 48 percent off-grid access as an input, the NEP defines a combination of extension of the national grid and deployment of off-grid solutions throughout the country that represents the least-cost option to supply forecasted demand for 2018–2024.

43. The joint IDA/AFD allocation of US\$90 million and EUR 78 million respectively for this component is expected to connect about 230,000 households and 17,300 enterprises in selected districts of Rwanda. This comprises of connecting about 125,000 households and 5800 enterprises through World Bank financing and connecting about 105,000 households and 11,500 enterprises through AFD financing. Further, the OPEC Fund and the SFD are providing US\$38 million in parallel cofinancing to this component, for connection of about 63,000 households and 3,000 enterprises in western Rwanda.

44. **The tentative allocation of districts for the joint IDA/AFD allocation is shown in figure 7.** The allocated districts include Gicumbi, Musanze, Rulindo, Burera, Ngororero, Nyabihu, Rubavu, Karongi, Rusizi, Rutsiro, and Nyamasheke (see Figure 7). The allocation may be modified during implementation to reflect adjustments to the allocations in the multi-donor financing program and/or revisions to the NEP.

45. With the availability of funds, EDCL has demonstrated implementation capacity to achieve the targeted annual number of connections. Component 1 of the project will be implemented by EDCL as part of the EARP. Under the EARP, EDCL has progressively increased implementation capacity for grid rollout and last mile connections over the past decade. The EARP has increased the grid access rate from about six percent in 2009 to 39 percent in 2020. Staring from connecting 61,047 households and 300 productive users to the grid during FY2014/15²⁷, the EARP had scaled up to connecting 146,337 households and 471 productive users during FY2018/19.²⁸ Pending available funding to deliver the NST1 electrification targets, the EARP has the capacity to deliver the estimated 200,000 grid connections annually required to deliver the NST1 targets.

²⁷ Backward looking Joint Sector Review Report, November 2015.

²⁸ Backward looking Joint Sector Review Report, October 2019.
Figure 6. Rwanda NEP Output



Source: REG.

46. The implementation approach for Component 1 will follow the guidelines in the NEP, and the procurement and implementation methods that have delivered success in the past decades. In combination with the implementation approach laid out in the NEP, the EARP will use a combination of engineering, procurement, and construction (EPC) contractors and local contractors to speed up the connection rate. Procurement packages will include several internationally procured EPC packages to implement backbone infrastructure. Goods packages for line construction materials for installation of connections will also be procured internationally, while labor contracts will be locally procured to implement the last mile connections. EDCL plans to adopt good labor practice, such as setting a female workforce quota for procurement packages and project staff to increase female participation in the project.





Source: REG.

47. A connection policy, introduced in 2017, which allows for household connections without an advance payment, will contribute to increase in the annual grid connection rates. The grid electricity connection policy was revised in 2017 to remove the upfront payment of connection fees, which was a barrier to expanding access. Consumers in Rwanda can now get connected to grid electricity without payment of upfront connection fees, which is deducted from payments for purchase of units of electricity. The EARP has been able to accelerate the electrification rate after revision of the connection policy.

48. **Climate change mitigation.** Since the grid electricity in Rwanda is dominated by hydropower (48 percent of installed generation capacity in 2019), providing grid electricity to households in Rwanda is expected to mitigate emissions from the lighting alternatives that households will otherwise use. Over a lifetime of 20 years, the grid electrification component is expected to mitigate 1.7 million tons of CO₂ equivalent against the alternative sources of lighting.

49. **Climate change adaptation.** From the perspective of climate and disaster risks, Rwanda's exposure rating is high for extreme temperature, extreme precipitation and flooding, and drought. These risk considerations are toward climate adaptation factors in the design of the physical infrastructure that will be built for expanding electricity access. The electric wires, poles, and other infrastructure to be built for grid densification will use materials resilient to high temperatures and the construction will

accommodate for the impact of potential flooding. Thus, the electricity access investments under the project will improve the resilience of Rwanda's distribution network toward climate risks.

Component 2: Enhancing the Efficiency of Electricity Service (US\$30 million equivalent)

Subcomponent 2a: Rehabilitation of Ntaruka Hydro Station (HPP) (US\$11 million equivalent)

50. This subcomponent will improve, in a low-cost manner, the efficiency of the power system through the rehabilitation of low-cost renewable energy generation capacity, which is an important part of the NST1 and ESSP. The first priority of the ESSP is 'Support continued economic development and growth in household electricity access through least-cost expansion of electricity generation capacity', with one of the targets under this priority being security of supply.²⁹

51. Specifically, the subcomponent will finance the rehabilitation of the Ntaruka HPP to restore the plant capacity to its installed capacity and upgrade the control systems and other electromechanical equipment. The Ntaruka HPP, located in the Burera District of Northern Province, at the border with Uganda, has been in operation since 1959. The plant has an installed capacity of 11.25 MW but is currently only capable of operating at a capacity of 9 MW and generates on average 22 GWh annually. Based on its age and current performance, it has been found necessary to rehabilitate the power plant to restore the plant capacity to its installed capacity and upgrade the control systems and other electromechanical equipment.

52. After rehabilitation, the Ntaruka HPP is expected to be restored to its original installed capacity of **11.25** MW and generate **27.65** GWh in average hydrological conditions. Rehabilitation of the Ntaruka HPP provides the utility the opportunity to enhance the stability and security of renewable energy supply while using a source of energy with a very low variable cost.

Subcomponent 2b: Investments to Improve Stability and Reliability of the Power System (US\$8.5 million equivalent)

53. Although investments in new infrastructure and upgrade of existing infrastructure have enhanced system reliability and efficiency, there is still considerable scope for improvement. Projects such as the World Bank-funded RESSP have contributed to reducing the system average interruption duration index (SAIDI) from 44 hours in 2017 to 26 hours in 2018–2019, and the system average interruption frequency index (SAIFI) from 265 in 2017 to 49 in 2018–2019. While these improvements are substantial, the reliability of electricity supply is not yet at levels that underpin a robust industrial growth. Similarly, at 19 percent, the transmission and distribution losses of the power sector in Rwanda still illustrate poor operational efficiency and are also a direct source of lost revenues through unbilled electricity. Poor quality of electricity services hinders economic growth as well as undermines consumer confidence in the utility, making application of cost-reflective tariff rates difficult and, in effect, harming financial sustainability of the power sector. Improving the quality and reliability of electricity services and reducing transmission and distribution losses are also imperative to help reap the benefits of expanding electricity connections.

54. **Rwanda is currently operating its high-voltage transmission network as a standalone in-country network and faces challenges due to inadequate reactive capability.** Owing to the light loads on the

²⁹ ESSP 2018/19–2023/24: "The HLTOs presented in this ESSP represent the key indicators to be measured. These cover vital sector issues such as generation capacity, access, efficiency and security of supply".

transmission lines, especially during off-peak conditions, there is inadequate reactive capability to control high voltages. Additionally, the power system has limited reactive capability to maintain adequate voltages during peak conditions and is hence exposed to voltage collapses due to single and multiple contingencies. The power system presently has no static or dynamic reactive capability to control high voltages during off-peak conditions and low voltages during single and multiple contingencies.

55. Going forward, Rwanda is planning operation of cross-border transmission lines, to prepare for energy trading and interconnected operations. It is planned to commission the ongoing 220 kV transmission lines within the region, starting during 2020 with the Uganda-Rwanda interconnector, connecting the Mirama substation in Uganda to the Shango substation in Rwanda. Adding this 140 km, 220 kV line to the Rwanda network will add 24 MVAR of reactive capacity which will further exacerbate high voltages during off-peak conditions. A study conducted on electricity interconnectivity in the EAPP countries identified gaps in each country that would pose a risk to destabilization of internal country grids and provided recommendations for the different countries to help them prepare the countries for interconnection. The main gaps identified for Rwanda included the risk of voltage fluctuations due to low loading on high voltage networks and transient stability.

56. It is important, especially in the context of integration to other networks, that system responses to demand fluctuations are well managed. Beyond the risk of routine voltage fluctuations, the expansion of the transmission network of Rwanda and the interconnection with the EAPP are expected to add to signal oscillations due to more exposure to demand and supply fluctuations. The network will have to be strengthened to be able to maintain stability under these fluctuations.

57. The investments through Subcomponent 2b of the project have been designed to address the two most critical risks to interconnectivity identified, namely voltage fluctuations and transient stability. The subcomponent will fund the following:

(a) Installation of static voltage compensators at key substations to reduce overvoltage created by low loading on the transmission lines. The static voltage compensators will regulate steady-state voltage to maintain a flat voltage profile within ±5 percent of nominal 220 kV voltage; control high voltage within limits during night time and weekend off-peak periods; dampen voltage oscillations during high transfer of power and during contingencies; reduce power system harmonics due to rapidly changing industrial loads; and inject capacitive capacity rapidly during system contingencies and increase power transfer capability by minimizing real-time losses. The subcomponent is designed to cover two substations (most likely, the Shango 220 kV substation and Kigoma 220 kV substation).

(b) Installation of power system stabilizers and governing systems at Nyabarongo 28 MW hydropower station and Mukungwa 12MW hydropower station. The power system stabilizers will be installed in the excitation systems of the synchronous generators and will improve the small-signal power system stability by damping out low-frequency oscillations in the power system. These investments are expected to mitigate frequency and voltage fluctuations in the transmission system. The subcomponent is designed to cover power system stabilizers and governing systems at two power stations (most likely, the Nyabarongo 28 MW hydropower station and Mukungwa 12MW hydropower station).

Subcomponent 2c: Improvements in the Operational Performance of EUCL (US\$10.5 million equivalent)

58. This subcomponent of EAQIP proposes continuation of the agenda of continued improvement of operational performance that previous and ongoing projects (including the RESSP) have supported.



The project proposes to continue with the RPP started under the RESSP and extend the ongoing smart meter program to the distribution network as detailed below.

- (a) EDCL³⁰ will use this subcomponent to complete installation of smart meters for EUCL's large consumers (second phase of RPP) and subset of medium-size consumers to connect to smart meters (the subset will be determined during implementation). The total expected number of smart meters to be installed is 4,000. This is a continuation of EDCL's ongoing work-program of installing smart meters and will increase the range of customers whose consumption is systematically monitored and whose meters can be monitored in real time. This program has helped EUCL to immediately detect bypass or other attempts to tamper metering premises and enable remote reading for billing and other purposes.
- (b) EDCL will also start a program of installation of smart meters on all network distribution transformers. This will place the utility in a position to detect in real time where losses are taking place, which will in turn, assist the utility with proper energy accounting and quantification of losses. The utility will also be in a better position to make technical decisions to deal with highloss areas or transformers with high-load imbalances.
- (c) To improve utility cash flow, and better monitor consumer behavior, EDCL will also conduct installation of high current, smart prepayment meters, both for MV and LV consumers, to gradually shift identified postpaid customers to prepayment.
- (d) Because EDCL and EUCL have embarked on a program that brought in a very large number of meters, there is a need to develop the local capacity of the utility to continuously check the performance of the meters installed on the network, in addition to checking the quality of meters supplied. The subcomponent will contribute to address this need by financing purchase and installation of test benches for both prepaid and postpaid meters.
- (e) Finally, to facilitate interfacing of the GIS database with the power system simulation tools, EDCL will conduct installation of a comprehensive electricity transmission and distribution network GIS covering all of REG's infrastructure.

59. **Climate change mitigation.** By restoring the capacity of the Ntaruka HPP from the current operating capacity of 9 MW to its design capacity of 11.25 MW, this Subcomponent 2a will increase the share of hydropower in Rwanda's energy mix, resulting in associated GHG mitigation. By supporting the integration of Rwanda's grid in the EAPP, the investments under Subcomponent 2b will facilitate the integration of variable renewable energy. The installation of smart meters and the GIS infrastructure financed under Subcomponent 2c will enable EUCL for the first time to segregate technical and commercial losses in the medium and high-voltage network and geolocate equipment in need of maintenance, repair, or replacement, thus enabling the reduction of technical losses.

60. **Climate change adaptation**. Rwanda's exposure rating is high for extreme temperature, extreme precipitation and flooding, and drought. The GIS system will incorporate climate risk information associated with transmission and distribution network. By supporting the integration of Rwanda's grid in

³⁰ EDCL's implementation of Subcomponent 2c will draw on EUCL's technical expertise, as needed. This will be done by seconding relevant EUCL staff to EDCL for the duration of the assignment.



the EAPP, the investments in this component will help mitigate the supply-security risks linked to droughts.

Component 3: Increasing Access to Off-Grid Electricity and Clean Cooking Solutions (IDA: US\$25 million equivalent; Clean Cooking Fund Grant: US\$7 million)

Subcomponent 3a: Increasing Off-Grid Electricity Access (US\$15 million equivalent IDA)

61. **The NEP foresees a major role for off-grid electrification—reaching 48 percent of the population by 2024**—as transitory solution before the grid arrives. The grid is eventually expected to cover almost the entire population of Rwanda, however, expansion of the grid in the medium term is constrained by high capital cost due to the country's hilly terrain. Off-grid SHS, with their lifetime of 5–8 years, are meant to ensure that households are not deprived from electricity service during the transition period toward full-grid electrification. For the same reason, large-scale deployment of mini-grids is not considered to be a viable medium- to long-term electrification option, given their longer investment horizon (as compared to SHSs) and higher per unit cost of electricity (as compared to the eventual provision of grid electricity).

62. The current off-grid access rate of 15 percent falls far short of the Government's target for 48 percent off-grid access by 2024, despite a favorable policy and regulatory framework. The Government has identified the villages that by 2024 are meant to be served with off-grid electrification solutions. About two dozen private companies are active in Rwanda and the GoR has made concessional debt financing available under the Rwanda Renewable Energy Fund Project (P160699). However, while the pace of grid electrification has increased, off-grid access expansion through SHS has slowed down despite the provision of debt financing, tax exemptions, and the adoption of quality standards for solar products. The off-grid market slowed down from about 100,000 SHSs sold in 2016/17 to 86,000 in FY2018, and 83,000 in FY2019.

63. Lack of affordability of Tier 1+ off-grid solar systems has emerged as the key challenge impeding the scale and speed of distribution of off-grid technologies in the country. Of all the solar lighting products sold in 2018, 8 percent were sold to Ubudehe 1, 41 percent to Ubudehe 2, and 51 percent to Ubudehe 3. As the off-grid market in the country got saturated for higher-income households, off-grid solar companies (OSCs) started to expand to customers with lower or irregular income, which led to an increase in their default rate (between 5 percent and 25 percent). This challenge is not unique to Rwanda but has been experienced by OSCs across Sub-Saharan Africa as business models are still evolving to service lower-income households through either cash-based or installment payments. Increased competition and innovative business models are required to serve households with affordability constraints and/or irregular income.

64. **To address the affordability constraint, the GoR has adopted a framework for providing partial grants through the RBF to make SHSs more affordable to lower-income consumers.** To accelerate the off-grid electrification market again to the 250,000 or so new connections per year needed to achieve the NST1 target, the Government has decided to provide partial grants to Ubudehe 1–3 households to increase the affordability of off-grid solar products. The RBF concept was prepared by MININFRA, REG/EDCL, and development partners, and approved by the SWG in November 2019.

65. The subcomponent will build on the experience of the very successful US\$2 million pro-poor pilot supported by Energising Development (EnDev) and financed by Power Africa and the UK Department for International Development. The EnDev pilot focuses on five districts in the south of Rwanda, commenced in November 2019, and will run until March 2021, with five off-grid SHS companies as current participants and two more expected to join the scheme. Participating companies receive an incentive for every SHS sold to an eligible household without electricity access in off-grid areas in the districts of Nyamagabe, Nyanza, Gisagara, Huye, and Ruhango. The EnDev pilot is jointly implemented by EnDev Rwanda, EDCL, and Urwego Bank, who all play a role in company selection, verification, and disbursement processes. EnDev Rwanda is building institutional capacity within EDCL to take over the program in full. The pilot has been very successful in reaching lower-income customers, including the poorest in Ubudehe 1, and has served as proof of concept for the national RBF mechanism.

66. In line with the approved RBF mechanism, Subcomponent 3a of EAQIP will provide US\$15 million of IDA financing to make access to off-grid electricity affordable at all income levels and connect at least 150,000 households. These grants will be provided through a newly created RBF window of the REF administered by the BRD. EAQIP will provide US\$15 million of IDA financing to the RBF window, bringing the total IDA financing resources allocated by the Government to this window to US\$30 million, responding to the large expected financing needs of the sector over the period through 2024.

67. **The RBF will allow sales to household and enterprise consumers.** However, due to the cap on the maximum subsidy amount per customer, it is expected that most beneficiaries will be households and microenterprises.

68. In line with best practices, the results-based grants will be provided to OSCs with the expectation that competitive pressure will induce these companies to pass on the grants to endconsumers and make their products more affordable. The pilot RBF currently delivers the total subsidy to participating companies as soon as installation has been verified. While this delivery mechanism has encouraged quick connections, the disbursement arrangement makes it difficult for the program to ensure that (a) customers pay their contribution and (b) that after-sales care is provided for the full life of the warranty. To address these concerns, the new RBF mechanism under EAQIP will disburse the subsidy to the companies over time, in line with the customer's contribution. This will ensure that companies focus on helping beneficiaries to complete their contribution by offering excellent customer service and competitive pricing.

69. The RBF mechanism will be designed to ensure that the grant is passed on from the OSCs to consumers. Companies will be able to easily calculate their expected subsidy payments and integrate it into the payment scheme they offer to customers. To ensure that the grants are passed on to target consumers, the BRD will track the cost to the end-user in two ways. The first is through the application and review process. All applicants will need to share their current pricing as well as their planned pricing scheme under the RBF. The second is through the monitoring of the program. If a company is not reducing pricing to reflect the subsidy level, the company could be removed from the program. Grant levels and price coverage estimates will be regularly reviewed to reflect the market changes to ensure sustainability of the program. In case of return or repossession of the system, grant support will not be provided or revoked.

70. **To avoid market distortions, beneficiaries will be required to contribute to the cost of solar kits.** This will ensure ownership of the system and adequate customer rights and duties. Experience in Sub-Saharan African countries also showcases that access to the first off-grid technology is a prerequisite for experiencing and understanding the benefits to access to electricity, increasing willingness to pay (WTP) (realized for example, through pooling of resources among the community) and for climbing the energy ladder over time. Public support to Ubudehe households is also well established and acknowledged in the



country, and access to off-grid solutions will leverage on existing communication channels to avoid any perception of discrimination.

71. **OSCs' sales will be verified before RBF payments are made.** Verification requirements would include, for instance, proof of installment, typically in the form of the contract service entered with the beneficiary, including main attributes such as name, address, and so on, as detailed in the Operations Manual. After-sale services verification will likely be conducted based on the warranty period associated to the system (specified as two years in the Ministerial Guidelines on Minimum Standards Requirement for Solar Home Systems). Verification will be done by EDCL, supported by an external service provider as needed, through a statistically relevant sample, as done under the EnDev pilot. Together with ensuring adequate tracking and verification of the RBF mechanism, EDCL's verification will allow the GoR to keep track of the overall progress and potential implementation issues within the broader GoR-funded RBF scheme, as well as ensure timely verification given the capacity of the agency. Should a company fail to provide the information requested or misreport this information, an escalation process will be initiated, which may ultimately result in expulsion from the program.

72. In line with the EnDev pilot, the results-based grants will likely be differentiated by Ubudehe category to reflect customer affordability levels. Verification of the beneficiaries' Ubudehe level will leverage on the eligibility tool—Off-grid Monitoring Information System—developed by EnDev for MININFRA and REG (for the EnDev RBF program), as well as the Local Administrative Entities Development Agency (LODA) Monitoring and Evaluation Information System (MEIS), which provides information on national IDs, households, and Ubudehe categories. Linking the Off-grid Monitoring Information System, the LODA MEIS, and the eligibility tool will ensure that the demographic data required will be as up to date as possible, sales across the sector are being tracked accurately, and monitoring is streamlined.

73. **The appraisal of the EAQIP project covered a total financing amount of US\$15 million for the RBF window.** The REF was designed to be the GoR's flagship fund to accelerate off-grid electrification, and has requested development partners to complement the World Bank's financing to meet the full expected financing needs of the RBF window, which is estimated at around US\$90 million – US\$150 million during 2020–2024 to reach 1,500,000 households.

74. During the course of implementation, the financing is expected to be further topped up by other development partners to close the remaining financing gap for the achievement of the 48 percent-off-grid access target. Several partners have indicated interest in providing parallel co-financing to this component, but the financing is expected to come at a later stage, as the resources provided by IDA are depleted.

75. If during the course of implementation it becomes clear that demand for credit-line financing under the existing credit line windows of the REF outpaces demand for the new RBF mechanism, consideration could be given to restructuring Component 3a to reallocate the funds from Component 3a to those windows. Such a restructuring would be subject to compliance with all applicable policies, and to the standard approval processes.

76. **Component 3a will also cover the incremental operating costs of BRD** for the management of the RBF-OSC Facility.

77. **Climate change mitigation.** By supporting solar power based off-grid electrification, this component will substantially reduce GHG emissions compared to the lighting alternatives. This



component also directly contributes to Rwanda's NDC mitigation measure that targets off-grid and rooftop solar electrification of around 1,500,000 households in line with the ESSP.³¹

Subcomponent 3b: Increasing Access to Clean Cooking Solution (IDA Credit: US\$10 million equivalent; Clean Cooking Fund Grant: US\$7 million)

78. MININFRA recently approved an ambitious new Biomass Energy Strategy (2019–2030) and an amendment to its NDC, with targets of reducing the percentage of households that use firewood for cooking from the baseline value of 79.9 percent in 2017 to 42 percent by 2024t and phasing out the use of charcoal in urban areas. The clean cooking agenda has been recently moved to MININFRA and REG/EDCL have the mandate to implement it. The Rwanda Standards Board (RSB) is tasked with certifications and setting standards for cooking products and a testing lab is currently under development. In October 2019, MININFRA published the Biomass Energy Strategy: A Sustainable Path to Clean Cooking 2019–2030. In May 2020, the Government updated its NDCs under the Paris Agreements which includes promoting the use of efficient cookstoves as a mitigation measure because cooking accounts for 14 percent of the GHG emissions from the energy sector.

79. Implementation of the Biomass Energy Strategy will require substantial grant resources made available to the sector to address the affordability and awareness gaps as well as the unproven nature of many new technological solutions in Rwanda. The Strategy estimates investment requirements of US\$240–US590 million (2018–2024) and US\$200–US\$365 million (2024–2030) to meet the targets. Besides the proposed EAQIP, there are several development partners with plans to support various aspects of the strategy such as *Gesellschaft für Internationale Zusammenarbeit* (GIZ)/EnDev, *Stichting Nederlandse Vrijwilligers* (SNV), European Union (EU), Enabel, the Tony Blair Institute, Loughbough University, Clean Cooking Alliance, Global LPG Partnership, and AfDB. An EU-funded program to be implemented by GIZ/EnDev aims to increase the use of improved stoves through strengthening the value chains from production to usage. Development partners can also play a role in capacity building, facilitating an exchange of knowledge, support in developing standards, quality assurance, and testing procedures that suit the local conditions.

80. **Subcomponent 3b will set up a clean cooking RBF window to subsidize purchases of clean and efficient cooking solutions by eligible households.** The design and implementation structure of the clean cooking RBF window will be aligned with Subcomponent 3a. The key principles and features of the cooking RBF window are outlined in the following paragraphs. More detailed information is provided in annex 5.

81. The clean cooking RBF window will initially support Tier 2+ solutions, with the objective to gradually increase the minimum performance level requirements as affordable Tier 3+ solutions become widely available. The cooking RBF window will not only use both International Organization for Standardization (ISO) Voluntary Performance Targets (VPTs) (ISO/TR 19867-3:2018) and MTF for cooking as the key reference documents for determining eligible cooking technologies but will also be flexible to incorporate Rwanda's specific cooking culture and practice. Based on the MTF survey, about 70 percent of households rely on three-stone (equivalent to Tier 0) or traditional stoves (equivalent to Tier 1) for cooking. To enable a practical transition toward improved and modern cooking solutions, the cooking RBF window will support technologies that meet at least Tier 2 performance level during the initial phase while providing TA to local producers to improve their products performance level and will lift the minimum

³¹ Update of Rwanda's Nationally Determined Contributions. May 5, 2020.

https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Rwanda%20First/Rwanda_Updated_NDC_May_2020.pdf.



requirement to Tier 3 performance level once sufficiently affordable Tier 3+ cooking technologies and products are available to meet the project targets.

82. **The RBF window will support both urban and rural households.** In urban areas, the focus of the clean cooking RBF will be to reduce and eventually phase out charcoal as a cooking fuel and replace it with Tier 3+ clean cooking solutions. In rural areas, the focus will be on reducing the reliance on firewood as a cooking fuel, by gradually introducing more efficient (Tier 2+) and clean cooking (Tier 3+) solutions. The two focus areas will contribute to the objectives of (a) phasing out charcoal use in urban areas and (b) reducing the reliance on firewood.

83. The performance of eligible cooking technologies will need to be demonstrated through laboratory testing and/or field-based data. The GoR will make public announcement on a rolling basis to invite stoves manufacturers and cookstove makers to submit their applications and products for eligibility review. The RSB is currently setting up a Stove Testing Laboratory which will be responsible for conducting stove testing and evaluation and issue recommendation on whether the cooking technologies are qualified under the cooking RBF window. TA will be provided to the RSB to build its cookstove testing and evaluation capacity and improve the national cookstove standards. Safety and durability will be evaluated as part of the eligibility criteria.

84. **RBF incentive amounts will be linked to the verified output, outcome, and impact-level results;** differentiated by cooking technology performance levels and consumer income categories (Ubudehe categories 1, 2 and 3); and reviewed and adjusted periodically. The RBF incentive levels and triggers will be reviewed periodically and adjusted in response to the market conditions. In doing so, the project will take an adaptive and flexible approach to periodically review market conditions, actively seek feedback from key stakeholders, and adjust accordingly. The project will continue to coordinate and collaborate with key stakeholders such as EU, GIZ/EnDev, SNV, Enabel, the Tony Blair Institute, Loughborough University, Clean Cooking Alliance, Global LPG Partnership, and AfDB as well as the relevant Global Practices (GPs) of the World Bank to align the efforts of ongoing and potential projects in the cooking sector.

85. The RBF mechanism aims to develop a sustainable market for affordable clean cooking solutions. Companies will be required to specify their pricing and marketing strategies in the application and their plans of utilizing the RBF subsidies, e.g. directly passing to the consumers to fill the affordability gaps or investing in product R&D, efficiency improvement and cost reduction, or market outreach to offer long-term affordable clean cooking solutions, and the use of the subsidies will be part of the evaluation criteria. The companies' strategies will be monitored through the program implementation. If a company is found to deviate from the intended usage of the RBF subsidies, the company could be removed from the program. Grant levels and price coverage estimates will be regularly reviewed to reflect the market changes to ensure sustainability of the program. In case of return or repossession of the product, grant support will not be provided or revoked.

Figure 8. Illustration of RBF Incentive Payments



86. **Subcomponent 3b will be cofinanced by the CCF of the World Bank's ESMAP.** The CCF is set up to accelerate progress toward universal access to clean cooking by 2030. The fund will incentivize public and private investments in the clean cooking sector to catalyze technology and business innovations and linking incentives with verified results, also known as RBF. The fund provides grant resources to cofinance with the World Bank Group or other Multilateral Development Bank (MDB) investment projects and requires at least 1:1 leverage. The fund is also expected to have at least 1:1 leverage for private sector investments. The fund grant resources will be used both for Subcomponent 3b and Component 4 to support clean cooking TA activities.

87. Component 3b will also cover the incremental operating costs of BRD for the management of the RBF-CCS Facility.

88. **Climate change mitigation.** By supporting clean and efficient cookstoves, this component will help reduce GHG emissions associated with the contemporary cooking alternatives. This component also directly contributes to Rwanda's NDC mitigation measure on dissemination of modern efficient cookstoves to 80 percent of the rural population and 50 percent of the urban population by 2030.³²

89. **Climate change adaptation.** From the perspective of climate and disaster risks, Rwanda's exposure rating is high for extreme temperature, extreme precipitation and flooding, and drought. About 80 percent of the households in Rwanda currently use biomass for cooking, which they collect by foraging, leaving them vulnerable to the risks of floods and droughts. By supporting a shift from biomass to other cooking alternatives, including LPG and electricity, this component will help households adapt to the impacts of climate change on firewood-based cooking.

³² Update of Rwanda's Nationally Determined Contributions. May 5, 2020.

https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Rwanda%20First/Rwanda%20Updated%20NDC%20May%20_2 020_Final.pdf



Component 4: Technical Assistance, Institutional Capacity Building and Implementation Support (US\$5 million equivalent IDA + US\$3 million CCF + EUR 2 million AFD + US\$2 million OPEC Fund³³)

- 90. This component will support:
- (a) Technical Assistance (supported by IDA), to address sector performance improvements and develop forward-looking options for sector development. The TA will include sector studies aimed at improving the efficiency of sector performance, impact evaluation studies to help the sector make appropriate decisions during and after project/program implementation, and policy and advisory notes required to inform sector decisions. The component will support an impact evaluation to assess the economic and non-economic benefits of energy access. The TA will also cover gender-specific activities, such as monitoring gender inclusion in the modern energy access components; identifying and analyzing further gender gaps in the sector to provide tailored and targeted measures to close the gaps; providing gender mainstreaming trainings to the project staff; and conducting awareness-raising, behavioral change, and entrepreneurship events to attract female participation in the program.
- (b) **Capacity building (IDA),** to ensure the sector continues to develop appropriate capacity for supervision of implementation of energy sector programs and efficient utilization of energy sector investments. Areas of possible capacity-building areas include energy sector planning, technical skills development, audit, compliance, and gender.
- (c) Implementation support (IDA, AFD and OPEC Fund). EAQIP will support extraordinary capacity needs in EDCL and staff in the Program Coordination Unit (PCU) and sector consultants to continue to support sector management and coordination. This subcomponent will directly support payment of supervision consultants to help EDCL in project oversight; key functions within the PCU and EDCL departments that are hired to support the implementation of the project; and the SWG secretariat to support project implementation and sector management and coordination.
- (d) RETF grant from the CCF for market development and TA for the clean cooking sector (CCF). The proposed US\$3 million grant from the CCF will support (a) awareness raising and behavior change campaign, (b) market facilitation and policy/regulation review and improvement, (c) stove testing and product development, (d) monitoring and verification for the RBF operation, and (e) innovation. In particular, innovation grants will be available to encourage innovative technological, business, and financing approaches with a focus on meeting the poor households' cooking need and encouraging female entrepreneurs in the cooking sector. Annex 5 includes more detailed information.
- (e) Incremental operating costs of EDCL (IDA and CCF) for providing verification and technical assistance for cooking sector development and management of the RBF-OSC Facility and the RBF-CCS Facility respectively.

³³ The exact allocation from the OPEC Fund to Component 4 is yet to be confirmed.



C. Project Beneficiaries

91. The direct project beneficiaries will include households, enterprises, and public institutions in **Rwanda.** Households, enterprises, and public institutions that will gain access to electricity or clean cooking solutions will benefit from the use of modern energy in economic and non-economic ways. For the purpose of the Results Framework, the project includes educational facilities, health facilities, and administrative facilities in the category of "public institutions". Specific focus will be on female beneficiaries to address existing gaps in energy and clean cooking access, such as affordability, awareness, and employment opportunities (see section IV.E for details). Non-economic benefits for households will include reduced exposure to harmful emissions. Besides new access, households, enterprises, and public institutions who are already connected to the grid will benefit from more reliable electricity service, which will improve productivity of their electricity use through fewer disruptions and less damage to equipment and appliances. Beneficiaries of access to cleaner cooking solutions are expected to attain better economic outcomes from use of time saved through spending less time collecting/using cooking solutions that require longer time collecting and using the fuels.

92. **EDCL, EUCL, and REG will be direct beneficiaries of the project through asset investment and capacity building.** REG is expected to benefit from higher cost recovery through improved operational efficiency (improved quality of service and lower technical and commercial losses), and higher revenues through increased electrification rate and improved quality of service. Consequently, the GoR will benefit because improved cost recovery for REG should ease the burden of fiscal transfers to REG, helping the GoR target other priority sectors.

93. **Providers of off-grid and clean cooking solutions will benefit from results-based subsidies for off-grid and clean cooking solutions**. It is expected that competitive pressures will lead to these subsidies being passed on to consumers to make products and services more affordable. The off-grid and clean cooking solutions providers will also benefit from the better enabling environment with awareness raising, technical assistance, capacity building, and policy improvement activities for their long-term sustainable business development in the sector.

94. Finally, the countries in the EAPP (Uganda, Kenya, Tanzania, Rwanda, Burundi, and Democratic Republic of Congo) will be project beneficiaries, as Rwanda will, through the project, prepare its electricity network for electricity trade between the neighboring countries. The project will finance stabilization of the high voltage 220 kV network and two generating units, closing gaps identified in regional grid codes that are necessary to be aligned to enable stable electricity transfer between the EAPP countries. In addressing the bottlenecks to electricity trade, countries can begin to benefit from either imports or exports to/from electricity generators in neighboring countries.

D. Results Chain

95. By improving access to modern energy access and efficiency of electricity service, the project aims to improve household livelihoods and economic productivity. The theory of change is visualized in Figure 9.





Figure 9. Theory of Change of the Proposed Project

Ε. **Rationale for Bank Involvement and Role of Partners**

The proposed Rwanda EAQIP is a part of the RUEAP, a coordinated program pooling more than 96. US\$674 million from multiple development partners in support of Rwanda's NST1. The RUEAP supports the GoR in achieving its objectives of reaching universal electrification by 2024 and increasing the adoption of clean cooking to 80 percent. EAQIP will provide an IDA credit of US\$150 million, will leverage a grant of US\$10 million from the CCF and will be complemented by joint cofinancing of EUR 80 million from the AFD, and parallel cofinancing of US\$40 million from the OPEC Fund and the SFD. The AfDB and the EIB are also part of the program, with AfDB providing financing of EUR 250 million distributed across grid electrification and densification and transmission expansion, and EIB providing financing of EUR 100 million toward grid electrification and densification. Annex 2 includes details of specific financing commitments.

97. The World Bank has been in a long-standing partnership with the GoR in supporting its development agenda for Rwanda, including support for the energy sector targets such as universal electrification by 2024. The World Bank and other development partners have played an instrumental role in providing technical advice and financing to support the sector in improving indicators related to the energy sector, including increasing electricity access from 10 percent in 2010 to 54 percent in 2020, improving the quality and reliability of electricity supply, and continuously improving the capacity of the sector institutions to manage the sector agenda. Since 2009, the World Bank has supported the Government in areas of energy sector reforms,³⁴ expanding access³⁵ and generation capacity,³⁶ restructuring Rwanda's electricity utility and improving its efficiency,³⁷ asset and liability evaluation, sector capacity needs assessments, capacity strengthening for the energy sector agencies, and comprehensive assessment of financial viability of the energy sector (

98. Figure **10**). The World Bank serves as the co-chair of the energy SWG, designed as a platform to discuss challenges and opportunities as well as promote a coordinated approach of donor partners and energy sector stakeholders toward a coherent sector agenda.

99. By financing expansion of electricity access through the project, the World Bank will support Rwanda's move toward universal electrification and will help realize the social and economic benefits associated with electricity supply. REG has allocated on-grid access districts to the development partners based on their indicated investments, in accordance with the NEP (fFigure 7). Electrification can bring substantial benefits to Rwanda, as nearly half of the population currently has no electricity connection. The access deficit is particularly large among low-income and rural households with, as of 2016–2017, only about 5 percent of the lowest income quintile households having electricity access compared to 61 percent of the highest income quintile, and about 15 percent of rural households having electricity access compared to about 76 percent of urban households. Higher electrification rates are expected to increase income-generating activities through productive uses of electricity. Electrification is also expected to improve the socioeconomic situation of households, specifically for the female-headed households, with expected positive impact on education, lifestyle, health, and connectivity, helping reduce the gap in the quality of life between rural and urban residents. Quantifiable impacts of higher electricity access will include avoided cost of lighting through candles, kerosene, batteries, or small diesel generators for lighting and other purposes. Benefits through avoided CO₂ emissions will also accrue through the relatively clean grid electricity supply in Rwanda (largely hydropower) and through increase in renewable based off-grid electrification.

³⁴ Energy Sector DPO series (US\$375 million; FY2018–20; P162607, P166458, and P169040).

³⁵ Rwanda Electricity Access Scale-Up and Sector Wide Approach Development Project (EASSDP) (P111567, 2009 and 2013; US\$130 million); RESSP (P150634, 2015; US\$45 million for access); and Scaling-up Renewable Energy Program-financed Rwanda Renewable Energy Fund (P160691, 2017; US\$50 million for off-grid access).

³⁶ AFR RI-Regional Rusumo Falls Hydroelectric Project (P075941, 2013; US\$340 million).

³⁷ RESSP (P150634, 2015; US\$50 million for utility reforms).



Figure 10. The World Bank's Support in the Energy Sector of Rwanda

Source: World Bank staff.

100. Improvement in quality and reliability of electricity supply will help promote industrial economic activity and increase consumer confidence in the utility's services which, along with reduced transmission and distribution losses, will help enhance REG's cost recovery. Interruptions in power supply in Rwanda are rather frequent and long. Poor reliability of supply negatively affects industrial activity dependent upon uninterrupted supply of electricity and consequently hampers economic growth. Reduction in the frequency and duration of interruptions will, thus, help increase economic activity. It will also have a positive impact on REG's cost recovery, as higher quality and reliability of electricity services will enhance consumer support for increases in tariffs to attain cost recovery. Reduction in transmission and distribution losses will also help with improving REG's cost recovery by reducing the share of unbilled electricity. The economic costs will include expense incurred to complete upgrading of the transmission and distribution system.

101. Replacement of traditional cookstoves with modern clean cookstoves will have direct health benefits through improvement in indoor air quality and gender benefits through reduction in time spent by women to collect firewood for cooking. There is a strong link between cooking with stoves emitting pollutants such as PM_{2.5} and CO₂ and an increase in the burden of disease for households. Households switching to technologies that have lower emissions can prevent the associated disease burden and reduce the mortality rates (from diseases such as lung cancer, ischemic heart disease, stroke, acute lower respiratory infection in those ages 0–4; and chronic obstructive pulmonary disease associated with HAP). In rural areas, where firewood for cooking is predominately collected and not purchased, the responsibility falls on women and girls. They spend more time collecting and preparing fuel for the household's cooking needs which reduces the time spent on economic or productive activities and increases drudgery. Shifting to other cooking options will lead to health and gender-specific benefits.

102. The World Bank Group participation is critical in complementing the support of other development partners through concessional financing, as well as in creating a suitable investment environment for private sector participation. The scale of investments will require concerted efforts from development partners as well as private capital. Investments in grid electrification will continue the World Bank's prior support to the GoR through the EASSDP (P111567, 2009 and 2013, US\$130 million) and the RESSP (P150634, 2015, US\$45 million for access. For off-grid electrification and clean cooking solutions, attracting private sector companies to participate in the market, particularly in low-income areas, would require the provision of subsidies to households.

103. Along with financial assistance, the World Bank's TA will be critical in helping improve the efficiency and reliability of electricity services and in creating an ecosystem for clean cooking in Rwanda. Furthermore, improving the institutional capacity of REG and other stakeholder government agencies will enhance their ability to not only provide better services but also enable them to increase the levels of private capital raised for current and future investment needs.

F. Lessons Learned and Reflected in the Project Design

104. Over the past decade, the World Bank has learned important lessons from investments in close to 20 IDA projects supporting electrification programs to develop grid and off-grid access in Africa (for example, Ethiopia, Uganda, Tanzania, Mali, Burkina Faso, and Liberia). In Rwanda, the World Bank has been supporting energy sector transformation since 2009 and has gained comprehensive experience across the board that is reflected in the design elements of EAQIP. Investments in grid electrification will continue the World Bank's prior support to the GoR through the EASSDP (P111567, 2009 and 2013, US\$130 million) and the RESSP (P150634, 2015; US\$45 million for access). The design of the off-grid access and clean cooking components builds on the experience of the Rwanda Renewable Energy Fund Project (P160699) and the pro-poor pilot RBF that was initiated by the GoR in collaboration with EnDev and the World Bank in October 2019.

105. By pooling finances from multiple donors toward achieving grid electrification objectives of the GoR, the project aims to replicate the success of the energy sectorwide approach (eSWAp) adopted in 2009 which led to a fourfold increase in grid electricity access in Rwanda between 2009 and 2018. EAQIP is a part of a sectorwide program that replicates the design elements of eSWAp in terms of developing a framework for coordination between donors and country stakeholders for integrated technical, financial, and implementation planning for the sector. Similar to the approach that led to setting up of the EARP, the current program pools financing from multiple donors toward the overall financing requirements of the GoR for grid electrification, with the GoR allocating respective financing amounts to different districts. This is different from a project-specific approach where each donor would have developed individual projects leading to substantial duplication of efforts for the Government.

106. The project is also using lessons learned from previous projects under the eSWAp/EARP to enhance project readiness and implementation arrangements. Technical capacities of the implementing agencies that require further strengthening (for instance, contract management and staffing for environment and social risk management) have been identified and are reflected in the design of EAQIP as well as of the RUEAP.

107. The off-grid electrification RBF aims to leverage private sector financing by adopting key learnings from the deep engagement of the World Bank and other donors in the off-grid electricity sector in Rwanda. Lessons learned through the implementation of the REF and of the pro-poor RBF pilot

are reflected in the project design. Specifically, the design of the off-grid electrification component attempts to incorporate the following learnings:

- (a) Tailoring the program to the country's needs. The off-grid component is in line with the GoR's target for leveraging private sector efforts to achieve 48 percent off-grid electrification by 2024. The component is supported by regulations and standards that have been adopted by the GoR over the years to expand the off-grid electrification efforts in Rwanda.
- (b) **Designing appropriate incentives.** The lack of affordability of off-grid systems has been identified as the key reason behind the slowdown in off-grid electrification. Consequently, the RBF scheme is designed to specifically address the affordability constraints while promoting private sector involvement. The RBF will offer different subsidy levels to firms for providing off-grid services to consumers belonging to different socioeconomic stratum, indicated by their Ubudehe categories.
- (c) Supporting market development. The design of Component 3 reflects extensive interactions undertaken under the BRD's Renewable Energy Fund Project (P160699) and through the pro-poor RBF pilot. These interactions spanned different market aggregators, such as financial institutions, manufacturers, private sector companies, and end-users, and have helped shape the project design and approach in a way that is practical and achievable in the country and is expected to achieve the desired results.
- (d) **Ensuring sustainability.** The off-grid access component will provide RBF grants in line with the approved concept for the nationwide RBF. The component will be deployed through the ongoing REF. Supporting a nationwide, GoR-led initiative will enhance the sustainability of the off-grid sector development beyond the project horizon.
- (e) **Quality Assurance.** SHSs and clean cookstoves must adhere to quality standards to create trust and confidence in the market. The off-grid SHSs imported to Rwanda must comply with the requirements of the Ministerial Guidelines on Minimum Standards Requirements for Solar Home Systems, which includes guidance on product quality standards as well as service-level requirements, warranty periods, and the terms of after-sales care. The clean cooking solutions will also adhere to government guidelines as well as incorporating international good practice., The project will provide technical assistance to further review and improve the government standards and testing. It will also draw on the cookstove testing lab which is being established by the RSB and provide technical assistance to improve local product design and encourage local solutions to be eligible for the project.
- (f) Swift monitoring, verification, and disbursement. The verification process in the pilot RBF is quite intensive and can take between one and two months to complete. To reduce the verification burden and improve the speed of subsidy delivery to companies, the new RBF window under the GoR's REF will establish an integrated payment system that allows for an automated calculation of the subsidy level to be paid. EDCL will then be able to move from performing a verification and monitoring role to focus mostly on sector monitoring. This will speed up the monitoring, verification, and disbursement process.

108. As the Rwanda clean cooking market is still in its infancy, it is important to take an integrated and collaborative approach by working across sectors and tackling supply, demand, and enabling environment to support clean cooking market development. Overall, there is no dedicated national program with sizable funding to address scale-up of clean cooking solutions. The current interventions are sporadic and fragmented, which have not moved the needle to increase access to clean cooking. The Ci-Dev-supported Improved Cookstoves Project (P158411) used a market-based intervention to support two selected private companies to deliver improved cooking solutions with payment linked to the verified carbon emission reductions. However, the project has faced the following challenges: (a) both companies have not been able to raise sufficient upfront financing to deliver the results as planned, thus not receiving the carbon payments, which further affect their fund raising capability; (b) there is a lack of TA, capacity building, and policy support with limited involvement of government agencies; and (c) because the project signed emission reduction agreements with the selected two companies, there is little room for making adjustments such as including additional companies or changing the payment terms and conditions based on market signals.

109. Key lessons learned from the World Bank's lending experience over the last 10 years in the clean cooking sector, that have been incorporated into the project design, are summarized as follows:

- (a) Access to modern-energy cooking services is a development issue. The most effective way to reduce HAP is by switching to modern clean fuels (for example, electricity, natural gas, LPG, ethanol, and biogas). Fuel switching should be encouraged, and more efforts are needed to invest in the delivery infrastructure. At the same time, it should be recognized that large-scale fuel switching is unlikely to occur in rural areas until rural economies become substantially more developed or ongoing public funding is provided for fuel switching. To lower HAP in rural households where the use of biomass is likely to persist over the near term, it is important to modernize the biomass fuel sector and promote integrated and cost-effective approaches (for example, improved/advanced biomass stoves, together with improved ventilation and behavior change).
- (b) A systems approach is needed to promote access to modern-energy cooking services. To make the cooking process clean, the whole system of interactions of cooking technologies (the combination of stove and fuel) with human behavior (for example, what to cook, how to cook, and how often and long to cook) and housing conditions (for example, kitchen location, arrangement of rooms and size, construction materials, and quality of ventilation) needs to be considered. It is important to encourage innovation in each element of the system.
- (c) Local innovation and localized solutions are critical for long-term sustainability. Cooking is a contextualized system with no one-size-fits-all solution. Although projects share common barriers, the best solutions will vary by location owing to differences in cooking behavior, culture, resources, institutions, and market conditions. Therefore, empowering the development of localized solutions, based on lessons from international experience, including the latest technology innovations, will be key because localized solutions are more likely sustainable. And only when solutions are sustainable, can they be truly transformative.
- (d) A national program with high-level support is essential to scale up access to modern-energy cooking services. While such programs need to involve stakeholders from a wide variety of positions and roles (public sector, civil society, and private sector) at all levels (that is, local, provincial, national, and international), there is no substitute for high-level political, technical, and financial support from national leaders and agencies.

- (e) Incentives or subsidies will be needed to achieve universal access to modern-energy cooking services. Like universal access to electricity—which no country has achieved without some form of subsidy—subsidies will be needed to achieve universal access to modern-energy cooking solutions. Market forces and mechanisms are powerful tools for ensuring a sustainable supply of modern cooking technologies and should be harnessed in a way that helps the private sector develop, market, and deliver modern cooking solutions. However, if left to market forces alone, access will be limited by affordability and other constraints that affect mainly poor households, particularly in less developed and more remote areas. Thus, government policies are needed to (i) establish and maintain adequate levels of subsidies and (ii) design and implement effective subsidy allocation mechanisms to mobilize and sustain private sector participation and target households who have an affordability gap.
- (f) RBF has been demonstrated to be an effective approach to using public resources to incentivize the market and can be designed to fit the country context and market conditions. The World Bank has implemented the RBF framework to support Efficient, Clean Cooking and Heating (ECCH) solutions in 10 client countries with variations based on country conditions (for example, in Bangladesh, China, Indonesia, Kenya, Lao People's Democratic Republic, Mongolia, and Uganda). The results demonstrate that RBF is an effective instrument to incentivize private sector investment and deliver clean and efficient cooking and heating solutions with predefined result levels and triggers for payment. In addition, its flexibility allows for designing and adjusting the predefined results and associated incentives based on the country context, market conditions, and feedback from program implementation.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

110. The project will be jointly implemented by EDCL and BRD. The implementation arrangements have been designed to manage the multi-donor RUEAP, and all projects within the program will be managed by two implementing agencies, with EDCL covering all grid-related components and the overall program coordination, while the BRD will implement the off-grid and clean cooking component. Using the same implementation arrangements for the overall multi-donor program, instead of creating separate implementing units for each project in the program, is expected to substantially reduce coordination costs, eliminate duplication of effort and transaction costs for the GoR, enhance the efficiency of implementation, and help streamline development partner coordination of the program.





111. **Components 1, 2, and 4 of the RUEAP program will be implemented by EDCL.** While EDCL has been implementing donor-funded projects, there is recognition that the RUEAP program is large and EDCL's current workforce may be too constrained to effectively manage the extra workload that the program imposes. For this reason, for reinforcing EDCL to manage the program, a PCU will be created within the structure of EDCL to provide the leadership that will run the program in coordination with the departments within EDCL. In addition, EDCL will be strengthened appropriately by recruiting additional relevant staff within the existing EDCL structure, who will provide support to ensure effective implementation of the program. The extra staff recruited to support the program will be funded by the program during the program duration. The PCU will be disbanded at the conclusion of the program, while it is hoped that EDCL will be able to maintain the staff recruited within EDCL departments on their structure, so that the program leaves a stronger EDCL structure in place.

112. **EDCL's implementation of Subcomponent 2c will draw on EUCL's technical expertise, as needed.** This will include seconding relevant EUCL staff to EDCL for the duration of the assignment.

113. The EDCL PCU, which will provide overall leadership for the program, will be staffed appropriately to manage the RUEAP, and will be housed within EDCL. The PCU will be headed by a program manager who will report directly to the managing director of EDCL (Figure 12). The program manager will have the overall responsibility for (a) program implementation management and coordination and (b) program monitoring and evaluation (M&E) and reporting. Within the PCU, the program manager will be supported by high-level staff to head program functions such as procurement, finance, safeguards, contract management, and any other function that is deemed to require high-level leadership. In addition, the PCU will also house a project coordinator for each group of participating development partners to provide the program manager coordination management and support for each participating development partner group.

114. The EDCL PCU will draw upon the existing, and newly recruited, resources from EDCL departments for implementation support. Table 5 presents the existing departments of EDCL that will be engaged for the implementation of different components of the program, including technical, operational, procurement, financial management (FM), planning, and legal components. These departments will be strengthened by additional staffing to ensure timely implementation of the program.



EDCL Department	Program Component/Activity
EARP	Component 1: Grid electrification
	Component 2: Subcomponents pertaining to the improvement of the
	reliability and strength of the distribution network ^a
Generation and Transmission	Component 2: Rehabilitation of the Ntaruka HPP and transmission-related
	subcomponents
Primary and Social Energy	Component 3: Off-grid electrification and clean cooking (technical aspects of
Development	implementation)
Procurement Management	Support day-to-day implementation of procurement processes for the
	program, under the supervision of the senior procurement specialist(s) in the
	PCU
Administration and Finance	Support day-to-day FM of the program, under the supervision of the senior
	FM specialist(s) in the PCU
Transaction and Legal	Support day-to-day contract management for the program, under the
	supervision of the senior contract management specialist(s) in the PCU
Planning	Support overall planning and implementation of the program
Human Resources	Support human resources related tasks of the program
Information Technology (IT)	Support IT related tasks of the program
Monitoring and Evaluation	Conduct Monitoring and Evaluation for the program

Table 5. Pro	posed Im	plementation	Arrangemen	t within	EDCL
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Note: a. Some of the subcomponents under Component 2 may also require the engagement of relevant departments of EUCL. This would require a Project Implementation Support Agreement between EDCL and EUCL.

115. EDCL will appoint or recruit project managers within EDCL technical departments who will report to the project coordinators in the PCU for program functions but will also maintain their existing reporting lines to their department manager. The project managers shall be supported by relevant specialists from the EDCL structure, who will be assigned to the program by the directors of the respective departments for implementation of the program. Given the scale of the program, additional resources will be recruited by EDCL and supported by the program. The Government has identified the resource gaps in the implementation structure, and these will be filled by funding through the program.

116. For fiduciary responsibilities, the program will draw resources from the existing fiduciary departments of EDCL including Planning, Procurement Management, Administration and Finance, and Transaction and Legal. Considering the scale of the program, some of these departments may require substantial reinforcing to meet the program requirements. The heads of these departments will appoint specific staff to work on the electrification program. These staff will also maintain dual reporting lines— to their respective fiduciary specialists within the PCU (for example senior procurement specialist, senior contract management specialist, and senior FM specialist) as well as to the respective department heads.

117. Two Steering Committees will be established at the Program Level to provide high-level government oversight and strategic guidance to the EDCL-PCU for components 1, 2, and 4 and to the BRD-PIU for Component 3. The Grid Electricity Steering Committee will be chaired by the permanent secretary (PS) of MININFRA and its members will include PSDG-MINECOFIN, CEO-REG, MD-EDCL, MD-EUCL, and Program Manager, who will be the Committee Secretary. The Off-Grid and Clean Cooking Steering Committee will also be chaired by PS-MININFRA and will include PS-MINECOFIN, CEO-REG, CEO-BRD, MD-EDCL, representatives from the Ministry of Environment, RSB, and Local Administrative Entities Development Agency (LODA), and the Program Manager. The Development Partners will be observers in both Steering Committees. The Steering Committees will meet at least once every semester, or as needed,



during project implementation to review implementation progress, discuss emerging challenges, and identify mitigating measures.





Figure 12. Detailed Program Implementation Arrangements for Components 1, 2, and 4

118. **The BRD will implement Component 3, supported in certain technical aspects by EDCL.** For the off-grid electrification and clean cooking subcomponents under Component 3, the BRD will take the lead in implementation while EDCL will cover certain technical aspects of implementation and verification. The BRD will recruit a separate project manager to manage the clean cooking RBF under subcomponent 3b. The process flow for component 3 is illustrated in Figure 13. The eligibility criteria and associated subsidy amounts for households belonging to different Ubudehe categories will be in line with the approved concept for the nationwide RBF. The BRD will receive applications from interested private sector firms for both off-grid access and clean cooking (under separate windows), appraise and approve eligible firms, with EDCL providing technical advice in the evaluation process. As the eligible firms expand operations across target consumers, they will be able to submit claims for disbursement under the RBF to the BRD. The claims will be verified through a statistically relevant sample before funds are disbursed by the BRD. In terms of the Environment and Social Management System (ESMS) for this component, the BRD has an adequate established ESMS under its REF that will apply to this component.



Figure 13. Coordination between BRD and EDCL under Component 3

B. Results Monitoring and Evaluation Arrangements

119. **M&E of project implementation progress and results indicators, as well as progress toward achievement of the PDO, will be the responsibility of the EDCL PCU and the BRD PIU.** The two implementing agencies shall ensure adequate M&E staffing to support M&E activities. The two implementation units will be responsible for collecting, verifying, and collating information, integrating the M&E reports, and submitting to the World Bank both the quarterly and annual progress reports. The implementing agencies will establish a database for each component of the project to periodically monitor

the evolution of implementation, outputs, and results, with systems for regular data gathering and processing of information required to monitor the main performance indicators and intermediary indicators as defined in the Results Framework.

120. The EDCL PCU and the BRD PIU will collect gender-disaggregated data and reports from other participating entities of the program and present progress in achieving the key and intermediate indicators to the World Bank in the project quarterly and annual progress reports. The implementing agencies and the SWG secretariat will be responsible for integrating the results from the program into overall sector performance indicators and preparing sector reports for the biannual SWG Joint Sector Performance Review discussions.

121. The project will carry out a follow-up impact evaluation survey three years into the implementation of the project. The baseline survey of the EARP was completed in mid-2014 and the follow-up survey is scheduled for 2020. The proposed project will build on the work done under the EARP and conduct a follow-up survey three years into the implementation of the project. The impact evaluation follow-up survey and assessments shall be jointly led by the EDCL PCU, the BRD PIU, and the SWG secretariat.

122. There will be two midterm (in-depth) reviews of the project; the first one taking place 18 months after project effectiveness.

C. Sustainability

123. **The GoR has demonstrated strong commitment and ownership of the proposed project.** The project is part of the government-driven multi-donor program that is aimed at progressing the Government's energy sector targets under the ESSP. The targets include electrification (going by the government-approved NEP), improving quality and reliability of electricity supply, and improving access to clean cooking solutions. The program/project concept was developed under the GoR's leadership, as well as through an extensive and participative consultation process with the participating development partners. The project design includes a mix of public and private financing, with the focus on enhancing the enabling environment for supporting grid and off-grid electrification and clean cooking solutions in an affordable and sustainable way.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic, and Financial Analysis

Technical Analysis

Component 1

124. The technical foundation of the universal electrification program of the GoR, toward which EAQIP contributes, is established in the NEP finalized in 2019. Considering the 52 percent on-grid and 48 percent off-grid split established in the ESSP as an input, the plan defines a combination of extension and densification of the national grid and deployment of off-grid solution throughout the country that represents the least-cost option to supply forecasted demand for 2018–2024 (Figure 6). The electrification decision is made at 'cell' level, which represents an administrative unit in Rwanda. The model takes as key inputs the population and population density, topography, distance from the grid, income level, and cost of electrification alternatives and provides as an output the distribution of grid extension and off-grid solutions across different cells that achieve universal electrification by 2024 at the least cost. The costing of electrification components, such as of the LV and MV lines, transformers, and poles were reviewed by

the World Bank during the preparation of the NEP and were found to be appropriate. The NEP also provides detailed investment requirements to expand the grid to the cells marked for grid electrification, forming the basis of the investment requirements under Component 1 of EAQIP.

Component 2

125. An elaborate technical and economic feasibility study for the rehabilitation of the Ntaruka HPP under Component 2 of the project was carried out in 2018 and was reviewed by the World Bank. The World Bank review found the feasibility study to be adequate for proceeding with appraisal of the rehabilitation of the HPP. Key technical observations from the review are highlighted as follows:

- (a) **Civil works.** The civil works are in good condition except for minor repairs required in the concrete structure.
- (b) **Hydraulic steel structures.** The scope of the rehabilitation includes replacement of gates at the intake which is recommended. The penstock is in good condition and its overdesigned thickness will secure safe operations for many years to come. Recommendations were made to verify the need for a safety valve at the base of the surge shaft at the beginning of the penstock and the potential installation of an ecological outlet at the bottom of the dam to connect the upstream and downstream natural reservoirs (Lake Burera and Lake Ruhondo respectively) when the HPP is not operating.
- (c) Hydromechanical works. The shafts are in bad condition and need to be replaced for all three units of the plant; the rest of the mechanical components including guide vanes, runners, and draft tubes are damaged by cavitation, which is fairly normal after several years of operations, and need to be treated and repaired. The three governors and parts of the operating systems also need to be replaced
- (d) Electromechanical works. The scope of replacement of electromechanical components covers nearly all systems and components yet the scope of work may increase once the contractor will dismantle and open up the casings, boxes, and boards. It was recommended that the contract be designed so as to accommodate all the potential variants and to provide for a sufficient level of contingencies.
- (e) **Dam safety.** The Ntaruka Dam must comply with the World Bank dam safety standards under the new Environmental and Social Framework (ESF). The risk classification of the dam is being carried out through an E&S audit and will inform the type of technical review that is required, including the need for update/preparation of all relevant dam safety plans.
- (f) **Cost estimate.** The cost estimates for the rehabilitation are rather on the high side but the higher estimate may leave margin for any contingencies that may arise when the actual rehabilitation is carried out.

126. The utility has established that the cause of incidences of voltage fluctuations occur quite frequently, owing to low loading of the 220 kV network. Installation of automatic voltage regulators on the 220 kV system network would reduce/eliminate voltage fluctuations, hence protecting network equipment and reducing incidences of blackout. The proposed investments are recommended through a study on electricity interconnectivity in the Nile Equatorial Lakes countries and would also prepare Rwanda's electricity grid for regional interconnection.

127. Installation of smart meters for MV and LV customers was started under the ongoing World Bank-funded RESSP. In continuation of the pursuit to identify and curb sources of technical and commercial losses, REG will continue to install smart meters for large consumers, and in addition, install smart meters on all distribution transformers on the electricity network. This will enable REG to easily identify feeders that are susceptible to commercial/technical losses and use the information to identify solutions, while also identifying transformers that are unevenly loaded and causing network imbalances, and similarly use the information to identify solutions. The project will also fund purchase of meter test benches for both prepaid and postpaid meters, in a bid to develop local capacity to continuously monitor the quality of the meters on the electricity network.

Component 3

128. Quality assurance for off-grid SHSs and clean cooking solutions. SHSs and clean cookstoves must adhere to quality standards to create trust and confidence in the market. All off-grid SHSs imported to Rwanda must comply with the requirements of the Ministerial Guidelines on Minimum Standards Requirements for Solar Home Systems, which includes guidance on product quality standards as well as service-level requirements, warranty periods, and the terms of after-sales care. To be eligible for RBF financing, OSCs will be required to comply with these Ministerial Guidelines and submit a business plan detailing the commercial viability of service provision through combined customer contribution and RBF financing, including for the provision of adequate after-sale services, which shall be granted until three months after the expiration of the warranty (two years for Tier 1 systems, as specified by the Ministerial Guidelines). A customer service Code of Conduct will be signed by all participating providers and will detail the standards that the verification process will evaluate against.³⁸ OSCs will also be required to submit a detailed plan for supporting the increase of affordability of off-grid solutions over time, in synergy with existing GoR safety net programs, for example, through training and participation to the off-grid labor market and/or public works. The clean cooking solutions will also adhere to government guidelines as well as incorporating international good practice. The project will provide technical assistance to further review and improve the government standards and testing. It will also draw on the cookstove testing lab which is being established by the RSB and provide technical assistance to improve local product design and encourage local solutions to be eligible for the project. See section II B for details on the technical eligibility requirements and minimum performance levels for clean cooking solutions.

Economic Analysis

Affordability of Electricity Access

129. **The average electricity consumption of rural households is substantially less than that of urban households.**³⁹ The average monthly electricity consumption of an average rural household was 12 kWh per month in 2016–2017 (15 kWh in 2013–2014), whereas that of an average urban household was slightly more at 20 kWh (25 kWh in 2013–2014). With the 2020 tariff review, rural households and urban households might consume slightly more than with the 2017 tariff (around 13 kWh for rural and 21 kWh

³⁸ Building on the one developed by GOGLA: https://www.gogla.org/consumer-protection.

³⁹ The household survey does not report the amount of electricity consumed, only the amount of money spent (Rwandan francs). The EICV5 was conducted from October 2016 to October 2017. For households surveyed in 2016, the usage amount was calculated using the flat rate of RWF 182 per kWh in effect in 2016. For the households surveyed in 2017, the usage amount is calculated based on the tariff approved by the RURA board in 2016 that entered into force in 2017. The tariff classifies residential customers into three classes with different tariff levels based on consumption.

for urban) (Figure 14). When quintiles are divided by urban/rural, consumption per location (urban/rural) does not differ much within each quintile, except for the top 20, between the flat tariff and the three-tier tariff of 2017. In the richest quintile, urban population consumed on average 10 kWh more per month than the rural population in the same quintile during 2016–2017. However, the difference was more than 20 kWh more per month on average during 2013–2014 with the flat RWF 134 tariff. With the new change in tariff, there may be a slight increment for both, urban and rural population (Figure 15).

130. **Electricity has become more affordable between 2013–2014 and 2016–2017.** The affordability ratio⁴⁰ has lowered for all and in 2016–2017 was on average 1 percent, but it is still higher for lower-income households, as seen in **Error! Reference source not found.**. The poor spent 1.5 percent (2.89 percent) of their income in grid electricity while for the richest quintiles, the percentage was less than 1 percent (1.37 percent) for the 2016–2017 (for 2013–2014; **Error! Reference source not found.**).











Source: EICV4 and EICV5.

⁴⁰ The percentage of per capita expenditure required to pay for electricity.



Figure 16. Affordability and Total Expenditure

Source: EICV4 and EICV5.



Source: EICV5 2016-2017.

The tariff reforms implemented since 2015 have helped move average household tariffs closer 131. to cost-reflective levels without significant impact on poverty. Most recently, subsequent to two tariff reviews implemented during the DPO series in 2017 and 2018, and subsequent to the approval of the last DPO in the series in August 2019, the Government introduced another tariff review in January 2020, raising average tariffs by 7 percent from RWF 174 to RWF 186 per kWh (US¢ 19.8 per kWh; value added tax (VAT)-exclusive). Using a subsidy simulation model⁴¹ and the household survey from 2013–2014 (Table 6) and 2016–17, the effect of the 2015, 2016, 2017, 2018, and 2020 tariff reviews was simulated (Table 7). Since electricity accounts for a small share of household expenditure (less than 5 percent on average), the direct impact of tariff reforms is not large. In the case of the 2017 tariff change, the effect is positive for all households. The projected effect that the 2018 tariff had on consumption quintiles is small but negative for all, while the effect expected with the 2020 tariff is zero for the poorest quintiles and very small but negative for the richest quintiles, which record an average loss in household welfare of 0.1 percent. The net impact of the three recent tariff reviews is positive for all quintiles (that is, a gain in welfare) except for the richest twenty percent of households (Table 7).

⁴¹ Consumption is approximated by expenditures of electricity. The calculations are made based on data from the EICV4 and EICV5. The own-price elasticity of electricity is taken to be zero.



Table 6. Direct Welfare Impact of Tariff Reviews of 2015 and 2016 across Different Consumption Quintiles Using 2013–2014 Household Survey Data

Direct Impacts	Percentage of Pre-reform Welfare Change		
	2015 Tariff Reform	2016 Tariff Reform	
Quintile 1 (poorest)	-0.03	-0.09	
Quintile 2	-0.06	-0.19	
Quintile 3	-0.07	-0.22	
Quintile 4	-0.17	-0.52	
Quintile 5 (richest)	-0.38	-1.15	

Table 7. Direct Welfare Impact of Tariff Reviews of 2017, 2018 and 2020 across Different Consumption Quintiles Using 2016–2017 Household Survey Data

Direct Impacts	Percent of Pre-reform Welfare Change			
	2017 Tariff Reform	2018 Tariff Reform	2020 Tariff Reform	Total
Quintile 1 (poorest)	0.07	-0.02	0.00	0.05
Quintile 2	0.10	-0.04	0.00	0.06
Quintile 3	0.14	-0.04	-0.01	0.09
Quintile 4	0.20	-0.10	-0.01	0.09
Quintile 5 (richest)	0.19	-0.26	-0.10	-0.17

Source: World Bank staff assessment.

Affordability of Clean Cooking Solutions

132. Household expenditure on cooking fuels is low as firewood is a predominant fuel across the country. Nationwide, households rely on firewood to meet their cooking needs (more than 90 percent in quintiles 1, 2, and 3), this is especially true for low-income households in the bottom two consumption quintiles (Figure 17). However, even higher-income households rely on firewood (85 percent in quintile 4 and 45 percent in quintile 5) but also use charcoal (14 percent in quintile 4 and about 50 percent in quintile 5) as their primary fuel. On average, households spend about US\$9 per month on charcoal. Only households in the highest quintile use gas or LPG, about 4 percent of quintile 5. In urban areas, charcoal is used as the primary fuel across all consumption quintiles but used by the majority of households in quintiles 4 and 5. Firewood is still used by 83 percent of urban households in quintile 1 and 67 percent of households in quintile 2. On the other hand, in rural areas firewood is dominant even among the high quintiles 4 and 5 with only 21 percent of households in quintile 5 using charcoal to meet their cooking needs.



Figure 17. Distribution of Primary Cooking Fuel by Consumption Quintiles

Source: EICV5 2016-17.

Project Economic Analysis

133. An economic analysis has been carried out to assess the economic viability of the program, using standard cost-benefit analysis methodology. The economic analysis was confined to the project activities that generate quantifiable benefits for which an economic value can be clearly identified and measured, specifically Component 1 on grid electrification and Component 3 on off-grid electrification and clean cooking. Beyond the benefits quantified for electricity access, higher electrification rates are also expected to increase income-generating activities through productive uses and improve the socioeconomic situation of households, with expected positive impact on education, lifestyle, and connectivity. For the clean cooking subcomponent, there is strong evidence of health and gender impacts from access to clean cooking solutions. For simplicity of this analysis, those benefits are not quantified. GHG mitigation benefits have been calculated both for Components 1 and 3. Detailed economic analysis is presented in annex 3.

134. The economic values of Component 1 (grid electrification) and Subcomponent 3a (off-grid electrification) are strongly dependent on the WTP of households for electricity and are positive if household WTP for grid and off-grid electricity as a percentage of their total expenditure is 4.2 percent and 1.3 percent respectively. The economic costs for Component 1 comprise grid connection costs and the cost of supply of electricity to newly connected consumers. Among the new connections that EDCL will extend, about 93 percent are expected to be for households and 7 percent for enterprises. The benefit of grid connection for households is estimated through their WTP for grid electricity and for enterprises as an avoided cost of diesel generated power. The analysis accounts for a range of household WTP for grid electricity including, as a low estimate, the expenditure on electricity of currently grid-connected households, and as a high estimate, the findings of a World Bank study on household WTP for grid electricity in Rwanda (Sievert and Steinbuks 2019).⁴² Similarly, for off-grid electrification, the current average expenditure of unconnected households on lighting alternatives (kerosene, candles, flashlight, batteries, and so on) as indicated in EICV5 is taken as the low estimate and the findings of Sievert and

⁴² Sievert, Maximiliane, and Jevgenijs Steinbuks. 2019. "Willingness to Pay for Electricity Access in Extreme Poverty: Evidence from Sub-Saharan Africa (English)." Policy Research Working Paper; No. WPS 8906. World Bank, Washington, DC. http://documents.worldbank.org/curated/en/968291561033778961/Willingness-to-Pay-for-Electricity-Access-in-Extreme-Poverty-Evidence-from-Sub-Saharan-Africa.

Steinbuks (2019) are taken as the high estimate. Table 8 reports the net present value (NPV) and the economic internal rate of return (EIRR), wherever applicable, for the low and high estimates of household WTP for electricity, including the threshold household WTP at which providing electricity access has a positive economic value for households. The threshold WTP values are within the generally accepted affordability level for household expenditure on grid electricity, which is considered as 5 percent of the total household expenditure (Kojima et al. 2016).⁴³ Table 8 also reports the NPV and EIRR for Component 1 at this affordability level.

Ducient Component	Household WTP for Electricity	NPV	EIRR	
Project Component	(as a percentage of total expenditure)	(US\$, millions)	(%)	
	Current expenditure of grid-connected			
	households	(104.86)	22	
	Urban: 4.6 percent	(104.88)	11.d.	
	Rural: ^a 1.1 percent			
Common ant 1.	Threshold WTP			
Component 1:	Urban and rural: 4.2 percent of total	1.02	6.1	
Crid Electricity	household expenditure			
Grid Electricity	Affordability level of grid electricity in		8.5	
	Kojima et al. (2016)	42.83		
	Urban and rural: 5 percent			
	WTP in Sievert and Steinbuks (2019)	774 50	49.8	
	Urban and rural: 19 percent	774.52		
	Current expenditure on lighting			
	alternatives	(1.08)	n.a.	
	Urban: 1 percent	(1.08)		
Subcomponent 3a:	Rural: 1.2 percent			
Increasing Off-Grid	Threshold WTP			
Electricity Access	Urban and rural: 1.3 percent of total HH	0.54	8.8	
	expenditure			
	WTP in Sievert and Steinbuks (2019)	111 56	n e b	
	Urban and Rural: 15 percent	111.50	11.d.°	

Table 8. NPV and EIRR of Cor	ponent 1 and Subcompo	onent 3a at Various Househ	old WTP for Electricity	Access
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Source: World Bank staff assessment.

Note: a. Current expenditure on electricity as a percentage of total expenditure for rural households is substantially lower than that for urban households because of both their low average consumption (12 kWh per month compared to 21 kWh per month for urban households) and consequently the low average tariffs (tariff of RWF 89 per month applying to consumption below 15 kWh per month compared to tariff of RWF 212 per month applying to consumption between 15- kWh per month and 50 kWh per month).

b. Net benefits are positive in all years.

135. The economic value of Subcomponent 3b is driven by savings on expenditure from the use of more efficient stoves and through improved health outcomes. The economic costs of Subcomponent 3b are stove costs and operating costs for using the stove which are largely fuel costs. As seen in EICV5, 79.8 percent of households use firewood and 17.4 percent use charcoal to meet their cooking needs with stoves that are inefficient and polluting. For households that continue purchasing the same fuel, either wood or charcoal, the potential operating costs will be lower with more efficient stoves and lead to fuel savings. For households switching to a clean fuel stove (pellet gasifiers, LPG stove, or electric stove) from

⁴³ Kojima, Masami, XIn Zhou, Jace Jeesun Han; Joeri de Wit, Robert Bacon, and Chris Trimble. 2016. *Who Uses Electricity in Sub-Saharan Africa? Findings from Household Surveys*. Policy Research Working Paper; No. 7789. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/25029 License: CC BY 3.0 IGO.

biomass stove the difference in operating costs may be positive or negative, depending on the fuel price. Table 9 reports the estimated NPV and EIRR when accounting for fuel-saving of households using cleaner and more efficient stoves and fuels.

Table 9. NPV and EIRR of S	Subcomponent 3b
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Project Component	NPV (US\$ millions)	EIRR (%)
Subcomponent 3b: Increasing Access	0.22	C 09
to Clean Cooking Solution	0.33	0.98

136. **Overall, the project and the individual components offer positive NPV and high EIRR when accounting for GHG mitigation benefits.** Table 10 outlines the NPV and EIRR of the project and of Component 1 and Subcomponents 3a and 3b, without GHG benefits and at low estimates of the shadow cost of carbon prescribed by the World Bank. These estimates are based on the affordability level for grid electricity (5 percent of total household expenditure) and the threshold WTP for off-grid electricity (1.3 percent of total household expenditure) specified above. The project will lead to avoidance of a total of 4.6 million tons of CO₂e GHG through all of its components, owing to a shift of households to relatively greener grid electricity (with hydropower being the dominant source of electricity in Rwanda), to SHS for off-grid access, and to cleaner alternatives for cooking.

Project Component	NP	v	EII	RR	GHG Mitigation
rioject component	(US\$ <i>,</i> m	illions)	(%)		(tCO₂e, millions)
	Without GHG	With GHG	Without GHG	With GHG	
	Benefits	Benefits	Benefits	Benefits	
EAQIP	43.71	222.16	8.5	20.6	4.6
Component 1:	42.83	86.95	8.5	11.0	1.7
Increasing Access to					
Grid Electricity					
Subcomponent 3a:	0.54	9.56	8.8	61.8	0.3
Increasing Off-grid					
Electricity Access					
Subcomponent 3b:	0.33	125.65	7.0	184	2.6
Increasing Access to					
Clean Cooking					
Solution					

Table 10. Summary of Economic Analysis

Source: World Bank staff assessment.

Financial Analysis

137. Financially, the grid electrification component is expected to have a positive NPV for REG⁴⁴ while the RBF design for off-grid access and clean cooking is expected to ensure that the offered solutions remain affordable to low-income households. The financial analysis for grid electrification has been carried out from the perspectives of EDCL as well as consumers, to assess the financial impact of offering grid electricity services on the service provider, and of procuring electricity services on end users

⁴⁴ The Utility Financial Analysis is done at the level of REG's consolidated financials, which aggregate and consolidate EDCL's and EUCL's financial positions.

(households and trade centers). Financial analysis of off-grid access and clean cooking solutions have been performed only from consumers' perspective as these services will be provided by the private sector. Connecting households and trade centers to the grid and providing electricity services will offer REG, a positive NPV of US\$2.95 million (Table 11). The positive NPV is a result of (a) the project allocation being extended as grant from the GoR to REG to cover the high average cost of connecting households (about US\$753 per connection) and (b) the relatively high tariffs for high consumption households and enterprises, covering most of the cost of supply of electricity, which will also decline in line with the Leastcost Power Development Plan (LCPDP). The financial analysis for grid electrification from the consumers' perspective compares the cost that the consumers will incur on grid electricity (inclusive of connection charges and tariffs) against the avoided cost of lighting alternatives. Because the current expenditure of unconnected households on lighting alternatives is very low (about US\$1.10 per month), the NPV of grid electricity is negative for households. However, given the high expressed WTP of households for grid electricity, households may eventually allocate a higher share of their total expenditure to cover electricity costs. It is important to note that grid electricity consumers are offered implicit subsidies through the low grid connection charges (about US\$62 or RWF 56,000 per connection) and low tariffs for consumption below 15 kWh per month (about US\$0.09 per kWh against the cost of supply of about US\$0.23 per kWh). The financial analysis for off-grid electricity access and clean cooking components compares the postsubsidy cost of these solutions to households with the avoided cost of their present lighting and cooking alternatives. The subsidy offered to households has been adjusted to ensure that the financial NPV to households is positive.

Table 11. Summary of Financial Analysis

Project Component	NPV	FIRR
Project Component	(US\$ millions)	(%)
Component 1: Grid electrification (REG)	2.95	12.2
Component 1: Grid electrification (Consumers)	(26.54)	n.a.
Subcomponent 3a: Off-grid electrification	0.58	18.1
(Consumers)		
Subcomponent 3b: Clean Cooking (Consumers)	0.3	11.2

Source: World Bank staff assessment

Note: FIRR = Financial Internal Rate of Return.

Utility Financial Analysis

138. Because the electrification investments will be made available to EDCL as grants and owing to recent tariff revisions and declining cost of service, the REG's consolidated financial situation is expected to stay on a sustainable track. The estimates in Figure 18 assume the commissioning schedule of power plants according to the LCPDP and adjustment of tariffs against exchange rate fluctuations. Based on these estimates, REG will be able to recover the bulk of its cost of service in most years between 2020 and 2025. The subsidy requirements to cover any cash deficit are estimated to rise from about US\$9 million in 2020 to about US\$45 million in 2022 as a large IPP gets commissioned in 2022, raising the cost of service of electricity and the subsidy requirements will fall to about US\$6 million in 2025.







Source: World Bank staff assessment.

A potential decline in demand due to the COVID-19 induced economic slowdown is likely to 139. increase the cost of service of electricity and the subsidy requirements to fulfill the cash needs of REG. In March and April 2020, a lockdown was implemented in Rwanda, along with closure of nonessential businesses, as a response to the onset of COVID-19 in the country. The electricity demand was observed to drop by about 15 percent during these months. As the lockdown is lifted and economic activity resumes, the electricity demand is expected to pick up; however, the annual demand for 2020 is likely to remain lower than the demand in 2019. For this analysis, it is assumed that aggregate electricity demand in Rwanda in 2020 will be 10 percent lower than that in 2019 and will resume a growth rate of 10 percent from 2021 onward, equal to the growth rate observed in 2017 and 2018. Since the demand in 2021 is assumed to pick up from a lower baseline in 2020, the effects of the COVID-19 crisis are implicitly assumed to be long term. The decline in demand will adversely affect REG's cost recovery (Figure 19), as relatively large IPPs with take-or-pay clauses are scheduled to be commissioned in 2020 and 2022, for which REG will have to pay capacity charges even as demand will fall substantially short of supply. This is expected to increase REG's subsidy requirements to about US\$23 million in 2020. The effects on REG's financials will extend in the future if the proposed power plants are commissioned on schedule, as actual absolute demand will be lower compared to the projections employed in preparing the LCPDP.


Figure 19. Financial Projections for REG (2020–2025) considering the impact of COVID-19

Source: World Bank staff assessment.

Note: Assumption: Demand declines by 10 percent in 2020 compared to 2019 and starts increasing again in 2021 at a rate of 10 percent but from the lower base of 2020, suggesting extended impact of the COVID-19 crisis on the power sector.

Rationale for Public-Sector Financing

140. **Rationale for public sector financing.** The proposed operation provides public sector financing for grid and off-grid electrification where commercial financing is not considered viable, or to de-risk and incentivize private sector participation. Experience worldwide amply confirms scale-up in electricity access cannot be achieved without substantial and sustained public support. The overall investment needs to achieve universal electrification are expected to be met by a combination of concessional financing through development partners and private financing which will be more likely to be secured through the de-risking provided by credit lines and future RBF support. Akin to electrification, public sector financing will be used to leverage private financing to expand clean cookstove adoption.

B. Fiduciary

(i) Financial Management

141. The GoR has made good progress in the establishment of PFM systems to enhance accountability in the management of public resources. The Government has established a Medium-Term Expenditure Framework, but there have been challenges linking the budget allocations with performance information. Similarly, the Government has adopted the International Public Sector Accounting Standards (IPSAS) to provide a basis for the preparation and presentation of annual financial statements. However, there have been challenges ensuring full adoption of IPSAS by all government entities with weaknesses noted in the format and content of annual financial statements. The Government is currently undertaking an upgrade and rollout of smart Integrated Financial Management Information System (IFMIS) in all Central Government entities, agencies and all districts to improve financial controls. The interface between electronic government procurement (E-GP) and smart IFMIS has enabled tracking of contracts, but payments are still made outside the IFMIS.

142. The PFM Sector Strategic Plan 2013–2018 identified enhancement of training, professionalization, and capacity building across all PFM disciplines as a priority area that needs to be

addressed to further strengthen and sustain accountability and transparency in the management of public resources. The last Public Expenditure and Financial Accountability assessment conducted in 2016 reported reasonable fiscal discipline, orderly budget preparation process, and financial controls. However, the report highlighted large in-year changes in the composition of expenditure indicating weak policy alignment of the budget. At the same time, the report observed weak annual monitoring of payment arrears and lack of performance information on service delivery which could undermine value for money. The World Bank is currently supporting reforms in PFM through an IDA Credit—the Public Finance Management Reform Project (P164807).

143. **EDCL.** Although EDCL has, through the EARP, implemented a number of World Bank projects, owing to the size of the program, they will need to invest in building more capacity to provide reasonable assurance that the financing proceeds shall be used for intended purposes in a transparent, effective and efficient manner. The Finance Function is currently adequately staffed for their current purposes, however additional staff will be needed to handle the FM requirements of the project. Previously EDCL was using modified cash basis of accounting, but starting July 2019, projects are using modified accrual basis of accounting internal audit department, it will be necessary for the internal audit annual approved plan to include the project activities.

144. **BRD.** The existing FM arrangements of the BRD provide reasonable assurance that the financing proceeds will be used for intended purposes in a transparent, effective, and efficient manner. The BRD is experienced in implementing World Bank financed projects and is currently implementing the REF, Rwanda Housing Finance Project, and Social-Economic Inclusion of Refugees and Host Communities in Rwanda Project. The PIU has two staff in the Finance Department, a financial reporting officer and an accountant who will adequately manage FM requirements for the project. The arrangements for project oversight appear reasonable: the BRD Internal Audit function will include the project activities in its annual audit plans and shall report to the Board Audit Committee of any findings; a private external auditor shall audit the project annually and shall be a member firm of the institute of Certified Public Accountants of Rwanda. The BRD will be required to submit a copy of the audited project financial statements and a copy of the BRD entity's audited financial statements to the World Bank within six months at the end of its financial year. The project audit should be accompanied with the Management Letter issued by the auditors on the project audit. The results of the assessment indicate that the overall FM arrangements at the BRD and EDCL satisfies the World Bank's minimum requirements under the World Bank Directive and is therefore adequate to provide, with reasonable assurance, accurate and timely information on the status of the project as required by the World Bank.

145. **Flow of funds.** The project will open two designated accounts each for EDCL and BRD, one in US dollars and one in Japanese Yen, into which proceeds from the World Bank will be received (four Designated Accounts in total). The proceeds of the financing will flow from the World Bank to EDCL's designated account, from which beneficiaries (suppliers/service providers) will be paid. Disbursement from the World Bank into the designated accounts will be transaction based using statements of expenditure.

(a) EDCL may follow one or a combination of the following disbursement methods: designated account, Direct Payment, Reimbursement, and Special Commitment. The method will be interim financial report (IFR)-based, covering six-month forecasts of cash flow needs. The designated accounts in US dollars and Japanese Yen will be opened at the National Bank of Rwanda and

managed by EDCL. The signatories of the designated accounts will be communicated to the World Bank by MINECOFIN.

(b) BRD's flow of funds will be similar to the ones adopted for ongoing projects of a similar nature in Rwanda. The IFR-based method will be used. Two designated accounts will be opened at the National Bank of Rwanda in US dollars and Japanese Yen to receive funds from the World Bank. MINECOFIN will communicate about signatories to the designated accounts. The methods of disbursement are advance, reimbursement, direct payment, and special commitment. Payment shall be made from the designated accounts to the beneficiaries following the BRD procedures and the Project Implementation Manual.



Figure 20. Flow of Funds under the Project

146. **Financial reporting.** Unaudited IFRs shall be prepared by EDCL and BRD for their components and submitted to the World Bank semi-annually. The IFRs shall be in format and content as discussed and agreed with the World Bank under the Rwanda portfolio and the reports shall be submitted within 45 days after the end of the related six-month period. In addition, monthly reports shall be prepared by EDCL and submitted to MINECOFIN for internal monitoring purposes.

147. **Internal audit arrangements.** The internal units established in various government ministries, departments, and agencies continue to provide regular internal audit oversight, although there have been challenges on follow-up of audit recommendations by the audit committees.

148. **External audit arrangements.** The Office of the Auditor General (OAG) has been effective in conducting annual audits of the financial statements of government agencies and making recommendations on measures to strengthen financial controls, accountability, and fiscal discipline. In this regard, the OAG will audit the project activities undertaken by EDCL and BRD, and a copy of the audited financial report together with the related Management Letter shall be submitted to the World Bank within six months after the end of the fiscal year to which it relates.

149. **The project FM risk is considered Substantial.** Key risks identified are as follows: (a) staffing gaps in FM and internal audit to absorb the additional workload generated by the project, (b) unreliable reporting, (c) FM staff turnover arising from the short duration of contracts (1 year in the BRD and 2 years at EDCL), and (d) inadequate and delayed implementation of the OAG recommendations. Additional risks may be identified during the FM assessment at appraisal.

150. **The proposed risk mitigation measures are as to** (a) Develop detailed FM guidelines for the project as part of the Project Implementation Manuals of EDCL and BRD, (b) recruit for EDCL and BRD additional experienced FM and internal audit staff with terms of reference to be agreed with the World Bank, (c) review contract durations of staff if possible, and (d) enroll the project into the IFMIS.

(ii) Procurement

151. Procurement for the proposed project will be carried out in accordance with the 'World Bank Procurement Regulations for Borrowers under Investment Project Financing', dated July 1, 2016, and updated November 2017 and August 2018, hereafter referred to as 'Procurement Regulations'. The project will be subject to the World Bank's Anticorruption Guidelines, dated July 1, 2016, and beneficiary disclosure requirements.

152. A Project Procurement Strategy for Development (PPSD) has been developed to understand the project implementation context, market situations, and associated potential risks to achieve value for money and the PDOs. The PPSD sets out the selection methods to be followed in the procurement of goods, works, and non-consulting and consulting services financed under the project. The PPSD describes the overall project operational context, market situations, implementing agencies' capacity and will identify possible procurement risks and mitigation measures. Following the market analysis, based on information obtained from the industry, and the implementing agencies' experience, the PPSD will advise whether there is risk of supply market or not. The underlying Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

153. **PPSD scope.** The PPSD focuses on EDCL's part of the project, that is, Components 1, 2, and 4. Component 3, implemented by the BRD, involves only financial intermediation and is therefore not part of the PPSD.

154. **PPSD readiness.** The PPSD has been completed and reviewed. It includes the Procurement Plan for the first 18 months of the project.

155. **Systematic Tracking of Exchanges in Procurement (STEP).** The proposed project will use STEP, a planning and tracking system that will provide data on procurement activities, establish benchmarks, monitor delays, and measure procurement performance.

156. A procurement capacity and risk assessment has been carried out by the World Bank for EDCL, the implementing agency of Components 1, 2, and 4. Though EDCL has adequate experience in project implementation, there are prevailing risks that need to be mitigated. The major project procurement risks and mitigation measures are as follows:

(a) **Risk.** Procurement under staffing: the existing three procurement staffs not adequate to manage the project procurement in addition to their current workload.

Mitigation. EDCL and its performance can be strengthened by (i) hiring more procurement staff, (ii) establishing a consultants' and contractors' performance monitoring system and agreeing on defined key



performance indicators (KPIs), and (iii) regulating supervision and implementation support from the World Bank team.

(b) **Risk.** Lack of experience with the World Bank procurement regulation as this is the first project which EDCL will be implementing using World Bank Procurement Regulations.

Mitigation. A series of training will be conducted at the project initial stage.

(c) **Risk.** Lack of experience on Operational Procurement Review Committee (OPRC) contract management.

Mitigation. Training on OPRC will be conducted for staff by individual consultants to be hired under the project.

(d) **Risk.** Less competitive bids due to introduction of OPRC project delivery system.

Mitigation. Adequate publicity (wider advertisement) will be conducted to attract more bidders, including informing diplomatic missions/embassies about the potential procurement opportunities and carefully designing bidding document and qualification requirements to ensure they are not restrictive.

(e) **Risk.** Extreme weather/intense rainfall/landslides due to climate change.

Mitigation. The risk will be mitigated by ensuring appropriate designs and work plans by contractors and adequate design review and monitoring by the consultant; while avoiding working during the rainy season in slide prone areas.

157. Though there are risks due to capacity, lack of experience on World Bank procurement regulation and OPRC, and extreme weather, with implementation of recommended mitigation measures and given extensive experience of the unit in project implementation, the project procurement risk is rated 'Moderate'. The first Procurement Risk Assessment and Management System was also carried out at Project Concept Note stage and project procurement risks are considered manageable and hence the procurement risk is rated 'Moderate'.

C. Legal Operational Policies

158. Operational Policy 7.50 (OP 7.50) of the World Bank, covering projects affecting international waterways, is applicable to this project because the project includes the rehabilitation of the Ntaruka HPP under Component 2, involving the use of the Lake Burera and Lake Ruhondo in Rwanda. The rehabilitation activities will be conducted on the Ntaruka HPP, which connects Lake Burera with Lake Ruhondo. Lake Ruhondo is connected to international waterways through a series of domestic rivers. Lake Ruhondo is the source of the Mukungwa River. The Mukungwa River merges with the Nyabarongo River, which empties in the Lake Rweru, shared between Rwanda and Burundi, and the Akagera River, which flows along the borders between Burundi-Rwanda, Rwanda-Tanzania, and Tanzania-Uganda, before emptying into Lake Victoria, which is part of the Nile River system.

159. **The Project falls under an exception to the riparian notification requirement under paragraph 7(a) of the policy.** Paragraph 7 of the policy specifies three exceptions to the requirement that the other riparian states be notified of the project. The exception under paragraph 7(a) applies: "For any ongoing schemes, projects involving additions or alterations that require rehabilitation, construction, or other changes that in the judgment of the Bank (i) will not adversely change the quality or quantity of water flows to the other riparians; and (ii) will not be adversely affected by the other riparians' possible water use. This exception applies only to minor additions or alterations to the ongoing scheme; it does not cover works and activities that would exceed the original scheme, change its nature, or so alter or expand its scope and extent as to make it appear a new or different scheme." The rehabilitation of the Ntaruka HPP will involve (a) minor civil repair works to improve dam safety and (b) repair and replacement of mechanical and electromechanical components to modernize the power plant and restore the capacity to original design capacity. There will be no additional use of water and no change in water quality. Therefore, the works to be funded under the project will neither (a) adversely change the quality or quantity of water flows to the other riparians nor (b) be adversely affected by the other riparians' possible water use. Rather, the project will lead to more efficient use of water and may improve water quality (due to reduced oil leakage from replaced electromechanical equipment) and enhance dam safety without any adverse impact on the quality and quantity of international waters.

160. **Other relevant international agreements.** Rwanda is a signatory of the 2003 Protocol for Sustainable Development of Lake Victoria of the East African Community. This protocol, which is also signed by Burundi, Kenya, Tanzania, and Uganda does require notification only for planned measures which may have adverse effects on other countries. Activities financed by this project do not trigger the notification obligation of the protocol.

	Triggered?
Projects on International Waterways OP 7.50	Yes
Projects in Disputed Areas OP 7.60	No

D. Environmental and Social

161. **The project is the first in Rwanda's energy sector to apply the new ESF of the World Bank.** The project's environmental and social (E&S) risk rating is Substantial as per the appraisal Environmental and Social Review Summary (ESRS). Though the project is deemed to deliver positive E&S impacts, some of the proposed activities under the project may results in adverse impacts. Those include rehabilitation of hydropower, construction of medium-voltage power distributions lines, and distribution of off-gird SHS and improved and clean cookstoves. The project also considers TA that involves sector performance improvements and forward-looking options for sector development and policy and regulatory improvement and entrepreneurship development which may have direct and/or indirect E&S impacts and risks. In compliance with the new ESF, EDCL in consultation with the World Bank has carried out an E&S assessment of the project and proposed proportionate mitigation measures (see Table 12) in a manner consistent with the Environmental and Social Standards (ESSs) and satisfactory to the World Bank.

162. **ESF instruments.** ESF instruments comprising the Environmental and Social Management Framework (ESMF; disclosed on July 20, 2020)⁴⁵, the Resettlement Policy Framework (RPF; disclosed on July 2, 2020, updated and re-disclosed on August 12, 2020),⁴⁶ the Labor Management Plan (LMP; disclosed on July 2, 2020, updated and re-disclosed on August 12, 2020)⁴⁷, the Stakeholder Engagement Plan (SEP;

⁴⁵ https://www.reg.rw/fileadmin/user_upload/Environmental_and_Social_Management_Framework_-

_Rwanda_Energy_Access_and_Quality_Improvement_Project__EAQIP_.pdf

 $^{^{46}\,}https://www.reg.rw/fileadmin/user_upload/Resettlement_Policy_Framework_for_RW_EAQIP_P172594_.pdf$

⁴⁷ https://www.reg.rw/fileadmin/user_upload/Final_Labor_Management_Procedure_for_RW_EAQIP_P172594_-Aug_2020_1_.pdf

disclosed on July 14, 2020)⁴⁸, and the Environmental and Social Commitment Plan (ESCP) were prepared to manage the E&S risks of the project. In addition, EDCL will prepare, submit to the Association, and disclose, in a form and substance acceptable to the Association, a revised written audit report of the Ntaruka HPP, its appurtenance and its performance history, that reviews and evaluates the Ntaruka HPP's operation and maintenance procedures and provides findings and recommendations for any remedial work or safety-related measures necessary to rehabilitate Ntaruka HPP (the "Ntaruka HPP Audit Report"). EDCL will ensure that Ntaruka HPP Audit Report is prepared and completed by qualified independent experts, including at least one hydrologist, and finalized in accordance with the findings of the experts and comments provided by the Association to meet the requirements of ESS4, including all the information listed in ESS4, Annex 1, paragraph 14. The completion of the E&S audit for the Ntaruka HPP approval by the Association and disclosure is a disbursement condition for the subcomponent. Site-specific ESS instruments (such as Environmental and Social Impact Assessments [ESIAs], Environmental and Social Management Plans [ESMPs] and Resettlement Action Plans [RAPs] as required) for subprojects will be prepared as per the ESF instruments and implemented accordingly during project implementation.

163. **Stakeholder engagement.** The project will ensure early, continuous, and inclusive (including vulnerable/disadvantaged groups) stakeholder engagement which will be documented in an SEP and disclosed. This plan will address specific risks identified by stakeholders, including the risks to vulnerable persons, and so on) and will be updated as and when necessary. The objective is to establish a systematic approach for stakeholder engagement, maintain a constructive relationship with them, considering stakeholders' views, promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle, and ensure that appropriate project information is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner. The project will set up a project-specific grievance redress and feedback mechanism for people to report concerns or complaints if they feel unfairly treated or are affected by any of the subprojects.

164. The proposed implementation agencies EDCL and BRD both have experience in working with World Bank safeguards policies. The institutional arrangement for safeguards and E&S risk management and implementation will use the existing systems of EDCL and other relevant institutions, including regulatory bodies, at national, province, and district levels with discrete accountabilities and decision-making roles based on existing mandates. Currently, EDCL is implementing the electrification component of the RESSP and various safeguards instruments including ESMF, RPF, ESMPs, and RAPs are under implementation. As this operation is being prepared under the ESF, the implementation agencies will be offered an induction training related to the ESF and its ten standards. The capacity of EDCL for implementing the ESSs has been reviewed and the following recommendations have been shared: (a) building the capacity of dedicated E&S specialists at EDCL and hiring E&S officers at the district REG branches, (b) EDCL to hire a certified occupational health and safety (OHS) specialist for the program, (c) EDCL to assign dedicated expropriation clerks to the program, (d) use of a single ESMP and OHS Plan for all distribution lines, and (e) streamline payments for minor compensations and use national systems for low-level social impacts.

165. Gender-based violence (GBV) risk assessment: The GBV risk assessment indicates that the proposed project poses low GBV risks. To ensure that all potential GBV risks are assessed and addressed, EDCL has included assessment of sexual exploitation and abuse (SEA)/sexual harassment risks in the

⁴⁸ https://www.reg.rw/fileadmin/user_upload/Stakeholder_Engagement_Plan_-

_Rwanda_Energy_Access_and_Quality_Improvement_Project.pdf

project's ESMF and the subsequent risk management plans. The program preparation team will ensure that women get the opportunity for a meaningful contribution to the consultation process. The capacity of the project implementing agencies to mitigate and monitor SEA/sexual harassment risks and respond to allegations has been assessed and a project GBV grievance mechanism included in all the ESF project instruments under preparation. GBV prevention and response services will be mapped out in areas where the project will be implemented and clear referral protocols to quality service providers will be established in the SEP, RPF, ESMF, and LMP, should allegations be brought forward. REG will ensure that all project actors sign and are trained on Codes of Conduct prohibiting SEA/sexual harassment, and communities are informed about their obligations under the Codes of Conduct. A grievance redress mechanism (GRM) has been established in the SEP and LMP for the program with multiple entry points to initiate complaint of SEA/sexual harassment, (including anonymous reporting) and establish reporting and referral protocols to GBV support services. The project beneficiaries will be adequately informed of opportunities for reporting and seeking redress for SEA/sexual harassment, as part of the GRM.

166. **COVID-19-related measures.** EDCL will ensure all project staff are properly equipped with personal protective equipment throughout the project implementation, in the event of a prolonged COVID-19 pandemic and other potential infectious diseases.

ESS	Risks and Mitigation Measures
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	The potential E&S risks and impacts are related to construction of power distributions lines, rehabilitation of the old Ntaruka HPP, and distribution of SHS and clean cooking solutions. The major risks and impacts include significant OHS issues including management of oils and lubricants for turbines, transformers, and support infrastructures, and management of lead/acid batteries. There are also potential risks and impacts on biodiversity, natural resources, and/or cultural heritage and related community health and safety risks because of civil works related to construction and rehabilitation. The TA component comprising policy and regulatory improvement may have direct and/or indirect E&S risks and impacts. The project has prepared ESF instruments (ESMF, RPF, SEP, LMP, and ESCP) to manage these risks and impacts. The project sites are identified, site-specific ESSs instruments (ESMPs/ ESIA/ RAP as required) for subprojects will be prepared, implemented, and monitored according to the ESF instruments during the project implementation. Each ESMP will incorporate a solid waste management plan, an LMP, and/or an OHS plan as required.
ESS2: Labor and Working Conditions	Anticipated key labor risks and impacts are mainly associated with the planned construction works and investments related to improving grid stability and operation efficiency, including Ntaruka HPP rehabilitation. There may be risks of child labor associated with the use of local labor. Due to the discrete nature of these activities, labor camps and influx are not anticipated. To ensure health and safety of workers, a Health, Safety, and Environmental Plan in line with Good International Industry Practice and EHS Guideline for Electric Power Transmission and Distribution will be prepared as part of each ESIA/ESMP. Also, the project has prepared LMPs that set out the way in which project workers will be managed including a Code of Conduct to mitigate GBV-related risks according to the national laws and the World Bank ESS2 requirements.
ESS3: Resource Efficiency and	Potential risks and impacts include (a) pollution in relation to management of oils and lubricants for turbines and transformers, solar batteries and panels, and construction/rehabilitation activities and (b) environmental damage due to civil works and

Table 12. Summary of ESS Risks and Mitigation Measures



ESS	Risks and Mitigation Measures
Pollution Prevention and Management	related extraction of excess sands and gravels), waste, and domestic waste. Also, the TA part, including the policy and regulatory development/improvement activity may have an impact on resource efficiency and pollution management. Conversely, the project will have significant positive impacts to improve access to energy and efficiency of energy services delivery. The off-grid solar power and clean cooking component will also contribute to Rwanda's priority mitigation actions, GHG emission reduction, and the reduction of deforestation and forest degradation and indoor air pollution. The project has prepared the ESMF, SEP, and ESCP to manage the risks and impacts, which will be further detailed in site-specific ESIAs/ESMPs for subprojects during the project implementation.
ESS4: Community Health and Safety	Anticipated community health and safety risks are related to increase in crime, prostitution, GBV, and other related social risks. The project could also contribute to potential structural safety risks such as electric shocks during connections, and road accidents due to increased number of vehicles during construction/rehabilitation. There will be also potential risks and impacts to community health and safety related to generation of wastes, noise, and dust related to construction/rehabilitation works; and transportation and operation of solar batteries (for example, fire and explosion risks); and recycle/disposal of used solar batteries containing hazardous waste and solar panels. The project has prepared the ESMF (comprising guidelines for management of solar batteries and panels, application of World Bank Group EHS Guidelines for Electric Power Transmission and Distribution, and Electromagnetic Interference and Electrocution), RPF, SEP, and ESCP to manage these risks and impacts, which will be detailed in site-specific ESIAs/ESMPs for subprojects during the project implementation. The E&S audit for Ntaruka HPP rehabilitation is also under way.
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	The project will involve civil works in on-grid connection for a portion of the currently unelectrified households across different parts of the country. These activities will involve expropriation and restriction on land use. Resettlement impacts are mainly expected to be temporary and largely economical. No voluntary land donation is anticipated under this project. The project has prepared an RPF that gives guidance to the implementing agencies during project implementation on how to deal with resettlement and expropriation issues. In addition to the RPF, the client has prepared an ESMF, SEP, and ESCP (comprising specific gendered social assessment). The preparation of Ntaruka's E&S audit is under way to identify legacy risks and prepare remedial actions for implementation.
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	The proposed investments related to construction of power distribution lines and rehabilitation of Ntaruka HPP could have potential risks and impacts on biodiversity conservation and sustainable management of living natural resources. The Ntaruka HPP rehabilitation could have potential impacts on aquatic biodiversity/living natural resources and ecological flows. The TA related to policy and regulatory improvement may have direct/indirect impacts on ESS6. Also, the clean cooking solutions may have impacts on forest and other resources if biomass sources and other supply chains are not properly identified and managed in a sustainable manner as per the GoR's laws and World Bank ESSs. The project has prepared an ESMF, SEP, and ESCP to manage these risks and impacts, which will be detailed in site-specific ESIAs/ESMPs for subprojects during the project implementation. The E&S audit for Ntaruka HPP rehabilitation is also under way with an objective to identify legacy risks and propose feasible remedial measures for implementation.
ESS7: Indigenous Peoples/Sub- Saharan African	This social standard is not applicable to this project as Rwanda does not have indigenous people or historically underserved traditional community in the proposed project implementation areas.



ESS	Risks and Mitigation Measures
Historically Underserved Traditional Local Communities	
ESS8: Cultural Heritage	Although no impacts to cultural heritage are anticipated, the project has included 'chance finds procedure' in the ESMF if previously unknown cultural heritage is encountered during the project implementation stage, which will be also included in the site-specific ESIAs/ESMPs for subprojects and in all contracts relating to construction or rehabilitation works.
ESS9: Financial Intermediaries	ESS 9 is not relevant for this project at this stage
ESS10: Stakeholder Engagement and Information Disclosure	The project has prepared an SEP that identifies the key stakeholders and the approaches to be used to consult with them and ensure their participation throughout the project cycle. It contains a summary of the consultations held during the preparation and a comprehensive list of stakeholders. It also sets clear procedure for establishing a project-specific GRM proportionate to the potential E&S risks and impacts of the project.

Note: EHS = Environmental Health and Safety.

E. Gender

167. **Rwanda has shown strong political will and target-driven gender policies**. For example, the Economic Development and Poverty Reduction Strategy⁴⁹ focused on sector strategies that enable women and men to participate, access, control, and benefit equally from growth processes in a way that recognizes their different needs with regard to access to finance, exposure to GBV, and control of assets. Despite declining poverty levels, female-headed households are still more likely to be poorer than male. While women's labor force participation and unemployment rates are similar to men's, the quality of employment is lower.⁵⁰ Women are rarely represented in the ranks of managers, professionals, and other high-paid jobs and are overrepresented in low-paying or unpaid jobs.⁵¹ According to the United Nations Development Programme's estimates, the female gross national income (GNI) per capita amounts to 77 percent of the male GNI.⁵²

168. However, several gender gaps persist in the energy sector in Rwanda:

(a) **Gender gaps in energy access.** Nationwide, female-headed households show lower access rates for both grid and off-grid electricity. EICV5 data indicate that only 19 percent of household electricity connections are to female-headed households, who represent 25 percent of all households. Similarly, the

⁵¹ Rwanda Systematic Country Diagnostic (SCD).

⁴⁹ MINECOFIN. http://www.minecofin.gov.rw/fileadmin/templates/documents/NDPR/EDPRS_2.pdf.

⁵⁰ Occupational gender segregation is often due to explicit and implicit gender biases, negative stereotypes, limited exposure, and social norms at school and home, circumventing opportunities for enrollment and retention in, for example, Science, Technology, Engineering, and Mathematics (STEM) subjects. Women who do enter STEM professions are likely to face a host of challenges, including (a) gender stereotypes and norms, (b) explicit or implicit biases in the workplace, (c) lack of mentors, (d) limited networks due to small numbers of women working in the sector, (e) issues maintaining work-life balance and the care burden, (f) gender wage gaps, and (g) sexual harassment and safety concerns, among others.

⁵² The 77 percent is obtained by dividing the estimated GNI per capita, female (2011 purchasing power parity \$) 1,708 by estimated GNI per capita, male (2011 purchasing power parity \$) 2,218. http://hdr.undp.org/en/countries/profiles/RWA.

MTF survey⁵³ reveals a gender gap in access to electricity in general, including off-grid electricity. As of 2016, only 21 percent of female-headed households have access to any source of electricity, against 31 percent for male-headed households. In urban areas, female-headed households have significantly lower access to the grid than their male counterparts but are more likely to have off-grid solutions, mainly solar lanterns or solar lighting systems. In rural areas, female-headed households have poorer access to both on-grid and off-grid electricity.

(b) **Quality of electricity supply gap.** A total of 80.3 percent of female-headed households are in Tier 0 for access to electricity, compared with 70.9 percent of male-headed households. In Tiers 1–5, the share of male-headed households is higher than the share of female-headed households, and the gap is wider in higher tiers. The gender gap for Tier 0 is wider in urban areas, where most households are connected to the grid, than in rural areas or nationwide. Female-headed households have a much harder time connecting to the grid than male-headed households do.

(c) **Health and time burden gaps:** In line with the fact that women are the main cooks in 78 percent of households, they also suffer more from health issues associated with indoor air pollution: 12.4 percent of women age 15 or older experienced cough in the last 14 days, compared with 3.6 percent of men age 15 or older. Similarly, 5 percent of young girls under age 15 experienced cough in the last 14 days, compared with 3.5 percent of young boys under age 15. Similarly, in rural areas, women spend an average of 80 minutes a day acquiring fuel, compared with 40 minutes for men. In urban areas, time spent acquiring fuel is halved, but the gap between men and women remains. Women who use an improved cookstove spend an average of 61 minutes a day acquiring fuel, compared with 81 minutes for women who use a three-stone stove and 78 minutes for women who use a traditional stove.

(d) Affordability gaps. The main driver of the gap in energy access is affordability, reflecting that female-headed households are on average poorer than male-headed households in Rwanda. For 60.7 percent of female-headed households and 52.4 percent of male-headed households, the main barrier that prevents them from connecting to the grid is the high connection cost. About 69.5 percent of femaleheaded households are not willing to pay for the connection fee under any given terms, compared with 40.1 percent of male-headed households. The results may be because fewer female household heads (76 percent) than male household heads (90 percent) are employed. The gender gap in WTP indicates that gender-targeted financing mechanisms are required to increase grid connections for female-headed households. WTP for an off-grid solar solution that allows a household to reach Tier 1 for access to electricity is significantly lower for female-headed households (63.2 percent) than for male-headed households (43 percent). These findings point to differences in income and therefore affordability constraints regarding the connection cost. The Government's measures to improve affordability of electricity under EAQIP, including connection subsidies and the focus on off-grid electrification to areas with higher shares of low-income households, are expected to reduce this gender gap. With regard to clean cooking, female-headed households are more likely to use a three-stone stove than male-headed households are, and male-headed households are more likely to use a traditional stove than femaleheaded households are. Female- and male-headed households are nearly equally likely to use an

⁵³ Koo, Bonsuk, Dana Rysankova, Elisa Portale, Niki Angelou, Sandra Keller, and Gouthami Padam. 2018. *Rwanda - Beyond Connections: Energy Access Diagnostic Report Based on the Multi-Tier Framework (English)*. Washington, DC: World Bank. http://documents.worldbank.org/curated/en/406341533065364544/Rwanda-Beyond-connections-energy-access-diagnostic-report-based-on-the-multi-tier-framework.

improved cookstove, despite the higher stove price. Similarly, female-headed households are less willing to pay for an improved cookstove than male-headed households are, especially at the full price of RWF 3,000. While WTP increases when a payment plan is offered, 25 percent of female-headed households will not pay for a cookstove under any given terms, compared with 19.3 percent of male-headed households. For female-headed households, WTP increases significantly if the price of the improved cookstove is reduced to RWF 1,000: 83.5 percent will pay upfront or with a payment plan of 6 or 12 months. Gender-targeted subsidies for improved cookstoves could significantly improve access to improved cookstoves.

(e) **Gaps in access to financing.** Gaps in affordability are partially linked to gaps in access to financing. Initial analysis on gender gaps related to financial services in Rwanda indicate that female applicants account for 29.3 percent and male applicants for 59.9 percent of the loan beneficiaries by volume (considering savings and credit cooperatives and banks). For savings and credit cooperatives, female applicants account for 25.6 percent and male applicants for 63.2 percent of the loan beneficiaries by volume. In addition, onlending by banks to female applicants currently stands at 20.7 percent versus 79.3 percent for male applicants.

(f) **Gender gaps in employment in the energy sector.** REG has conducted a baseline assessment of institutional gender gaps (out of 1,153 REG staff, 208 are female) and the formalization of gender focal points at REG. Based on a workshop in March 2018, REG management adopted an action plan that will reduce the gender gap and ensure a harassment-free environment. No baseline data exist for female employment in the off-grid and clean cooking sectors.

169. EAQIP incorporates three levels of gender actions:

(a) At the project design level, several measures are introduced to ensure affordability of electricity access and clean cooking solutions to address the lower-than-average income level of female-headed households. These measures include connection subsidies for grid customers and the ability to pay the remaining connection fee over time, results-based subsidies for off-grid connections, promoting pay-as-you-go (PAYG) type business models for off-grid that allow consumers to pay over time, and targeted incentives in the clean cooking RBF.

(b) At the project implementation level, EDCL has put together a Gender Action Plan for EAQIP, included as annex 4 to this Project Appraisal Document, which focuses on closing gender gaps in energy access and employment in the energy sector. The Gender Action Plan includes, among others, the following actions:

• **Public awareness activities with large participation from women stakeholders**, to ensure that female-headed households and female beneficiaries in general, can benefit from electricity connections and clean cooking solutions under the project, and to ensure strong participation of women in community decisions related to the project. The Gender Action Plan also includes awareness raising among communities on the role of men and women in domestic energy management, such as firewood collection.

• **Promoting employment by contractors and companies benefitting from RBF,** with a target of reaching at least 10 percent female employees at various project roles without any pay gap. To

achieve these objectives, EDCL and the BRD will adopt good labor practice, such as setting a female workforce quota for procurement packages and project staff.

• Promoting female entrepreneurship in clean cooking through TA and training on entrepreneurship and, if necessary, improvements in policy and regulatory environment. As part of the TA and training, the project is planning targeted training for women entrepreneurs in the clean cooking space; both for what concerns management and technical skills and matters related to the clean cooking supply chain (and opportunities in the various aspects of stove technology, fuel provision, customer care, and after-sale services), as well as related to financial literacy and opportunities (access to formal channels of credit, provision of collaterals for bank loans, access to cooperatives, leasing and other instruments, and so on). The TA component will also review the policy and regulatory environment as it relates to female entrepreneurship and will propose adjustments as necessary. Relevant gaps related to this are the limited access to, and high cost of financing for women and potentially non-land asset based lending as a way to encourage more women to invest.

• **Capacity building for project staff on infectious diseases** (for example, SEA, violence against children [VAC], and GBV; see above for details).

(c) At the sectoral level, MININFRA has adopted an Infrastructure Gender Mainstreaming Policy outlining how the sector will strive to mainstream gender in its policies, plans, processes, programs, and projects from 2017 to 2022. Key priorities include, for example, strengthening institutional and human resource capacity for gender equality promotion in the infrastructure sector, enhancing the gender responsiveness in infrastructure subsectors, and improving access to job opportunities and earnings for women from different infrastructure investments. Occupational gender segregation is often due to explicit and implicit gender biases, negative stereotypes, limited exposure, and social norms at school and home, circumventing opportunities for enrollment and retention in, for example, STEM subjects. For women who do enter STEM professions, they are likely to face a host of challenges, including, among others, (i) gender stereotypes and norms, (ii) explicit or implicit biases in the workplace, (iii) lack of mentors, (iv) limited networks due to small numbers of women working in the sector, (v) issues maintaining work life balance and the care burden, (vi) gender wage gaps, and (vii) sexual harassment and safety concerns.

170. The objectives of the gender actions under the project are reflected in the Results Framework and monitoring arrangements.

(a) The project aims to achieve that 25 percent of household electricity connections are to femaleheaded households, compared to a baseline (from EICV5 data) of only 19 percent. This reflects the projectdesign elements mentioned as well as the awareness raising efforts under the project implementationrelated elements.

(b) The project aims to achieve 15–20 percent female employees at various project roles without any pay gap, reflecting EDCL and the BRD adopting good labor practice, such as setting a female workforce quota for procurement packages and project staff.

F. Citizen Engagement

171. The GoR prioritizes accountability to citizen feedback in the electricity sector. All new regulations in the sector are subject to public commenting period and are discussed in stakeholder workshops. Besides the measures outlined in the project-specific SEP, the following actions are taken by the relevant institutions under the project:

- (a) To inform its grid electricity service, REG conducts annual customer satisfaction surveys and will start publishing these starting in 2020 under the new RUEAP. The publication is reflected in the Results Framework.
- (b) The design of the RBF mechanisms for off-grid and clean cooking will be subject to regular reviews that will incorporate household feedback, to be gathered as part of the awareness campaign activities that are being implemented for both subcomponents, and customer surveys that will be carried out by REG for components 1 and 3 of the project.

V. GRIEVANCE REDRESS SERVICE

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

VI. KEY RISKS

www.inspectionpanel.org.

173. **The project has been assessed to have an overall Substantial risk.** The key risks and mitigation measures are outlined in the following paragraphs.

174. **Macroeconomic risk (Substantial).** The main macroeconomic risk is a rapid decline in fiscal space that would impede the delivery of critical infrastructure services in the long run. The fiscal deficit is forecast to reach more than 11.6 percent of GDP in 2020 (up from 8.1 percent in 2019), as a result of structurally high public investments and reduced revenues due to the COVID-19 pandemic. Public debt (including public sector guarantees) is projected to reach 68 percent of GDP in 2020. In the Debt Sustainability Analysis (DSA) released in June, the deterioration in the prospects for Rwanda's output and export growth, coupled with an increase in borrowing needs due to the pandemic, led to a change in the risk rating of debt distress from "low" to "moderate." There also is a significant risk associated with further deterioration in Rwanda's external accounts. The current account deficit (CAD) widened by 9.2 percent of GDP in 2019 and is projected to increase further in 2020 as a result of COVID-19. The exchange rate could come under pressure if the COVID-19 crisis is prolonged, which would continue to depress not only traditional exports but also the key strategic sectors of travel and tourism receipts (about 20 percent of



Mitigation. The macroeconomic risk is mitigated to some extent by Rwanda's commitment to incurring mostly concessional debt and the pursuit of a sound fiscal policy, supported by an active International Monetary Fund (IMF), program. In accordance with the Policy Coordination Instrument program with IMF, the Government intends to reduce the fiscal deficit to 6.6 percent of GDP in 2022. Furthermore, the proposed World Bank Human Development DPO fiscal pillar supports maintaining long-term fiscal sustainability and a low level of public and publicly guaranteed external non-concessional debt through strengthening transparency, fiscal risk assessment, and reforms in public investment management. The proposed project, along with GOR's investment considered in the ERP to improves access and quality of energy, should also contribute to mitigating the macroeconomic risk by spurring growth and accelerating the recovery in medium to long term. Despite these mitigating factors, macroeconomic risks are assessed as substantial because of uncertainties related to the magnitude and duration of the crisis and its fiscal implications for Rwanda.

175. **Technical design of project (Substantial).** The design of the project's Component 1 on increasing grid access is based on sound technical analysis incorporating geospatial planning, that incorporates lessons learned from the last decade of implementing grid access projects. The technologies are simple and widely used and the implementing agency will adopt the concepts that have worked before. EDCL has been implementing grid access for the last decade. Similarly, the designs of Component 2 on distribution strengthening are simple and based on technical studies carried out by the utility. The utility has also been implementing similar activities under the ongoing World Bank-funded RESSP. The risk that implementation will be hampered by the design of Components 1 and 2 is low. The design risk is higher for Component 3 (RBF for off-grid solar solutions and clean cooking solutions), as the project is supporting the private sector in markets or market segments that are relatively new and unproven for commercial sales. The project will have to carefully design and adjust incentives to (a) make sure RBF payments are financially attractive for commercially operating companies, (b) avoid market distortions, and (c) keep the complexity of the scheme limited to avoid too high transaction costs.

Mitigation. To ensure that the design of Component 3 is as robust as possible at the project approval stage, extensive consultations with stakeholders have been held, including a series of consultations with the off-grid sector and a clean cooking workshop held as a part of the project preparation. The design aims to build on the mechanisms that have worked globally and, in the region, and draws as much as possible on the local implementation experience of pilot operations in the two markets, most notable the EnDev RBF pilot launched in late 2019. Further mitigations measures include incorporating flexibility in the design and leaving room for adjustment during the implementation stage.

176. **Institutional capacity for implementation and sustainability (Substantial).** EAQIP has been designed, timed, and included in the RUEAP to assist the Government to reach the NST1 goals for 2024. The size of the program is very large, and the timing of the program gives only four years to the NST1 target dates of 2024. The Government's readiness to implement the program is critical, as delays in start of implementation of the program would pose a substantial risk that the program will not serve the purpose of supporting the Government to reach its NST1 targets within the desired time frame. Although EDCL has been handling large complex projects and has demonstrated reasonable ability to implement

large programs in the energy sector, it is already implementing a high volume of projects, and its capacity to implement the additional project/program at the current level of staffing is constrained. It has also been observed that EDCL lacks some crucial skills like contracts management that may put the project at risk. The BRD is handling the REF Project and has demonstrated understanding and capability to implement the rollout of support to the off-grid sector, they are yet to demonstrate their ability to ably implement an RBF program in the energy sector. The BRD has not handled clean cooking programs either.

Mitigation. First, the program implementation structure has introduced a PCU, which will consist of an outsourced experienced set of resources to support EDCL in the program implementation. The PCU will include the overall program management coordination, including capacities that require reinforcement, for example, contracts management. The PCU is directly answerable to the Managing Director of EDCL, who is responsible for the success of the project. The EDCL PCU will also hire additional operational staff to support the project. Second, the implementation structure has introduced a high-level Steering Committee, chaired by the permanent secretary of either MININFRA or MINECOFIN, and observed by the participating development partners, to continuously monitor the progress of the program and provide strategic guidance to help in progressing speedy implementation of the program. The successful history of stakeholder (including donor) involvement and follow-up of sector projects and results is replicated in the project design and will continue to support the Government in achievement of sector results. Third, the World Bank has agreed with the Government on the use of advance procurement and retroactive financing as a tool for them to begin procuring goods and services that can potentially be financed by the project once it becomes effective. This gives the Government an opportunity to get a head start on procuring implementation lots to be financed by the project ahead of project approval and effectiveness. Additionally, the EDCL has put together a PPSD, which includes the Procurement Plan for the first 18 months of the project. Component 1 of the project (grid access), which constitute the bulk of EAQIP financing, is already defined by the NEP and different line routes and lots are already laid out. The EARP, which is in existence and rolling out grid access, has the resources to begin procurement of lots for grid access rollout. This places the Government in a position to quickly put together bidding documents and start procurement processes for Component 1. Additionally, EDCL has implemented grid access rollout for a decade through EARP/EDCL and is adequately resourced to start the procurement process for several lots, even before the PCU is in place. Similarly, Component 2 activities have already been designed and bills of quantities are in place for each of the subcomponents. The subcomponent comprising smart meter procurement and rollout is an extension of an ongoing activity with the World Bankfinanced RESSP, so EDCL is in a good place to procure and implement the subcomponent.

177. **Environmental and Social (Substantial).** The project's E&S risk rating is Substantial with the Environmental risk rating being Substantial and Social risk rating being Moderate. The Environmental risk rating is substantial considering the civil works related to the MV power distributions lines and Ntaruka HPP rehabilitation which could have potential risks and impacts on biodiversity, natural resources, and/or cultural heritage. There are also potential OHS issues such as management of oils and lubricants for turbines, transformers, and support infrastructures. There are also potential E&S risks related to SHSs which include waste management issues comprising storage and final disposal of used batteries containing hazardous waste, recycling/disposal of solar panels, and related OHS issues such as fire and explosion risks. The project also entails TA that involves sector performance improvements and policy and regulatory improvement which may have direct and indirect E&S risks. Regarding specific social risks, the



investment in grid connections is likely to involve compensation requirements for affected assets such as crops and trees; hence, there may be delays especially in the expropriation payments. There may be risks of child labor associated with the use of local labor as well.

Mitigation. ESF instruments (ESMF, RPF, SEP, LMP, and ESCP) have been prepared to manage E&S risks of the project. The preparation of an E&S audit for Ntaruka HPP rehabilitation is under way to identify and manage legacy risks associated with it, including dam safety plans requirements. In addition, site-specific E&S instruments (ESIAs, ESMPs, and RAPs as required) for subprojects will be prepared and implemented during the project implementation. In relation to civil works, EDCL shall commit to require civil works contractors to develop contractor ESMPs as per the ESMF and site-specific ESMPs/ESIAs and enforce their implementation in a manner consistent with the ESSs and satisfactory to the World Bank.

178. Other: COVID-19 pandemic (Substantial). The energy sector in Rwanda is expected to be deeply affected by the COVID-19 pandemic at a time when maintaining reliable electricity services will be critical to ensure public service delivery, to partially mitigate the economic slowdown and to ensure that the gains in energy access for the poor are sustained. The measures taken to contain the spread of the pandemic will restrict the utility's ability to restore supply disruptions. In addition, a decline in electricity demand and the ability of consumers to pay electricity bills will deteriorate the utility's financial situation, further affecting its ability to maintain reliable electricity supply. This will compound the impact of the crisis on the industrial and commercial activities, and on the delivery of health care and other essential public services that depend on electricity, causing ripple effects across the economy and society. The supply of off-grid electricity will also be strongly hampered as the low-income households, affected by the crisis, will find it hard to make payments to service providers. Besides, the off-grid electricity services providers are also typically small firms with little access to credit facilities and fragile supply chains. Many of them may not survive the financial impact of the crisis to sustain operation post-crisis. Timely financial intervention in the energy sector will be imperative to maintain reliable supply of grid electricity, mitigate the impacts on off-grid electricity services, and ensure that the sector is stable to jump-start post-crisis recovery of the economy.

Mitigation. The GoR has taken prompt actions to mitigate the impact of the pandemic, including launching an ERP, which provides a blueprint for recovery in the hardest hit sectors, resumption of productive activity, and safeguarding of employment. The ERP takes infrastructure development as a critical sector that could catalyze broader economic recovery through boosting productivity and has the potential to contribute significantly to creation of immediate jobs. The ERP includes a strong focus on further investment in energy access including connecting 350,000 households to grid electricity during the FY2020/21, more than double the recent rate of connections, and connecting 100,000 households using off-grid solutions. The World Bank has also stepped in in supporting the crisis mitigation efforts of the GoR through supplemental financing of US\$100 million (P173882) to the Rwanda Energy Sector DPO, approved on May 1, 2020. Additionally, under the CPF, it was agreed with the authorities that should the situation warrant considerable changes to the Government's strategy and its program with the World Bank Group, the Performance and Learning Review) will be brought forward to accommodate such changes. Importantly, while the countrywide lockdown has been eased since May 2020, localized case surges have led to lockdowns in specific regions. In the event of a large surge in cases leading to lockdown in project areas, the project implementation may be delayed.



Results Framework

COUNTRY: Rwanda Rwanda - Energy Access and Quality Improvement Project

Project Development Objectives(s)

Improve access to modern energy for households, enterprises, and public institutions and enhance the efficiency of electricity services in the Republic of Rwanda.

Project Development Objective Indicators

Indicator Name	PBC	Baseline	End Target				
Improved access to modern energy for households, enterprises, and public institutions							
People provided with new or improved electricity service (CRI, Number)		0.00	1,634,000.00				
Enterprises provided with new or improved electricity service (Number)		0.00	17,000.00				
Public institutions (clinics, schools, and administrative centers) provided with new or improved electricity service. (Number)		0.00	51.00				
People provided with new or improved access to clean cooking solutions (Number)		0.00	2,150,000.00				



Indicator Name	PBC	Baseline	End Target
Reduction of net CO2 emissions through off-grid electrification and clean cooking solutions (Metric ton)		0.00	1,400,000.00
Enhanced efficiency of electricity service			
Reduced voltage fluctuations in Rwanda's backbone transmission lines. (Percentage)		0.00	50.00
Generation capacity of energy constructed or rehabilitated (CRI, Megawatt)		0.00	11.25
Hydropower generation capacity rehabilitated under the project (CRI, Megawatt)		0.00	11.25

Intermediate Results Indicators by Components

Indicator Name	PBC	Baseline		End Target				
			1	2	3	4		
Increasing access to grid electricity								
Households provided with new or improved access to grid electricity (Number)		0.00	46,000.00	92,000.00	138,000.00	184,000.00	230,000.00	
of which: female-headed households (Percentage)		0.00	24.80	24.80	24.80	24.80	24.80	



Indicator Name	PBC	Baseline		End Target			
			1	2	3	4	
Kilometers of MV lines constructed under the project (Kilometers)		0.00	450.00	900.00	1,350.00	1,800.00	2,250.00
Kilometers of LV lines constructed under the project (Kilometers)		0.00	800.00	1,600.00	2,400.00	3,200.00	4,088.00
Distribution transformers installed (Number)		0.00	271.00	542.00	813.00	1,084.00	1,355.00
Share of female workers under contracts financed by Component 1 (Percentage)		0.00	10.00	10.00	10.00	10.00	10.00
Enhancing the Efficiency of Elec	ctricity	/ Service					
EUCL is able to measure the system losses in the main transmission and distribution network using smart meters. (Yes/No)		No	No	Yes	Yes	Yes	Yes
Substations equipped with static VAR compensators (Number)		0.00	0.00	1.00	2.00	2.00	2.00
Power stations with generation governing systems installed (Number)		0.00	0.00	1.00	2.00	2.00	2.00
Distribution transformers fitted with smart meters (Number)		0.00	600.00	1,200.00	1,800.00	2,400.00	3,000.00
Industrial/Commercial customers fitted with smart		0.00	800.00	1,600.00	2,400.00	3,200.00	4,000.00



Indicator Name	PBC	Baseline		End Target			
			1	2	3	4	
meters by the project (Number)							
Share of female workers under contracts financed by Component 2 (Percentage)		0.00	10.00	10.00	10.00	10.00	10.00
Increasing Access to Off-Grid E	lectrici	ty and Clean Cooking Solu	tions				
Households provided with new or improved access to off-grid electricity (Number)		0.00	30,000.00	60,000.00	90,000.00	120,000.00	150,000.00
of which: female-headed households ()		0.00					25.00
Households provided with new or improved access to clean cooking solutions (Number)		0.00	100,000.00	200,000.00	300,000.00	400,000.00	500,000.00
of which: female-headed households (Percentage)		0.00	25.00	25.00	25.00	25.00	25.00
Amount of private investment mobilized (Amount(USD))		0.00	3,800,000.00	7,600,000.00	11,400,000.00	15,200,000.00	19,000,000.00
Policies and regulations adopted by the government to support clean cooking market development (Number)		0.00	0.00	1.00	1.00	1.00	1.00
Share of female workers in enterprises financed by Component 3 (Percentage)		0.00	10.00	10.00	10.00	10.00	10.00
Technical Assistance, Institutio	nal Ca	pacity Building and Impler	mentation Support				



Indicator Name	PBC	Baseline		Intermediate Targets				
			1	2	3	4		
Impact evaluation studies conducted for the project (Yes/No)		No	No	No	Yes	Yes	Yes	
REG publishes its annual customer satisfaction survey results (Yes/No)		No	Yes	Yes	Yes	Yes	Yes	
Grievances received addressed (Percentage)		0.00	100.00	100.00	100.00	100.00	100.00	

Monitoring & Evaluation Plan: PDO Indicators							
Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection		
People provided with new or improved electricity service		Annual	For grid, EDCL PCU as connections are made. Verification reports submitted to	For grid, data collection by EDCL PCU as they distribute meters for connection. For off- grid, collection of verification reports from off-grid service	For grid, EDCL PCU. For off-grid, BRD PIU.		



			the BRD PIU from off- grid service providers for disbursemen t of the RBF.	providers for disbursement of the RBF.	
Enterprises provided with new or improved electricity service	Enterprises provided with new or improved access to electricity.	Annual	EDCL PCU as connections are made.	EDCL PCU as they distribute meters for connection.	EDCL PCU
Public institutions (clinics, schools, and administrative centers) provided with new or improved electricity service.	Clinics, schools, and administrative centers provided with new or improved access to electricity.	Annual	EDCL PCU as connections are made.	EDCL PCU as they distribute meters for connection.	EDCL PCU
People provided with new or improved access to clean cooking solutions	People provided with new or improved solutions access to clean cooking.	Annual	Reports on number of clean cook- stoves sold submitted to the BRD PIU from clean cooking service providers for disbursemen t of the RBF.	Collection of verification reports from clean cooking service providers for disbursement of the RBF.	BRD PIU



Reduction of net CO2 emissions through off-grid electrification and clean cooking solutions	This indicator captures the CO2 emission reduction as a result of providing solar power based off-grid electricity solutions and efficient clean cooking solutions.	Annual	Reports on sales of solar home systems and clean cook- stoves from off-grid electricity service providers and clean cooking service providers.	Reports submitted to the BRD PIU by off-grid electricity service providers and clean cooking service providers.	BRD PIU
Reduced voltage fluctuations in Rwanda's backbone transmission lines.	Reduction in voltage fluctuations of +/- 10% in Rwanda's backbone transmission lines.	Annual	EUCL	EUCL database on voltage fluctuations	EUCL
Generation capacity of energy constructed or rehabilitated		Annual	EDCL PCU	EDCL PCU to report when rehabilitation is complete.	EDCL PCU
Hydropower generation capacity rehabilitated under the project		Annual	EDCL	EDCL to report when rehabilitation is complete	EDCL



Monitoring & Evaluation Plan: Intermediate Results Indicators						
Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection	
Households provided with new or improved access to grid electricity	Households provided with new or improved access to grid electricity.	Annual	EDCL PCU	EDCL PCU as they distribute meters for connection.	EDCL PCU	
of which: female-headed households	this indicator evaluates if a minimum specified percentage of new connections are made to female-headed households	Annual	EDCL PCU	EDCL PCU as they distribute meters for connection	EDCL PCU	
Kilometers of MV lines constructed under the project	This indicator outlines the number of kilometers of 30kV and 15kV lines constructed under the project, in aid of grid- connections of households, trade centres and public institutions.	Annual	EDCL PCU	Project progress reports from the contractors and project consultant.	EDCL PCU	
Kilometers of LV lines constructed under the project	This indicator outlines the number of kilometers of LV lines constructed under the project, in aid of grid- connections of households,	Annual	EDCL PCU	Project progress reports from contractors and project consultant.	EDCL PCU	



	trade centres and public institutions.				
Distribution transformers installed	This indicator outlines the number of transformers installed under the project, in aid of grid-connections of households, trade centres and public institutions.	Annual	EDCL PCU	Project progress reports from contractors and project consultant	EDCL PCU
Share of female workers under contracts financed by Component 1	This indicator evaluates if the contractors undertaking the project work are employing a minimum specified percentage of female workers on the project work.	Annual	EDCL PCU	Contracts signed by EDCL PCU under the component.	EDCL PCU
EUCL is able to measure the system losses in the main transmission and distribution network using smart meters.	This indicator indicates an improvement in EUCL's ability to monitor system losses across the network.	Annual	EUCL	EUCL Reports	EUCL
Substations equipped with static VAR compensators	Substations equipped with static VAR compensators	Annual	EDCL PCU	Contractor and project consultant report	EDCL PCU
Power stations with generation governing systems installed	Power stations with generation governing systems installed	Annual	EDCL PCU	Contractor and project consultant report	EDCL PCU
Distribution transformers fitted with smart meters	This indicator reports the numbers of smart meters installed on network	Annually	EDCL PCU	From contractor reports, and verified by EDCL	EDCL PCU



	transformers under the project. The baseline is zero			PCU/EUCL distribution of meters	
Industrial/Commercial customers fitted with smart meters by the project	This indicator reports the numbers of smart meters installed on utility customer premises under the project. The baseline is zero	Annually	EDCL PCU	Contractor and project consultant reports verified by EDCL/EUCL distribution of meters	EDCL
Share of female workers under contracts financed by Component 2	This indicator evaluates if the contractors undertaking the project work are employing a minimum specified percentage of female workers on the project work.	Annual	EDCL PCU	Contracts signed by EDCL PCU	EDCL PCU
Households provided with new or improved access to off-grid electricity	Households provided with new or improved access to off-grid electricity.	Annual	BRD PIU	Disbursement made by the BRD PIU to off-grid electricity service providers + verification agency.	BRD PIU
of which: female-headed households	of which: female-headed households	Annual	BRD	Reports submitted by off-grid electricity service providers and verified by EDCL	BRD
Households provided with new or improved access to clean cooking	Households provided with new or improved solutions	Annual	BRD PIU	Reports submitted by clean cooking	BRD



solutions	access to clean cooking			service provider companies and verification by EDCL	
of which: female-headed households	of which: female-headed households	Annual	BRD PIU	Reports submitted by clean cooking service provider companies and verified by EDCL	BRD PIU
Amount of private investment mobilized	Amount of private investment mobilized	Annual	BRD PIU	Reports submitted to the BRD PIU by off-grid electricity and clean cooking service provider companies and verified by EDCL PCU	BRD PIU
Policies and regulations adopted by the government to support clean cooking market development	Policies and regulations adopted by the governments to support clean cooking market development.	Annual	Gazzette of the Government of Rwanda	Official Gazette of Rwanda	MININFRA
Share of female workers in enterprises financed by Component 3	This indicator evaluates if the off-grid solar home system providers and clean cooking service providers participating in the RBF employ a minimum	Annual	BRD PIU	Applications submitted by off-grid electricity and clean cooking services companies.	BRD PIU



	specified percentage of female workers.				
Impact evaluation studies conducted for the project		After 3 years	EDCL	Through an independently hired consultant	EDCL
REG publishes its annual customer satisfaction survey results		Annual	REG website	n/a	EDCL PIU
Grievances received addressed	A project Grievance Redress Mechanism (GRM) is set up; all grievances received are recorded and resolved.	Annually	EDCL PCU	Review of grievance register by EDCL responsible staff	EDCL PCU



ANNEX 1: Implementation Arrangements

COUNTRY: Rwanda Energy Access and Quality Improvement Project

PROCUREMENT

1. Procurement for the proposed project will be carried out in accordance with the 'World Bank Procurement Regulations for Borrowers under Investment Project Financing', dated July 1, 2016 and updated November 2017 and August 2018, hereafter referred to as 'Procurement Regulations'. The project will be subject to the World Bank's Anticorruption Guidelines, dated July 1, 2016 and beneficiary disclosure requirements.

2. A PPSD has been prepared to understand the project implementation context, market situations, and associated potential risks to achieve value for money and the PDOs. The PPSD sets out the selection methods to be followed in the procurement of goods, works, and non-consulting and consulting services financed under the project. The PPSD describes the overall project operational context, market situations, and implementing agencies' capacity and identifies possible procurement risks and mitigation measures. Following the market analysis, based on information obtained from the industry, and the implementing agencies' prior experience, the PPSD will also advise whether there is risk of supply market or not. The underlying Procurement Plan will be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

Box 1.1. Summary of the PPSD

Status. Status. The final PPSD dated July 3, 2020 is the basis of this summary.

Scope. The PPSD focuses on EDCL's part of the project implementation, i.e., Components 1, 2, and 4. Component 3, will be implemented by BRD which involves only financial intermediation and is therefore not part of the draft PPSD.

The project procurement profile comprises:

Procurement of Works and EPC contracts (Rehabilitation of Power plants, Construction and Rehabilitation of Power Transmission Lines and Rural electrification of various Districts of RWANDA.

Procurement of Goods are significant comprising mainly, **Supply of transformers and switchgears, Supply of Cables, conductors and accessories, Supply of electric poles and accessories and Supply of energy prepayment meters and accessories and supply of ready boards.**

Procurement of associated consultancy services under the project include **Provision of Capacity Building and Technical Assistance in the Rwanda Energy Sector**.

Small value procurements that may be identified during the project implementation and such incidental procurements can be managed through RFQ or NCB as may be appropriate.

The analysis revealed that there is no risk of market, both in terms of competitiveness of the market and quality of the services. Mainly international market approach is recommended, whereas, other methods including National Competitive Bidding (NCB), Request for Quotation (RFQ), Direct Contracting (DC), Quality- and Cost-Based Selection (QCBS) & Individual Contract (IC) selection methods will be commonly used for procurement of low value Works, Goods and Consultancy services.

Though there is no major market and competitiveness risk, a number of other risks that need to be mitigated were identified. These are: (a) Procurement under staffing: the existing three procurement staffs are not adequate to manage the project procurement in addition to their current workload; (b) lack of experience on World Bank procurement regulation is potential risk as this is the first project the agency will be implementing using Bank procurement regulation.; (c) lack of experience on OPRC contract management; (d) less competitive bids due to introduction of Design, Supply and Installation project delivery system; (e) extreme weather / intense rainfall / land slide due to climate change.

The following measures are recommended to mitigate the risks; a) Strengthening the PIU by hiring more procurement staffs, establishing consultants' and contractors' performance monitoring system and agreeing on defined KPI and regulate supervision and implementation support from the Bank team, are mitigation measures to address the risk; (b) introducing series of trainings at the project initial stage; (c) providing trainings to staffs on Design, Supply and Installation project delivery system, by IC to be hired under the project; (d) adequate publicity (wider advertisement) to attract more bidders, informing diplomatic missions / embassies about the potential procurement opportunity, carefully designing bidding document and qualification requirements to ensure it is not restrictive; (e) ensuring appropriate design and work plan by contractor and adequate design review and monitoring by consultant and avoiding working during rainy season on slide prone areas.

Procurement method. All the main tenders under Components 1 and 2 are planned to be procured through international competitive bidding (ICB) in view of the nature and scope of the packages. For Component 4, the PPSD proposes Cost and Qualification Based Selection (CQBS).

Contract type. The PPSD proposes that the main electrification packages under Component 1 are procured as Engineer, Procure and Construct (EPC) contracts, although it proposes to leave flexibility to separate goods procurement and works in selected electrification lots. For Component 2, the PPSD proposes a mix of EPC and goods contracts. For Component 4, the PPSD proposes QCBS for consultancy service contracts.

Framework contracts. During preparation, EDCL had requested the use of framework contracts for specific electrification lots. The WB confirmed that procurement regulation allows use of existing framework contracts. Accordingly, the existing framework contract will be subject to Bank review at the time of procurement to make sure it is done consistently with core procurement principles and Bank anti-corruption provisions.

Advance Contracting: Advance contracting is allowed under Bank procurement regulation and hence EDCL is free to initiate the procurement in advance. However, the agency should make sure procurement is done consistently with section I, II & III of the procurement regulation. It is also to be noted that advance contracting is undertaken at borrower's own risk and any communication or advice in this regard doesn't commit the Bank to retroactively finance the procurement.

Procurement documents. For all ICB tenders, the borrower is required to use World Bank standard procurement documents. The PPSD provides for rare cases in which national standards are used, for small value and non-complex procurements. In such case, the bid documents shall be subject to Bank review and clearance to ensure, the bid document addresses the social and environmental requirements and is consistent with Bank Procurement Regulations including provision for Bank anti-corruption guidelines and Bank's right to audit, consistent with REG's Procurement manual. Rwanda initiated electronic government procurement systems (E-GP), however, so far, the agency uses the E-GP only for government financed procurement. The implementing agencies shall be using the Rwanda e-Procurement system (Umucyo) for all "post" review procurements of the project and for "prior" review procurement as soon as Bank and RPPA agrees to it.

Procurement staffing. Though EDCL project implementation unit is well staffed, procurement management of EAQIP in addition to the ongoing projects will exceed the capacity of the current 3 procurement specialists. Therefore, EDCL will hire or assign from other departments, one or more procurement specialists, who will be dedicated to this project.

Oversight. Procurement will be overseen by REG's internal Audit, the Quality Assurance unit of EDCL's that is under the Energy Planning Department and the Office of the Auditor General (OAG).

Project Procurement Risk Rating: Based on procurement assessment of the implementing agency and given long experience of the PIU in implementing development partners financed projects, the project procurement risk is rated **Moderate**.

PRAMS: The Procurement Risk Assessment and Management System (PRAMS) is done at the PCN stage and procurement risk is rated "**Moderate**".

3. **STEP.** The project will use STEP, a planning and tracking system, which will provide data on procurement activities, establish benchmarks, monitor delays, and measure procurement performance.

4. **e-Procurement system.** The e-Procurement system assessment was carried out against the MDBs' requirements and has been found acceptable for use for procurement under World Bank-funded projects. Accordingly, the implementing agencies of the project will be using the Rwanda e-Procurement system (Umucyo) for all 'post' review procurements. EDCL will also use e-Procurement for 'prior' review procurement as soon as there is agreement between the World Bank and Rwanda Public Procurement Authority (RPPA).

5. **Beneficial ownership pilot.** The preliminary assessment revealed that there will be no procurement activity under the project that would fall within OPRC thresholds that requires applying the 'beneficial ownership pilot'. However, it will apply if contracts happen to fall within OPRC thresholds.

6. **Procurement risk assessment.** A procurement capacity and risk assessment has been carried out by the World Bank for EDCL to review the organizational structure and functions, experience, staff skills and capacity, procurement cycle management, quality and adequacy of supporting and control systems, and record keeping. EDCL has long experience in implementation of development partner-financed projects including World Bank-financed projects. The EDCL PIU (EARP) is currently staffed with three procurement specialists. The existing three procurement staff are not adequate to manage procurement of the proposed project in addition to the ongoing projects.

7. **REG and its subsidiary companies EDCL and EUCL shall avail its expertise and support to the program through existing departments.** However, with the increase of activities resulting from the new program, new staff must be added to strengthen REG's departments especially the one in EDCL that is suggested to be the Program Implementing Company. Accordingly, four procurement specialists shall be hired in addition to the existing three, for a total of seven procurement staff for the whole program implemented under the EDCL PCU. One procurement specialist will be dedicated to EAQIP.

8. **EDCL has adequate experience in implementing World Bank-financed projects under the World Bank's Anti-Corruption 'Guideline'.** However, it has no experience in implementing projects using the 'Procurement Regulations'. This project will be the first that EDCL will implement under the 'Procurement Regulations' (also applying five different E&S instruments that have been prepared for the implementation of the project⁵⁴ plus the project-specific ESIA/ESMP that sets out the mandatory rules for the subproject/contracts to take action for E&S management). EDCL's lack of experience in using the Procurement Regulations is considered a potential risk and shall be mitigated through a series of trainings to be organized jointly by EDCL and the World Bank.

9. There has been reasonably adequate competition for bids undertaken by EDCL in the past. For example, the average number of bids received for works and plant design, supply, and installation was

⁵⁴ ESMF, SEP, LMP, ESCP, RPF.



12.5, for supply of goods 15, and expression of interest for consultancy service 24.5. Similarly, the market assessment shows that a number of contractors with good performance are available in the market.

10. **There is adequate oversight arrangement in place.** EDCL procurement oversight is undertaken by REG internal audit, the Quality Assurance Unit of the EDCL Energy Planning Department, and the OAG.

11. **Rwanda has an established appeal/complaint handling mechanism**. The appeal/complaint system is institutionalized according to the provision of the procurement law. EDCL, and Rwanda in general, has put in place a system by which complaints that cannot be closed by the implementing agency/EDCL to the complainant's satisfaction are handed over to a mediation committee that gives final resolution and grievances. The process of complaints management and dispute resolution on the bidding process is clearly addressed in the law and transparent. Complaints are well received and handled at the first level by EDCL and to the second level by the Independent Review Panel. The e-Procurement system includes a feature for submitting and addressing complaints electronically in the system and hence all complaints and responses are available in the system for public disclosure and auditing for those procurements done in e-Procurement.

12. Given the nature and value of the project procurement packages, most tenders will follow international market approach where the World Bank's SPDs are used. However, in rare cases where national standards are used, the bid documents shall be subject to the World Bank's review and clearance. This is to ensure the bid documents are consistent with World Bank regulation and include provision for the World Bank's anti-corruption guideline and the World Bank's right to audit, consistent with the REG Procurement Manual and the ESF instruments prepared for the project—ESMF, RPF, SEP, ESCP, and LMP.

13. **The key procurement risks are the following:** (a) procurement understaffing: the existing three procurement staff not adequate to manage the project procurement in addition to their current workload; (b) lack of experience on the World Bank Procurement Regulations as this is the first project EDCL will be implementing using these regulations; (c) lack of experience on OPRC contract management; (d) fewer competitive bids due to introduction of the design, supply, and installation project delivery system; (e) extreme weather/intense rainfall/landslides due to climate change.

14. **The proposed mitigation measures for the identified risks are the following:** (a) strengthening the EDCL PCU by hiring more procurement staff, establishing consultants' and contractors' performance monitoring system, agreeing on defined KPIs, and regulating supervision and implementation support from the World Bank; (b) introducing a series of trainings at the project initial stage; (c) providing training to staff on the design, supply, and installation project delivery system, by the individual consultant to be hired under the project; (d) providing adequate publicity (wider advertisement) to attract more bidders, informing diplomatic missions/embassies about the potential procurement opportunity, and carefully designing the bidding document and qualification requirements to ensure it is not restrictive; and (e) ensuring appropriate design and work plan by the contractor and adequate design review and monitoring by the consultant and avoiding working during rainy season on slide prone areas.

15. **Project procurement risk rating.** Based on the procurement assessment of EDCL and given its long experience in implementing development partner-financed projects, the project procurement risk is rated Moderate.

16. **The Procurement Risk Assessment and Management System (PRAMS) assessment** is done at the Project Concept Note stage and procurement risk is rated Moderate.

17. The project procurement profile comprises rehabilitation of hydropower plants, installation of automatic voltage regulators on 220 kV system networks and installation of power system stabilizers and governing systems on main generators, building of a GIS, installation of smart metering, electrification of sectors in various districts, TAs, capacity building, and implementation support. Based on estimated value and nature of procurement of each activity, both international and national market approaches will be used. ICB for international market approach and national competitive bidding and request for quotation for national market approach are optimum selection arrangements for procurement of works; design, supply, and installation; and goods/supplies. For consultancy services, international market approach using Quality- and Cost-Based Selection (QCBS) and individual consultant selection methods are identified as optimum selection arrangements. On a case-by-case basis, the existing framework contract will be used, especially for supply of goods.

18. **From July 1, 2017, all procurement entities in the country have been using the Rwanda e-Procurement system for Government-financed projects and most development partners-financed projects.** The e-Procurement system is used for World Bank-financed projects starting from January 1, 2019, for all post review contracts and will be applied to prior review procurement in the near future. To avoid duplicate use of the E-GP and STEP, the World Bank is working on an interface for the two systems. Until the interfacing is completed, the two systems will be used in parallel.

19. The assessment revealed that adequate number of international and national suppliers/contractors/consultants are available in the market.

20. In general, the assessment revealed that the track record of procurement performance of EDCL was adequate from the capacity, integrity, transparency, and accountability of procurement process perspective. However, there have been delays in procurement processes both at EDCL and EUCL. This is due to lengthy evaluation processes and internal approval processes.

21. **A preliminary Procurement Plan** for the first 18 months with a list of procurable items, descriptions, cost estimates, review types, selection methods, and market approach is presented in the PPSD. The World Bank's SPDs should be used for all procurements using international market approach.

22. **Use of national procurement procedures.** EDCL uses the World Bank's Procurement Regulations for World Bank-financed projects, where required by the Financing Agreement. For other procurements, including for projects financed by the Government or from REG internal income, the Public Procurement Law procedures (RPPA) or REG Manual is used, as appropriate. EDCL does not have a clear policy as to when to use the Public Procurement Law procedure or REG Manual. In addition, REG has not developed its own SPD and hence uses the RPPA SPD in both scenarios. The RPPA SPD will be reviewed by the World Bank to ensure provision for application of the World Bank's Anti-Corruption Guideline and the World Bank's right to audit and all ESF requirements are included.

23. **Procurement of works and design, supply, and installation (EPC).** Procurement of works and EPC are mainly for rehabilitation of hydropower plants, installation of automatic voltage regulators on 220 kV system networks and installation of power system stabilizers and governing systems on main generators, building of GIS, installation of smart metering, and electrification of sectors in various districts. Works and design, supply, and installation contracts other than through ICB will use national procurement procedures and national standard bidding documents as agreed with and deemed satisfactory to the World Bank. Small-value works will be undertaken through request for quotation procedures. The request for quotation will indicate the specifications for the works as well as the delivery/completion time. The

contract award will be based on comparing price quotations from several qualified contractors, with a minimum of three, to ensure competition. When the value of the contract of such works exceeds the request for quotation threshold and when procured through national competitive bidding procedures, the national standard bidding documents issued by the RPPA and acceptable to the World Bank will be used. Direct contracting shall be used where the PPSD informs so and it is to the benefit of the project and in accordance with the Procurement Regulations.

24. **Procurement of goods and non-consultancy services.** Significant goods and non-consultancy service procurements are not envisaged under the project. However, small goods and non-consulting services may be identified as the project takes shape. Procurement of goods and non-consultancy services other than through ICB would use the national procedures and standard bidding documents as agreed with and deemed satisfactory to the World Bank. Direct contracting will be used where the PPSD informs so, to the benefit of the project.

25. **Procurement of consultancy services.** Procurement methods to be used are specified in the PPSD. Project staff required for the implementation will be hired following the Procurement Regulations for positions identified as individual consultants and following the clause on project implementation support personnel, paragraph 7.32 of the Procurement Regulations, for positions not identified as individual consultants.

26. **Operating costs.** The items to be identified as operating costs in the PPSD will be procured using the borrower's procurement and administrative procedures (REG Manual) subject to review and acceptable to the World Bank, including selection of project implementation support personnel not identified as individual consultants.

27. **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 will be retained by the respective agencies and in electronic or hard copy and uploaded in STEP.

28. **Disclosure of procurement information.** The following documents shall be disclosed on the agencies websites: (a) a Procurement Plan and updates; (b) an invitation for bids for goods and works for all contracts; (c) Request for Expression of Interest for selection/hiring of consulting services; (d) contract awards of goods, works, and non-consulting and consulting services; (g) a monthly financial and physical progress report of all contracts; and (h) an action taken report on the complaints received on a quarterly basis.

29. The following details shall also be published in the United Nations Development Business and the World Bank's external website: (a) an invitation for bids for procurement of goods and works following open international market approaches, (b) Request 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.

30. **Fiduciary oversight by the World Bank.** The World Bank shall prior review contracts according to prior review thresholds set in the PPSD/Procurement Plan.



31. All contracts not covered under prior review by the World Bank shall be subject to post review during implementation support missions and/or special post review missions, including missions by consultants hired by the World Bank or a third-party independent auditor delegated by the World Bank. To avoid doubts, the World Bank may conduct, at any time, independent procurement reviews of all the contracts financed under the loan.

Contract management. Currently, high-risk and high-value procurements have not been identified for increased contract management support. However, if such a contract is identified during implementation, the agencies will develop KPIs for such identified contracts and the KPIs will be monitored during actual execution of contracts. The World Bank will provide additional due diligence and independent review of the contract performance of such identified procurements. A fully staffed PCU at EDCL will be responsible for overall project/contract management.


ANNEX 2: Proposed Financing of RUEAP by Development Partners⁵⁵

COUNTRY: Rwanda

Energy Access and Quality Improvement Project

Area/Investment	Details	Financing	Development			
Need	Details	Commitment	Partner			
1. Increasing Access to Grid Electricity						
Grid access - World	District allocation ⁵⁶ : Gicumbi, Musanze, Rulindo,	US\$90,000,000	World Bank			
Bank Group and AFD	Burera, Ngororero, Nyabihu, Rubavu, Karongi,	and	and AFD			
(joint cofinancing)	Rusizi, Rutsiro, and Nyamasheke.	EUR 78,000,000				
Grid access - SFD and	Districts: Gakenke, Muhanga, Kamonyi.	US\$38,000,000	SFD and OPEC			
OPEC Fund (parallel			Fund			
co-financing)						
Grid access - AfDB	Districts: Gisagara, Huye, Nyamagabe, Nyanza,	US\$64,701,845	AfDB			
	Nyaruguru, Ruhango.					
Grid access - EIB	Districts: Bugusera, Gatsibo, Kayonza, Kirehe,	EUR 78,000,000	EIB			
	Ngoma, Nyagatare, Rwamagana.					
	Component Subtotal	US\$363,567,124				
2. Enhancing the Efficie	ency of Electricity Services					
Rehabilitation of the	Rehabilitation of the Ntaruka HPP to ensure	US\$11,000,000				
Ntaruka HPP	security of generation in Rwanda.					
Installation of	To reduce voltage rises due to low loading on	US\$8,500,000				
automatic voltage	220 kV; improve network responses to					
regulators on 220 kV	fluctuations and load loss; prepare EAPP regional					
system networks,	interconnection.					
installation of power						
system stabilizers and						
governing systems on						
main generators			World Bank			
Building of GIS	Building of Rwanda's power system GIS.	US\$6,000,000				
Completing	Identify and curb sources of	US\$ 4,500,000				
installation of smart	commercial/technical losses and phase					
meter for all	imbalances.					
distribution						
transformers and						
medium/large						
customers						
	Subtotal - World Bank	US\$30,000,000				
Substation upgrades,	20/20 kV quitabing substation in Nuemata for					
connections of	officient supply					
feeders to	Connect Putongo, Gikomera and Kanomba	US\$2,867,715	AfDB			
substations, and	Foodors to Shango substation					
rehabilitation						

⁵⁵ Subject to approval by the respective institutions.

⁵⁶ Subject to change during implementation of the RUEAP.



Area/Investment Need	Details	Financing Commitment	Development Partner
(Nyamata, Rutongo, Gikomero and Kanombe, Shango, Muhanga, Rubavu, and Nyagatare)			
Lingrade of Karisimhi	Lingrade 8 km 6.6 km of MV network in		
6.6 kV line to 30 kV	Karisimbi to 30 kV to improve flexibility in interventions and network standardization (underground line with associated transformers and switching elements).	US\$4,189,716	
Upgrade and extension of different MV lines for improved supply	Enable electrification of new areas.	US\$35,411,340	
Improving quality of power supply in distribution system	Electrification of new areas.	US\$29,968,693	
Upgrade of single to three-phase lines countrywide	Upgrade all existing single-phase networks to three-phase network.	US\$22,050,208	
Demand stimulation	Construct 600 m and provide transformers for all customers regardless of their distances from the grid; expedite connections for customers that qualify under the free connection policy demand stimulation.	US\$6,436,897	
	Subtotal - AfDB (Distribution)	US\$100,924,569	
Transmission lines and associated substations	 110 kV transmission line Rwinkwavu-Kirehe and associated substations. 110 kV transmission line Rukarara-Huye- Gisagara and associated substations. 110 kV transmission line from Bugesera industrial park to Bugesera international airport substation with associated substation. 110 kV transmission line Gabiro - Nyagatare and associated substations. 110 kV D/C Rulindo - Gicumbi TL (cut in-cut out) and associated substations. 	US\$81,460,000	AfDB
Upgrade of substations	 Bugesera industrial park substation (3 × 30 MVA). 	US\$14,400,000	
Transformer upgrades	 Replacement of 10 MVA Karongi Transformer and replacement of Gikondo transformers with 2 × 30 MVA 110/15 kV. Upgrade of Gahanga and Nzove substations with second transformer on each substation. 	US\$10,810,284	AfDB



Area/Investment Need	Details	Financing Commitment	Development Partner		
	 Replacement of old 6 MVA Kibogora Transformer. 20 MVA standby transformer at 110/30 kV. 				
	Subtotal - AfDB (Transmission)	US\$106.670.824			
Kigali distribution rehabilitation	 Upgrade and extension of MV lines with transformers. Renovation of existing MV/LV cabins and new MV/LV cabins (electrical installation and civil works). 	EUR 20,000,000	EIB		
	Component Subtotal	US\$259,495,861			
3. Increasing Access to	Off-grid Electricity and Clean Cooking Solutions				
RBF for off-grid solar solutions and clean cooking solutions	RBF for off-grid solar connections and clean cooking solutions to reach poorer households and more remote areas.	U\$\$25,000,000 (U\$\$15,000,000 for off-grid and U\$\$ 10,000,000 for clean cooking)	World Bank		
RETF grant from the CCF	Matching grant for RBF and TA for clean cooking.	US\$7,000,000	World Bank – administered		
Component Subtotal US\$32,000,000					
4. Technical Assistance	, Institutional Capacity Building, and Implementation	on Support			
TA Conceitu huilding	Address sector performance improvements; forward-looking options for sector development.	US\$1,000,000			
Capacity building	compliance (plus others to be identified).	0\$\$2,000,000	World Bank		
Implementation support	Support PIU functions (staff); support the SWG secretariat staff.	US\$2,000,000			
RETF grant from the CCF	Market development and TA for the clean cooking sector.	US\$3,000,000	World Bank administered		
Implementation support	Support PIU functions (staff); support the SWG secretariat staff.	EUR2,000,000	AFD		
	Support PIU functions (staff); support the SWG secretariat staff.	US\$2,000,000	OPEC Fund		
	Support PIU functions (staff) and other implementation support.	US\$5,000,000	AfDB		
ТА	Scope to be determined.	EUR 2,000,000	EIB		
	Component Subtotal	US\$19,380,201			
Complementary Support (Non-Financing)					
The Program is supported by ongoing activities of other development partners, including Enabel, Japan International Cooperation Agency, <i>Kreditanstalt für Wiederaufbau</i> , Power Africa, and the EU.					



ANNEX 3: Economic and Financial Analysis

COUNTRY: Rwanda Energy Access and Quality Improvement Project

1. This annex provides the rationale for the program based on the economic and financial analysis of the project's activities and their associated costs and benefits. The analysis focuses on the grid and off-grid electrification and clean cooking components of the project (Component 1 and Subcomponents 3a and 3b), which constitute about three-fourths of the total project allocation. The project design offers strong economic returns as well as substantial GHG mitigation benefits.

Methodology and Assumptions

2. Economic and financial viability of the proposed project was assessed using a standard costbenefit analysis methodology at a discount rate of 6 percent for the economic analysis and 10 percent for the financial analysis. The economic analysis was confined to the project activities that generate quantifiable benefits for which an economic value can be clearly identified and measured, specifically Component 1 on grid electrification and Component 3 on off-grid electrification and clean cooking. Beyond the benefits quantified for electricity access, higher electrification rates are also expected to increase income-generating activities through productive uses and improve the socioeconomic situation of households, with expected positive impact on education, lifestyle, and connectivity. For the clean cooking component, there is strong evidence of health and gender impacts from access to clean cooking solutions. However, for simplicity of this analysis, those benefits are not quantified. GHG mitigation benefits have been calculated for Components 1 and 3.

3. Table 3.1 presents key assumptions underlying the analysis.

Assumptions	Unit	Value	Source		
Overall assumptions and inputs					
Economic discount rate	%	6	World Bank - Guidelines		
Financial discount rate	%	10	Assumption		
Average residential electricity consumption - urban households	kWh/month	20.71	EICV5		
Average residential electricity consumption - rural households	kWh/month	11.8	EICV5		
Annual increase in electricity consumption	%	1	Assumption		
Annual increase in household's WTP for electricity	%	4.4	Average annual growth in per capita GDP between 2011 and 2018		
Emission reduction for households switching from lighting alternatives	tCO ₂	0.374	GHG Accounting Methodology for Energy Access Investment Operations - World Bank Group		

Table 3.1. Modeling Assumptions and Inputs



Assumptions	Unit	Value	Source			
Component 1: Increasing Access to Grid	Component 1: Increasing Access to Grid Electricity					
Unit connection cost	US\$	753	MININFRA/REG			
Connection fee	RWF	56,000	REG (Calculated)			
Annual connections as a percentage of	0/	25	Accumption			
total connections over 2021–2024	%	25	Assumption			
Of which urban	%	30	Assumption			
Of which rural	%	70	Assumption			
Electricity cost of service in 2018	US\$/kWh	0.229	Calculated from financial statements for FY2017/18, includes operation and maintenance costs			
Annual reduction in cost of service from 2025 onward	%	3	Assumption in line with cost reductions under the LCPDP			
Rural household tariff (2020)	RWF/kWh	89	Tariff for consumption <15 kWh/month per Tariff Order 2020			
Urban household tariff (2020)	RWF/kWh	212	Tariff for consumption between 15 and 50 kWh/month per Tariff Order 2020			
Enterprise tariff (2020)	RWF/kWh	227	Commercial tariff per Tariff Order 2020			
Subcomponent 3a: Increasing Off-grid E	lectricity Access	S				
Unit SHS cost for Tier 1 system	US\$	82	Typical Tier 1 system cost in Rwanda			
Effective SHS cost under PAYG paid	LIS\$	164	Twice the up-front cost; includes			
over two years	037	104	operation and maintenance			
Percentage of the cost to be covered by project grant	%	65	Calculated			
SHS useful life	Years	5	Typical Tier 1 SHS useful life			
Annual SHSs sold as a percentage of total SHSs sold under the project over 2021–2024	%	25	Assumption			
Average urban HH expenditure on lighting alternatives	US\$/month	1.00	EICV5			
Average rural HH expenditure on lighting alternatives	US\$/month	1.20	EICV5			
Subcomponent 3b: Increasing Access to	Clean Cooking	Solution				
Share of HH switching to Tier 2 stove	%	10				
Share of HH switching to Tier 3 stove (efficiency only)	%	40	Assumption			
Share of HH switching to Tier 3 stove	%	40	Assumption			
Share of HH switching to Tier 4 or Tier	0/	10	Accumption			
5 stoves	70	10	Assumption			
Among HH switching to Tier 4 or Tier 5						
stoves:						
Share of pellet gasifier users	%	50	Assumption			
Share of LPG users	%	50	Assumption			
Share of HH collecting wood	%	90	Assumption			
Share of HH purchasing wood	%	10	Assumption			
Cost of a Tier 2 improved wood stove	US\$	15	Market assessment			



Assumptions	Unit	Value	Source
Cost of a Tier 3 improved wood stove	US\$	30	Market assessment
Cost of a Tier 3 improved charcoal stove	US\$	35	Market assessment
Cost of a pellet gasifier stove	US\$	52	Market assessment
Cost of an LPG stove	US\$	60	Market assessment
Lifetime of Tier 3 stoves	years	3	Market assessment
Lifetime of Tier 4 or 5 stoves	years	5	Market assessment
Annual wood consumption with Tier 2 stoves	ton/HH/year	1.08	Estimated based on energy requirement
Annual wood consumption with Tier 3			Estimated based on energy
stoves	ton/HH/year	0.72	requirement
Annual charcoal consumption with Tier 3 stove	ton/HH/year	0.38	Estimated based on energy requirement
Annual pellet consumption	ton/HH/year	0.27	Field data from climate change team
Annual LPG consumption	ton/HH/year	0.102	Assumption
Price of wood	US\$/ton	13.63	REG's website
Price of charcoal	US\$/ton	260	Market assessment
Price of pellets	US\$/ton	360.17	Market assessment
Price of LPG	US\$/ton	1,148.31	Market assessment
Difference in operating expenses:	US\$ per		
Firewood T0 to ICS T3	stove per	14.72	Calculated
	year		
Difference in operating expenses:	US\$ per		
Charcoal T2 to ICS T3	stove per	19.55	Calculated
	year		
Difference in operating expenses:	US\$ per		
Charcoal stove T2 to pellet T4	stove per	20.07	Calculated
	year		
Difference in operating expenses:	US\$ per		
Charcoal stove T2 to LPG T5	stove per	0.18	Calculated
	year		
CO_2 Emissions Reduction:	tCO ₂ per HH	1.183	Estimated based on fuel saving,
Firewood 10 to ICS 13	per year		calorific value, and emission factor
CO_2 Emissions Reduction:	tCO ₂ per HH	0.93	Estimated based on fuel saving,
	per year		calorific value, and emission factor
CO_2 Emissions Reduction:	tCO ₂ per HH	2.46	Estimated based on fuel saving,
Charcoal stove 12 to pellet 14	per year		calorific value, and emission factor
CO_2 Emissions Reduction:	tCO ₂ per HH	2.66	Estimated based on fuel saving,
Charcoal stove 12 to LPG T5	per year		calorific value, and emission factor

Note: HH = Household; ICS = Improved Cookstove.

4. The project allocation for Component 1 covers the cost of providing grid connection to households whereas the project allocation for Component 3 covers the subsidy portion of the cost of providing off-grid SHS and clean cooking solutions to households. The number of households to be

provided with grid connection is obtained by dividing the component allocation of US\$175 million (inclusive of the World Bank allocation of US\$90 million and AFD allocation of EUR 78 million) by average connection cost in the districts allocated to the World Bank and AFD. The target consumers comprise 93 percent households and 7 percent enterprises. For off-grid electricity access, the number of SHSs expected to be sold is obtained by dividing the component allocation of US\$15 million by the subsidy portion of the retail cost of an SHS offered under a PAYG model. Similarly, the number of clean cookstoves sold under the project are obtained by first estimating the share of each stove type (10 percent switching to Tier 2, 40 percent switching to Tier 3 in rural areas, 40 percent switching to Tier 3 in urban areas, and 10 percent switching to Tier 4 or 5 in urban areas), the subsidy allocation for each stove type, the average retail cost of a stove, and the subsidy per stove.

Description	Unit	Component 1: Increasing Access to Grid Electricity	Subcomponent 3a: Increasing Off-grid Electricity Access	Subcomponent 3b: Increasing Access to Clean Cooking Solution
		Grid	Tier 1 SHSs	Tier 3, 4, and 5
Component allocation	US\$, millions	177	15	15.7
Estimated number of	Number	235,145	140,713	500,000
households				

Economic Analysis

5. The economic values of Component 1 (grid electrification) and Subcomponent 3a (off-grid electrification) are strongly dependent on the WTP of households for electricity and are positive if household WTP for grid and off-grid electricity as a percentage of their total expenditure is 4.2 percent and 1.3 percent, respectively. The economic costs for Component 1 comprise grid connection costs and the cost of service of electricity to newly connected consumers. The cost of service is assumed to decline from 2025 onward as power plants with low generation costs will be commissioned in line with the schedule of the LCPDP. The economic cost for Subcomponent 3a is the average retail cost of a mid-Tier 1 SHS in Rwanda. The benefits of grid connection for households are estimated through their WTP for grid electricity and for trade centers as an avoided cost of diesel-generated power. The analysis accounts for a range of household WTP for grid electricity including, as a low estimate, the expenditure on electricity of currently grid-connected households and, as a high estimate, the findings of a World Bank study on household WTP for grid electricity in Rwanda (Sievert and Steinbuks 2019).⁵⁷ Similarly, for off-grid

⁵⁷ See: Sievert, Maximiliane, and Jevgenijs Steinbuks. 2019. "Willingness to Pay for Electricity Access in Extreme Poverty: Evidence from Sub-Saharan Africa (English)." Policy Research Working Paper No. WPS 8906, World Bank Group, Washington, DC. http://documents.worldbank.org/curated/en/968291561033778961/Willingness-to-Pay-for-Electricity-Access-in-Extreme-Poverty-Evidence-from-Sub-Saharan-Africa. The study found that households are willing to pay up to 19 percent of their monthly expenditure on grid electricity and up to 15 percent of their monthly expenditure on off-grid electricity. These estimates appear to be on the higher side of typically observed WTP for electricity.

electrification, the current average expenditure of unconnected households on lighting alternatives (kerosene, candles, flashlight, batteries, and so on) as indicated in EICV5 is taken as the low estimate of benefits and the findings of Sievert et al. (2019) are taken as the high estimate. An annual increase of 4.4 percent in household WTP for electricity is assumed, consistent with the growth rate of GDP per capita in Rwanda since 2011. Table 3.3 reports the NPV and the EIRR, wherever applicable, for the low and high estimates of household WTP for electricity, including the threshold household WTP at which providing electricity access has a positive economic value for households. The threshold WTP values are within the generally accepted affordability level for household expenditure on grid electricity, which is considered as 5 percent of the total household expenditure (Kojima et al. 2016).⁵⁸ Table 3.3 also reports the NPV and EIRR for Component 1 at this affordability level.

6. For Subcomponent 3b (clean cooking), the main economic benefits accrue from fuel switching and from better health outcomes. The component is designed to target three types of households—two categories that will continue to use the same fuel and one category that will switch to clean fuel stoves. The first are households in the rural areas which predominantly use firewood and traditional stoves for cooking (Category 1). These households will switch to improved stoves at Tier 2 and 3 for efficiency gains. The second type are households in urban areas which predominantly use charcoal and traditional stoves for cooking (Category 2). These households will switch to improved stoves at Tier 3 level of efficiency and emissions. The third type are households in urban areas as well but which already use improved charcoal stoves at an efficiency and emission level corresponding to Tier 2 (Category 3). These households will switch to clean fuel and purchase the corresponding stoves. The analysis makes several assumptions about the cooking behavior and adoption of different stove types. The first assumption is that households exclusively use the stoves they own and the new stoves they will switch to with the program. Stove stacking is the practice of using more than one stove to meet the cooking needs of a household. While stacking behavior is prevalent in Rwanda but not common, 6.6 percent of the households stack their stoves. The second assumption is on the different types of clean fuel stoves that will be adopted through the program. The Rwanda market is nascent, and the program aims to stimulate the market and bring in different players, fuels, and technologies. To estimate the benefits from switching to clean fuel stoves, two types of stove-fuel combinations are considered in this analysis: gasifier stoves using biomass pellets and LPG stoves. The share of households switching to pellet gasifier stoves and LPG stoves is assumed to be 50 percent each. The third assumption is on the share of households that collect firewood in rural areas and the share that purchase firewood. Collecting firewood is prevalent in rural areas and it is assumed that all households switching to Tier 2 and 90 percent of the households for those switching to Tier 3 will do so while 10 percent of households will purchase the wood.

⁵⁸ Kojima, Masami, Xin Zhou, Jace Jeesun Han, Joeri de Wit, Robert Bacon, and Chris Trimble. 2016. "Who Uses Electricity in Sub-Saharan Africa? Findings from Household Surveys." Policy Research Working Paper No. 7789, World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/25029 License: CC BY 3.0 IGO.



Project Component	Household WTP for Electricity (as a percentage of total expenditure)	NPV (US\$, millions)	EIRR (percentage)
	Current expenditure of grid-connected HH Urban: 4.6 percent Rural:ª 1.1 percent	(104.86)	n.a.
Component 1: Increasing Access	Threshold WTP Urban and rural: 4.2 percent of total household expenditure	1.02	6.1
to Grid Electricity	Affordability level of grid electricity in Kojima et al. (2016) Urban and rural: 5 percent	42.83	8.5
	WTP in Sievert and Steinbuks (2019) Urban and rural: 19 percent	774.52	49.8
Subcomponent 3a:	Current expenditure on lighting alternatives Urban: 1 percent Subcomponent 3a: Rural: 1.2 percent		n.a.
Increasing Off-Grid Electricity Access	Threshold WTP Urban and rural: 1.3 percent of total HH expenditure	0.54	8.8
	WTP in Sievert and Steinbuks (2019) Urban and rural: 15 percent		n.a. ^b

Table 3.3. NPV and EIRR of Component	1 and Subcomponent 3a at Various Household WTP for Electricity Access
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Note: a. Current expenditure on electricity as a percentage of total expenditure for rural households is substantially lower than that for urban households as a result of their low average consumption (12 kWh per month compared to 21 kWh per month for urban households) and consequently the low average tariffs (tariff of RWF 89 per month applying to consumption below 15 kWh per month compared to tariff of RWF 212 per kWh applying to consumption between 15 and 50 kWh per month).

b. Net benefits are positive in all years.

7. **The program supports households switching to more efficient stoves that will reduce the fuel consumption.** Thus, one of the benefits evaluated is the difference in the operating costs when a household switches over to a new stove, that is, the value of the fuel saved by a household. The operating expenses are determined by the price per unit of fuel and the annual consumption of that fuel based on the different stoves. The analysis considers the difference in the operating expenses when households switch from a baseline stove to a migrating stove of Tiers 2, 3, 4, or 5. The operating expenses could be positive or negative based on the price of the fuel, the consumption of fuel, the thermal efficiency, or performance level. The analysis shows that there is a fuel saving for households switching from baseline wood and charcoal stoves to Tier 2, Tier 3, Tier 4, and Tier 5 stoves.



8. Table 3.4. lists the NPV and EIRR of Component 3b.

Table 3.4. NPV and EIRR of Subcomponent 3b

Project Component	NPV (US\$, millions)	EIRR (%)
Subcomponent 3b: Increasing Access to Clean Cooking Solution	0.33	6.98

9. **Overall, the project and the individual components offer positive NPV and high EIRR both with** and without accounting for GHG mitigation benefits. Table 3.5. outlines the NPV and EIRR of the project and of Component 1 and Subcomponents 3a and 3b, without GHG benefits and at low estimates of the shadow cost of carbon recommended by the World Bank. These estimates are based on the affordability level for grid electricity (5 percent of total household expenditure) and the threshold WTP for off-grid electricity (1.3 percent of total household expenditure) specified above.

Project Component	NPV (US\$, millions)		EIRR (%)		GHG mitigation (tCO2e, millions)
	Without GHG Benefits	With GHG Benefits	Without GHG Benefits	With GHG Benefits	
EAQIP	43.71	222.16	8.5	20.6	4.6
Component 1:	42.83	86.95	8.5	11.0	1.7
Increasing Access to					
Grid Electricity					
Subcomponent 3a:	0.54	9.56	8.8	61.8	0.3
Increasing Off-grid					
Electricity Access					
Subcomponent 3b:	0.33	125.65	7.0	184.0	2.6
Increasing Access to					
Clean Cooking Solution					

Table 3.5. Summary of Economic Analysis

10. Table 3.6. indicates the baseline and threshold values of key assumptions underlying the economic value of each project component. Ceteris paribus, the economic value of the respective components (excluding GHG mitigation benefits), switch from positive to negative at the indicated threshold values.

Variable	Unit	Baseline	Threshold
Component 1: Increasing Access to Grid Electricity			
Average connection cost	US\$ per connection	753	759
Average initial cost of service of electricity	US\$ per kWh	0.229	0.231
Annual reduction in cost of service from 2025 onward	%	3	2.8
Discount rate	%	6	6.1



Variable	Unit	Baseline	Threshold
Subcomponent 3a: Increasing Off-grid Electricity Access			
Retail cost of Tier 1 SHS	US\$	82	87
Discount rate	%	6	8.9
Subcomponent 3b: Increasing Access to Clean Cooking			
Solution			
LPG price to refill	US\$/kg	1.148	1.181
Discount rate	%	6	7

Financial Analysis

11. Financially, the grid electrification component is expected to have a positive NPV for REG while the RBF design for off-grid access and clean cooking is expected to ensure that the offered solutions remain affordable to low-income households. The financial analysis for grid electrification has been carried out from the perspectives of REG as well as consumers, to assess the financial impact of offering grid electricity services on the service provider (REG) and of procuring electricity services on end users (households and trade centers). Financial analyses of off-grid access and clean cooking solutions have been performed only from consumers' perspective as these services will be provided by the private sector. Connecting households and trade centers to the grid and providing electricity services will offer REG a positive NPV of US\$2.95 million and an FIRR of 8.7 percent (Table 3.7). The positive NPV is a result of (a) the project allocation being extended as grant from the GoR to REG to cover the high average cost of connecting households (about US\$753 per connection) and (b) the relatively high tariffs, especially for high consumption households and trade centers, covering the cost of supply of electricity, which will also decline in line with the LCPDP. The financial analysis for grid electrification from the consumers' perspective compares the cost that the consumers will incur on grid electricity (inclusive of connection charges and tariffs) against the avoided cost of lighting alternatives. Since the current expenditure of unconnected households on lighting alternatives is very low (about US\$1.10 per month), the NPV of grid electricity is negative for households. However, given the high expressed WTP of households for grid electricity, households may eventually allocate a higher share of their total expenditure to cover electricity costs. It is important to note that grid electricity consumers are offered implicit subsidies through the low grid connection charges (about US\$62 or RWF 56,000 per connection) and low tariffs for consumption below 15 kWh per month (about US\$0.09 per kWh against the cost of supply of about US\$0.23 per kWh). The financial analysis for off-grid electricity access and clean cooking components compares the postsubsidy cost of these solutions to households compared to the avoided cost of their present lighting and cooking alternatives. The subsidy offered to households has been adjusted to ensure that the financial NPV to households is positive.



Ducient Commencet	NPV	FIRR
Project Component	(US\$ million)	(%)
Component 1: Grid electrification (REG)	2.95	12.2
Component 1: Grid electrification (Consumers)	(26.54)	n.a.
Subcomponent 3a: Off-grid electrification (Consumers)	0.58	18.1
Subcomponent 3b: Clean cooking (Consumers)	0.30	11.7

12. **Table 3.8. indicates the baseline and threshold values of key assumptions underlying the financial NPV of each project component**. Ceteris paribus, the financial NPV of the respective components switch from positive to negative (or vice versa) at the indicated threshold values.

Table 3.8. Threshold Values of Key Variables for Fina	ancial Analysis

Variable	Unit	Baseline	Threshold
Component 1: Grid electrification (REG Perspective)			
Connection fee	RWF	56,000	40,300
Average initial cost of service of electricity	US\$ per kWh	0.229	0.237
Annual reduction in cost of service from 2025 onward	%	3	2.4
Rural household tariff (2020)	RWF/kWh	89	74
Urban household tariff (2020)	RWF/kWh	212	191
Commercial tariff (2020)	RWF/kWh	227	210
Discount rate	%	10	n.a. ⁵⁹
Component 1: Grid electrification (Consumer Perspective)			
Connection fee	RWF	56,000	n.a. ⁶⁰
Rural household tariff (2020)	RWF/kWh	89	n.a. ⁶¹
Urban household tariff (2020)	RWF/kWh	212	25
Commercial tariff (2020)	RWF/kWh	227	75
Current expenditure on lighting alternative as a percentage	%	Urban: 1	Average:
of total expenditure		Rural: 1.2	4.2
Discount rate	%	10%	NA ⁶²
Subcomponent 3a: Off-grid electrification			
Unit SHS cost for Tier 1 system	US\$	82	90
Effective SHS cost under PAYG paid over two years	US\$	164	180
Percentage cost covered by RBF	%	65	61
Current expenditure on lighting alternative as a percentage	%	Urban: 1	Average:
of total expenditure		Rural: 1.2	1.3
Discount rate	%	10	19

⁵⁹ The cash flows for REG are initially positive (as REG collects connection fee), followed by negative in the medium term (as tariffs fall short of recovering costs), and eventually turn positive in the long term (as tariffs attain cost recovery levels due to falling cost). This atypical cash flow, especially the positive cash flow in the beginning, keeps NPV positive for all practical discount rates. ⁶⁰ The NPV is predominantly negative due to high electricity tariffs compared to the expenditure of households on lighting alternatives. Reducing the connection fee does not turn around the NPV to positive.

⁶¹ While reducing rural household tariff increases the NPV, it is still not enough to turn it around to positive.

⁶² Ceteris paribus, the cash flows are negative across all years; thus, the NPV does not turn positive at any discount rate.



Variable	Unit	Baseline	Threshold
Subcomponent 3b: Clean cooking			
Charcoal price	US\$/kg	0.260	0.260
LPG price for refill	US\$/kg	1.148	1.187
Pellet price	US\$/kg	0.360	0.375

Utility Financial Analysis

13. Because the electrification investments will be made available to REG as grants and owing to recent tariff revisions and declining cost of service, the utility's financial situation is expected to stay on a sustainable track. The estimates in figure 3.1 assume the commissioning schedule of power plants according to the LCPDP and adjustment of tariffs against exchange rate fluctuations. Based on these estimates, REG will be able to recover the bulk of its cost of service in most years between 2020 and 2025. The subsidy requirements to cover any cash deficit are estimated to rise from about US\$9 million in 2020 to about US\$45 million in 2022 as a large IPP gets commissioned in 2022, raising the cost of service of electricity and the subsidy requirements will fall to about US\$6 million in 2025.

14. A potential decline in demand due to COVID-19 induced economic slowdown is likely to increase the cost of service of electricity and the subsidy requirements to fulfill the cash needs of REG. In March and April 2020, a lockdown was implemented in Rwanda, along with closure of nonessential businesses, as a response to the onset of COVID-19 in the country. The electricity demand was observed to drop by about 15 percent during these months. As the lockdown is lifted and economic activity resumes, the electricity demand is expected to pick up; however, the annual demand for 2020 is likely to remain lower than the demand in 2019. For this analysis, it is assumed that aggregate electricity demand in Rwanda in 2020 will be 10 percent lower than that in 2019 and will resume a growth rate of 10 percent from 2021 onward, equal to the growth rate observed in 2017 and 2018. Since the demand in 2021 is assumed to pick up from a lower baseline in 2020, the effects of the COVID-19 crisis are implicitly assumed to be long term. The decline in demand will adversely affect REG's cost recovery (figure 3.2), as relatively large IPPs with take-or-pay clauses are scheduled to be commissioned in 2020 and 2022, for which REG will have to pay capacity charges even as demand will fall substantially short of supply. This is expected to increase REG's subsidy requirements to about US\$23 million in 2020. The effects on REG's financials will extend in the future if the proposed power plants are commissioned on schedule, as actual absolute demand will be lower compared to the projections employed in preparing the LCPDP.



Figure 3.1. Financial Projections for REG (2020–2025)

Source: World Bank staff assessment.

Figure 3.2. Financial Projections for REG (2020–2025) Considering the Impact of COVID-19



Source: World Bank staff assessment.

Note: Demand is assumed to decline by 10 percent in 2020 compared to 2019 and to start increasing in 2021 at 10 percent but from the lower base of 2020, suggesting extended impact of the COVID-19 crisis on the power sector.



ANNEX 4: Gender Action Plan

COUNTRY: Rwanda Energy Access and Quality Improvement Project

Components	Activities to Be Undertaken	Implementation Timeline	Responsible Entity
1. Increasing Access to Grid Electricity	1. To organize and conduct public awareness campaign and stakeholder consultations on project activities. 30 percent women will be aware of project activities in the area of intervention and will participate.	During project implementation phase.	EDCL Contractors
	2. To ensure that there is participation of both men and women in construction, administration, maintenance, security, and supervision roles during program implementation. At least 10 percent of all workers will be women.	During project implementation phase.	Contractors
	3. To organize and conduct training on Sexual Transmitted Infections including HIV AIDS and Hepatitis B Virus and related prevention measures to all program workers prior to implementation of the program activities, provide condoms to all construction sites and ensure their safe access. 100 percent of program workers.	January 2021 and continuous refreshment on a monthly basis during project implementation phase.	EDCL Contractors
	4. To ensure that all project workers (men and women) are well equipped in terms of personal protective equipment to protect them from potential infectious diseases, including COVID-19.	January 2021 and continuous refreshment during project implementation phase.	Contractors
	5. To conduct campaigns to create awareness on the fight against SEA, VAC and GBV to all program workers.	January 2021 and continuous refreshment during project implementation phase.	EDCL Contractors
	 To ensure no salary/pay discrimination based on gender (equal pay for men and women for the same level job position). 	Commencement of the project up to completion phase.	Contractors
	7. To organize public awareness campaign on efficient use of energy and ensure equal participation of both men and women. At least 10 percent of women in the program intervention area will participate.	January–April 2022.	EDCL Contractors



Components	Activities to Be Undertaken	Implementation Timeline	Responsible Entity
	8. To ensure that women and men are involved in the development of renewable sources of energy.	January 2021 to April 2024.	EDCL Contractors EPD
	9. To organize sensitization meeting for the beneficiaries on the role of men's participation in domestic energy management.	January 2021 and continuous throughout the project Implementation period.	EDCL Contractors EPD
	10. To prepare and submit the quarterly report on Environmental and Social safeguards including Gender and Social inclusion for EAQIP. This can be done after the project starts and will be part of the entire project report.	Continuous: Every quarter during the project implementation period.	EDCL
2. Enhancing the Efficiency of Electricity Service	1. To organize and conduct public awareness campaign and stakeholder consultations on project activities. Both men and women will participate and at least 30 percent women from the project implementation area will participate.	During project implementation phase	EDCL Contractors
	2. To ensure men and women's participation for the construction, administration, maintenance, security, and supervision roles during project Implementation. At least 10 percent of all workers should be women.	January 2021 and continuous: During project implementation phase.	Contractors
	3. To organize and conduct training on sexual transmitted infections, including HIV/AIDS and Hepatitis B, and their prevention to all project workers prior to implementation. 100 percent of project workers will participate.	January 2021 and continuous refreshment during project implementation phase	EDCL Contractors
	4. To ensure that all project workers (men and women) are well equipped in terms of personal protective equipment to protect them from potential infectious diseases, including COVID-19.	January 2021 and continuous refreshment during project implementation phase.	Contractors
	5. To create awareness session on the fight against SEA, VAC, and GBV to all project workers.	January 2021 and continuous refreshment during project implementation phase.	EDCL Contractors
	6. To ensure no salary/pay discrimination based on gender (equal pay for men and women).	Continuous: during the project	Contractors



Components	Activities to Be Undertaken	Implementation Timeline	Responsible Entity
		implementation phase.	
	7. To organize public awareness campaign on efficient use of energy resources and both men and women involved. At least 10 percent of women in the project implementation area will participate.	January 2022.	EDCL Contractors
	8. To prepare and submit the quarterly report on Environmental and Social safeguards including Gender and Social inclusion for EAQIP. This can be done after the project starts and will be part of the entire project report.	Continuous: Every quarter during the project implementation period.	EDCL
3. Increasing Access to Off- Grid Electricity and Clean Cooking Solutions	1. To provide extensive TA on the clean cooking solutions, particularly on policy and regulatory improvement and entrepreneurship development, including targeted training for women entrepreneurs in the project activities' intervention.	March 2021.	EDCL
	2. To organize and conduct public awareness campaign and stakeholder consultations on project activities including 30 percent women representatives in the project implementation area.	August–December 2020.	EDCL Contractors
	3. To ensure men and women participation in the construction, administration, maintenance, security, and supervision roles during program Implementation. At least 10 percent of all workers should be women.	During project implementation phase.	Contractors
	4. Conduct training on sexually transmitted infections, including HIV/AIDS and Hepatitis B Virus, and their prevention to all project workers (men and women) before implementation. 100 percent of project workers will participate.	January–May 2021 and continuous refreshment during project implementation phase	Contractors
	5. To ensure that all project workers are well equipped in terms of personal protective equipment to protect them from potential infectious diseases, including COVID-19.	January–March 2021 and continuous refreshment during project implementation phase.	Contractors
	6. To create awareness on the fight against SEA, VAC, and GBV to all men and women project workers.	January 2021 and continuous refreshment	Contractors



Components	Activities to Be Undertaken	Implementation Timeline	Responsible Entity
		during project implementation phase.	
	7. To ensure no salary/pay discrimination based on gender (equal pay for men and women).	Continuous: during the project implementation phase.	Contractors
	8. To ensure that women and men are involved in the development of renewable sources of energy.	January 2021 to April 2024.	EDCL Contractors EPD
	9. To organize sensitization meetings for the beneficiaries on the increase of men's participation in firewood collection and other sources of domestic energy management.	January 2021 and continuous throughout the project completion	EDCL Contractors EPD
	10. Public awareness campaign on efficient use of energy resources and women's involvement, including at least 30 percent of women representatives in the project implementation area.	January–April 2022.	Contractors
	11. To prepare and submit the quarterly report on Environmental and Social safeguards including Gender and Social inclusion for EAQIP. This can be done after the project starts and will be part of the entire project report.	Continuous: Every quarter during the project implementation period.	EDCL
4. Technical Assistance,	 Project staff to be trained on gender mainstreaming activities and social inclusion. 	January 2021	EDCL
Institutional Capacity Building and Implementation	2. Organize the capacity building on different topics without gender discrimination.	Continuous throughout the project implementation	EDCL
Support	3. To prepare and submit the quarterly report on Environmental and Social safeguards including Gender and Social inclusion for EAQIP. This can be done after the project starts and will be part of the entire project report.	Continuous: Every quarter during the project implementation period.	EDCL



ANNEX 5: Clean Cooking Fund and Detailed Description of Clean Cooking Interventions

COUNTRY: Rwanda Energy Access and Quality Improvement Project

Introduction

1. The World Bank's ESMAP announced the establishment of a US\$500 million CCF at the 2019 United Nations Climate Summit, to galvanize political commitment and investment to achieve universal access to clean cooking by 2030. To achieve this goal, the CCF's objectives are to

(a) Leverage World Bank Group/MDB finance and attract private sector investments in the clean cooking sector;

(b) Catalyze technology and business innovations by generating additional revenue sources/incentives for players across clean cooking value chains; and

(c) Link incentive payments with verified results at the levels of output, outcome (number of households with access to clean cooking, directly contributing to SDG 7), and impact (improved health, gender equity, and global climate), using an RBF mechanism.

2. EAQIP proposes co-financing project components with the CCF to accelerate access to clean cooking in Rwanda and contribute to the GoR's clean cooking targets. The CCF includes two pillars. Pillar 1—Country/Regional Investment Program—provides grant resources to co-finance investment projects of the World Bank Group and other MDBs to scale up public and private sector investments in the clean cooking sector. The CCF grant funding can be used to (a) pay for the verified output, outcome, and impact results to achieve health, gender, and climate benefits from clean cooking interventions; (b) support the enabling environment through TA and capacity building; and (c) support project development and preparation. Pillar 2-Knowledge, Innovation, and Policy Coordination-works with development partners to mobilize high-level political commitments for the clean cooking sector at both global and country levels, generate and disseminate knowledge, promote ongoing technology and business innovations, and improve policy coordination. The GoR has set the target of reducing the percentage of households that use inefficient cooking solutions from the baseline value of 79.9 percent in 2017 to 42.0 percent by 2024 and achieve universal access to clean cooking by 2030. EAQIP proposes allocating US\$10 million in IDA funding, matched by US\$10 million in CCF grant funding, to co-finance its clean cooking operation; this will also include tapping into the CCF's expertise and networks comprising a wide range of development partners to contribute to both Rwanda's and the global clean cooking agenda.

Sector Context

3. **Rwanda's slow progress on access to clean cooking reflects its high dependence on solid biomass for meeting household cooking needs, with 80 percent reliant on firewood and 17 percent on charcoal** (Figure 5.1). According to EICV5, more than half of Rwanda's households use three-stone fires for cooking. The country's high population growth and density have exerted pressure on natural resources, especially forests. In addition, unsustainable charcoal production has contributed to deforestation, forest degradation, and air pollution. Around 86 percent of the country's charcoal is



produced in inefficient ways, using traditional earth-mound kilns with average thermal efficiency of about 12 percent.





4. Lack of access to clean cooking is still a significant bottleneck in improving the health and wellbeing of Rwandan households. Dependence on biomass cooking energy used with traditional stoves is linked to major health issues and deforestation. Women and children are more susceptible to HAP caused by emissions from biomass cooking, while cooking-related chores consume time that could otherwise be spent on more productive activities, including employment. This time poverty disproportionately affects women and girls, who spend more hours per day engaged in cooking-related activities and bear the largest share of drudgery.

5. Major drivers of households' lack of access include the lack of alternative solutions, low awareness, and unaffordability, but awareness raising, behavior-change campaigns, and financing support for high-performing technologies that reduce fuel use can overcome these obstacles. Households in Rwanda have few options available for meeting their cooking needs, in terms of fuels and stove technologies (box 5.1). Self-built stoves are used by about 15 percent of households, mainly in rural areas, while 16 percent, including more than half of urban households, use traditional charcoal stoves. Efficient cookstoves account for only 13.5 percent of stoves nationwide. Clean fuel stoves, including LPG and biomass pellets, are used by about 1 percent of households, mostly in urban areas. Stove stacking (that is, using more than one type of stove to meet cooking needs) is practiced by only about 6.6 percent of households. Affordability underscores the choices households make, especially in rural areas, where households across all consumption quintiles rely on firewood as their primary fuel (Figure 5.2). About 76 percent of households spend an average of 7 hours per week acquiring fuel (either by collecting or purchasing it) and preparing it for their stoves, with a disproportionate burden on households using firewood. Households using charcoal tend to purchase it in small quantities at frequent intervals, especially if they are resource constrained. A majority of households in Ubudehe categories (socioeconomic classes) 1, 2, and 3 are dependent on firewood to meet their primary cooking needs

Source: EICV5 2016-17.



(Figure 5.3). Adapting to improved and modern cooking requires increased awareness, availability of affordable and diverse technological and financing solutions that fit the needs of diverse consumers, and financing support to fill affordability gaps.

Box 5.1. Typology of Cookstoves in Rwanda

The MTF survey grouped Rwanda's cookstoves into the following four categories:

- **Three-stone stove.** A pot balanced on three stones over an open fire. Fuel use and emissions are high, and thermal efficiency and safety are low. Three-stone stoves usually use firewood, but other solid fuels may also be used. The three-stone stove is an equivalent of Tier 0.
- Traditional biomass stove. Locally produced stove made of mud, metal, or other low-cost materials and following cultural practices. Traditional biomass stoves use biomass fuels. The MTF survey identified six types of stoves as traditional: (a) round mud stove, (b) rocket stove, (c) gisafuriya, (d) double and triple movable metal charcoal stove, (e) all-metal stove, and (f) Muyaga. The traditional biomass stove is an equivalent of Tier 1.
- Improved biomass stove. This stove uses newer technology to improve efficiency, cleanliness, and safety. Improved biomass stoves use less energy than three-stone and traditional biomass stoves to deliver a given amount of usable heat and may also produce less indoor and overall air pollution. Thus, improved biomass stoves may enable cleaner and more efficient delivery of traditional fuels, though they may not meet emissions or efficiency standards. Their performance cannot be visually identified and thus must be tested. The MTF survey identified nine types of improved biomass stoves for Rwanda: (a) Darfour 1, (b) Darfour 2, (c) canarumwe, (d) canamake ivuguruye, (e) canamake itavuguruye, (f) fixed canamake itavuguruye, (g) double and triple movable (canamake itavuguruye), (h) sawdust/rice husks stove, and (i) Save80. The improved biomass stove can range from Tier 1 to Tier 3, depending on product materials, design, thermal efficiency, and emissions.
- Clean fuel stove. Stove that uses fuels with very low levels of polluting emissions (for example, biogas, LPG/cooking gas, electricity, ethanol, natural gas, and solar). Such fuels often provide high technical performance in emissions and efficiency that is largely 'stove independent'. Processed biomass (for example, biomass pellets), if burned using a well-designed stove, can also achieve high performance. In Rwanda, LPG/cooking gas (including PAYG), biogas, and biomass pellet gasifiers are currently used by a limited number of households. The new ethanol business model used by KOKO Networks, a company operating in Kenya, and the availability of high-efficiency electric pressure cookers in the region may offer new opportunities for bringing more modern cooking solutions to Rwanda. Clean fuel stoves are equivalent to Tiers 4 and 5 in terms of efficiency and emissions.





Figure 5.2. Primary Fuel Use in Urban and Rural Areas, by Quintile



Figure 5.3. Fuel Use by Ubudehe Category



Source: EICV5 2016–17.

6. The market for efficient and clean cooking solutions is small and nascent but has the potential to grow and expand. The local production process for improved cookstoves is artisanal with limited manufacturing and scale and no channel for systematic product development or receiving technology



transfers and licensing. This situation is mainly due to institutional isolation, lack of promotion or incentives for entrepreneurs, lack of dedicated support to clean cooking enterprises, limited financing options, and high interest rates. However, some opportunities are available that can help support private enterprises move forward and scale up. Cooking enterprises are eligible for exemptions on value added tax (VAT) and import duties. A few clean cooking promotional activities and ongoing pilots are testing new products and business models. Thus, promoting technology development, technology transfer, and localization based on the local cooking culture, as well as providing financing and knowledge support, is needed.

Integrating Lessons from the World Bank's Lending Experience into Project Design

7. Key lessons from the World Bank's lending experience in the clean cooking sector over the past decade, which have been incorporated into the project design, are summarized as follows:

(a) Access to modern-energy cooking services is a development issue. Access to modern-energy cooking services is closely related to the level of economic development and urbanization rate. The most effective way to reduce HAP is by switching to modern clean fuels (for example, electricity, natural gas, LPG, ethanol, and biogas). Fuel switching should be encouraged, and more efforts are needed to invest in the delivery infrastructure. At the same time, it should be recognized that large-scale fuel switching is unlikely to occur in rural areas until rural economies become substantially more developed or ongoing public funding is provided for technology upgrading and fuel switching. To lower HAP in rural households where the use of biomass is likely to persist over the near term, it is important to modernize the biomass fuel sector and promote integrated and cost-effective approaches (for example, improved/advanced biomass stoves, together with improved ventilation and behavior change).

(b) **A systems approach is needed to promote access to modern-energy cooking services.** To make the cooking process clean, the whole system of interactions of cooking technologies (the combination of stove and fuel) with human behavior (for example, what to cook, how to cook, and how often and long to cook) and housing conditions (for example, kitchen location, arrangement of rooms and size, construction materials, and quality of ventilation) needs to be considered. It is important to encourage innovation in each element of the system.

(c) Local innovation and localized solutions are critical for long-term sustainability. Cooking is a contextualized system with no one-size-fits-all solution. Although projects share common barriers, the best solutions will vary by location owing to differences in cooking behavior, culture, resources, institutions, and market conditions. Therefore, empowering the development of localized solutions, based on lessons from international experience, including the latest technology innovations, will be key because localized solutions are more likely sustainable. And only when solutions are sustainable can they be truly transformative.

(d) A national program with high-level support is essential to scale up access to modern-energy cooking services. While such programs need to involve stakeholders from a wide variety of positions and roles (public sector, civil society, and private sector) at all levels (that is, local, provincial, national, and



international), there is no substitute for high-level political, technical, and financial support from national leaders and agencies.

(e) **Targeted incentives or subsidies will be needed to achieve universal access to modern-energy cooking services.** Like universal access to electricity—which no country has achieved without some form of subsidy—subsidies will be needed to achieve universal access to modern-energy cooking solutions. Market forces and mechanisms are powerful tools for ensuring a sustainable supply of modern cooking technologies and should be harnessed in a way that helps the private sector develop, market, and deliver modern cooking solutions. However, if left to market forces alone, access will be limited by affordability and other constraints that affect mainly poor households, particularly in less developed and more remote areas. Thus, government policies are needed to (i) establish and maintain adequate levels of subsidies and (ii) design and implement effective subsidy allocation mechanisms to mobilize and sustain private sector participation and target households who have an affordability gap.

(f) **RBF has been demonstrated as an effective approach to using public resources to incentivize the market and can be designed to fit the country context and market conditions.** The World Bank has implemented the RBF framework to support ECCH solutions in 10 client countries with variations based on country conditions (for example, in Bangladesh, China, Indonesia, Kenya, Lao PDR, Mongolia, and Uganda). The results demonstrate that RBF is an effective instrument to incentivize private sector investment and deliver ECCH solutions with predefined result levels and triggers for payment. The RBF framework can be used to unify key elements and interventions needed to achieve results. In addition, its flexibility allows for designing and adjusting the predefined results and associated incentives based on the country context, market conditions, and feedback from program implementation.

Detailed Component Design

8. The GoR plans to partner with the private sector and facilitate a competition-based development of markets for clean cooking products and technologies. Under Rwanda's Biomass Energy Strategy, biomass pellet production, its required equipment and parts, stoves that meet the emissions and efficiency criteria of the ISO corresponding to Tiers 2–4, and the supply of bio-gasification energy are exempt from VAT. The clean cooking agenda has been recently moved to MININFRA, which is leading the coordination on the Biomass Energy Strategy, with implementation support provided by REG. However, a gap remains in the investment, implementation, and capacity required to meet the 2030 SDG targets. The strategy estimates that investment requirements of US\$240–590 million (2018–24) and US\$200–365 million (2025–30) are needed to meet the targets. There is no clear road map on where these investments are coming from, and there are few private sector players or cooking projects that are bankable. Currently, MININFRA's clean cooking capacity is limited institutionally and in terms of local-level implementation. The RSB is tasked with certification of cooking products and standards setting, and development of a testing laboratory is currently under way. Thus, consolidation and mobilization of resources are needed. Grant resources are especially needed to address the affordability gap and bankability issue through more innovative financial arrangements. Various development partners have plans to support aspects of the strategy: the GIZ/EnDev, SNV, EU, Enabel, Tony Blair Institute, Loughborough University, Clean Cooking Alliance, Global LPG Partnership, and AfDB. An EU-funded program to be implemented by GIZ/EnDev aims to increase the use of improved stoves through strengthening the value chains from production to usage.



Development partners can also play a role in capacity building; facilitation of knowledge exchange; and support in developing standards, quality assurance, and testing procedures appropriate to local conditions.

Subcomponent 3b: Increasing Access to Clean Cooking Solutions (IDA Credit: US\$10 million equivalent; CCF Grant: US\$7 million)

9. This subcomponent will set up a cooking RBF window to provide cash incentives to attract private sector investment and deliver eligible clean and efficient cooking solutions with a predefined results level and triggers for payment. The key features of the RBF window of Subcomponent 3b are the following:

- (a) Eligibility criteria for cooking technologies. The cooking RBF window is technology agnostic and supports continued technological innovations. The ISO has published ISO/TR 19867-3:2018 VPTs on cookstoves' thermal efficiency, carbon monoxide (CO) emissions, emissions of fine particulate matter (PM_{2.5}), safety, and durability. The MTF for cooking also has a tiered approach with reference to ISO VPTs on emissions and efficiency. The cooking RBF window will use both ISO VPTs and the MTF as the key reference documents for determining eligible cooking technologies and will support the contextual testing approach, which incorporates Rwanda's specific country context to reflect its cooking culture and practice. About 53 percent of households use three-stone stoves (equivalent to Tier 0) and about 15 percent use self-built or traditional biomass stoves (equivalent to Tier 1) (box 5.1). To enable a practical transition toward improved and modern cooking solutions, the cooking RBF window will support technologies that meet at least the Tier 2 performance level during the initial phase while providing local producers TA to improve their products' performance level. Once sufficient cooking technologies and products at the Tier 3 (and higher) performance level are affordable and available in Rwanda, the minimum requirement will be lifted to the Tier 3 performance level.
- (b) **Qualification of eligible cooking technologies.** The performance of eligible cooking technologies should be demonstrated through laboratory testing and/or field-based data. The PIU will make a public announcement on a rolling basis to invite stove manufacturers and cookstove makers to submit their applications and products for eligibility review. The RSB is setting up a stove-testing laboratory,⁶³ which will be responsible for conducting stove testing and evaluation and issuing recommendations on whether the cooking technologies are qualified under the cooking RBF window. The RSB will be provided TA to build its cookstove testing and evaluation capacity and improve national cookstove standards (table 5.1). Safety and durability will be evaluated as part of the eligibility criteria.

⁶³ Currently, the RSB is setting up a stove-testing laboratory, with funding from the World Bank; under an environmental project, a memorandum of understanding has been signed between the Rwanda Environment Management Authority and the RSB. The project will provide the stove-testing laboratory TA funding for training and capacity building, as well as support on cooking-technology improvement.



Stove Technology	Testing/Evaluation Requirements	
Stoves and accessories using biomass fuels that	Meeting thermal efficiency and	Evaluate for safety
require no additional processing	PM _{2.5} and CO emissions Tier 2	and durability (the
	requirements, according to ISO	expected lifetime is
	VPTs.	at least 3 years and
Stoves and accessories using biomass fuels that	Meeting thermal efficiency and	the manufacturer's
may require additional processing (for example,	PM _{2.5} and CO emissions Tier 3	warranty at least 1
charcoal, wood, or charcoal briquettes/pellets)	requirements, according to ISO	year).
and/or ventilation (for example, chimney)	VPTs; vented stoves will be	
	assessed for fugitive emissions.	
Stoves and accessories using modern fuels/energy,	Meeting thermal efficiency and	
which may include LPG, biogas, ethanol, electricity	PM _{2.5} and CO emissions Tier 4	
(including electric rice cooker and electric pressure	or Tier 5 requirements,	
cooker), pellets, and solar energy	according to ISO VPTs.	

Table 5.1. Illustrative	e Types of Stove	Technology and	Testing Requirements
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(c) **RBF incentives and payment triggers.** The total amount of eligible RBF incentives will be linked to the cooking-technology performance levels and consumer-income categories (Ubudehe categories 1, 2 and 3). The payment triggers will be linked to the verified results at the output, outcome, and impact levels (Figure 5.4). It is important to note that RBF incentive levels and triggers should be reviewed periodically. To illustrate, the total amount of eligible RBF incentives for each eligible cooking technology could range from US\$10 to US\$50, which could be adjusted in response to market conditions.





(d) **Focus on affordable and sustainable adoption.** The cooking RBF is designed to incentivize the private sector to deliver affordable and sustainable improved and modern cooking solutions. Companies will be required to specify their product and marketing strategies in the application and the impact of the

RBF incentives on product offerings and pricing. These strategies will be monitored through the program implementation. If a company is found to deviate from the specified pricing and product offerings, the company could be removed from the program. TA and training will be provided to local producers to improve the local product design and quality production. Innovation grants will be available (through a competitive process) to encourage innovative technological, business, and financing approaches with a focus on meeting poor households' cooking needs and encouraging female entrepreneurs in the cooking sector. Awareness raising and behavior-change campaigns will be conducted to stimulate demand and support sustainable adoption. The Operations Manual will also detail the processes for revoking RBF grants and reimbursement in case of nonperformance.

(e) Adopting an adaptive and collaborative approach. The ongoing COVID-19 presents many uncertainties that affect all aspects of the cooking sector, ranging from individual cooking behavior to the global supply chain for stoves, components, and fuels. Therefore, the project will take an adaptive and flexible approach to periodically review market conditions, actively seek feedback from key stakeholders, and adjust accordingly. The project will continue to coordinate and collaborate with key stakeholders (for example, the EU, GIZ/EnDev, SNV, Enabel, Tony Blair Institute, Loughborough University, Clean Cooking Alliance, Global LPG Partnership, and AfDB), as well as relevant Global Practices (GP) of the World Bank to align efforts in ongoing and potential projects in the cooking sector.

10. **Management and operating costs.** This component will cover the management and operating costs of both EDCL and the BRD.

Subcomponent 4 on clean cooking: Technical Assistance, Institutional Capacity Building and Implementation Support to support an enabling environment for clean cooking sector development (US\$3 million CCF)

11. This subcomponent will build institutional capacity and support an enabling environment for development of the cooking sector. More specifically, the component will support the following activities:

(a) Awareness raising and behavior-change campaigns. The project will work with health practitioners, women's groups, and educators on the issue of HAP and clean cooking options. Gender-targeted messages will be developed, and influential champions (for example, clean cooking ambassadors) will be identified. Mass media and social media, as well as other innovative marketing approaches, will be used to raise awareness of and demand for improved and modern cooking solutions. These activities will be designed and implemented in close coordination with development partners to ensure complementarity with other related cooking programs.

(b) **Market facilitation and policy/regulation review and improvement.** The component will hire a market facilitator to reach out to promising and interested cooking companies on opportunities and provide targeted business-development training for cooking companies participating in the RBF operation. It will also provide TA in reviewing related policies and regulations and identifying areas for improvement to support market development.

(c) **Stove testing and product development.** TA and capacity building will be provided to (i) increase stove-testing laboratories' testing and evaluation capacity; (ii) improve the design and quality of local



producers' stoves, with a special focus on incorporating women's needs as users; (iii) establish links with international suppliers, partners, and financiers to assist technology development or transfer; and (iv) improve the RSB's testing protocol and relevant national standards to incorporate the local cooking culture and practices.

(d) **Monitoring and verification for the RBF operation.** This component will cover the costs related to monitoring and verification of results at the output, outcome, and impact levels as well as support the development of a database to track and verify the operations.

(e) **Innovations.** This component will provide an innovation subgrant through a competitive process to support innovative cooking technologies, modern materials, technology transfer, and business and financing approaches, giving preferential support to female entrepreneurs.

Project cooking intervention objective: Accelerated progress on access to clean cooking in Rwanda				
OUTCOME: Improved access to clean cooking in Rwanda		Project target		
Outcome indicator 1.1	People provided with new or improved access to clean cooking solutions (Number).	2.15 million (500,000 households)		
Outcome indicator 1.2	Amount of private investment mobilized (Amount(USD)).	US\$19 million ⁶⁴		
INTERMEDIATE OUTCOME: Governments have adopted policies and regulations to support public and private sector				
investment in clean cooking				
Intermediate outcome indicator 1.1	Policies and regulations adopted by the government to support clean cooking market development (Number).	1		
Intermediate outcome indicator 1.2	Share of female workers in enterprises financed by Component 3 (Percentage).	10		
OUTPUTS				
Output 1	Policies and regulations adopted by the government to support clean cooking market development (Number).	1		

Clean Cooking Results Framework

⁶⁴ The amount refers to private investment mobilized for the entire Component 3: Increasing Access to Off-Grid Electricity and Clean Cooking Solutions.