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INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT PAPER

ON A

PROPOSED ADDITIONAL GRANT

IN THE AMOUNT OF SDR 8.8 MILLION (US\$12 MILLION EQUIVALENT)

TO THE

DEMOCRATIC REPUBLIC OF SÃO TOMÉ AND PRÍNCIPE

FOR THE

POWER SECTOR RECOVERY PROJECT

March 16, 2020

Energy and Extractives Global Practice Africa Region

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CURRENCY EQUIVALENTS

Exchange Rate Effective February 29, 2020

Currency Unit = Sao Tomean Dobra (STD)

US\$1 = STD 22.3194

US\$1 = SDR 0.728183262

FISCAL YEAR January 1 - December 31

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ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
AFAP	Project Fiduciary Agency (Agência Fiduciária de Administração de Projeto)
AGER	General Regulatory Authority (Autoridade Geral de Regulação)
CFL	Compact Fluorescent Lamp
DSM	Demand Side Management
E&S	Environmental and Social
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
EMAE	National Water and Electricity Utility (<i>Empresa de Água e Electricidade</i>)
ENCO	National Fuel Company (Empresa Nacional de Combustíveis e Óleos)
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FIRR	Financial Internal Rate of Return
FTL	Fluorescent Tube Light
FM	Financial Management
GBV	Gender-based Violence
GDI	Gross Domestic Income
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GoSTP	Government of São Tomé and Príncipe
GRM	Grievance Redress Mechanism
GRS	Grievance Redress Service
GWh	Gigawatt Hours
HDI	Human Development Index
IDA	International Development Association
IFR	Interim Financial Report
IL	Incandescent Lamp
IMF	International Monetary Fund
IPF	Investment Project Financing
ISR	Implementation Status and Results Report
kWh	Kilowatt Hour
LCPDP	Least-cost Power Sector Development Plan
LED	Light Emitting Diode
LV	Low Voltage
MOPIRNA	Ministry of Public Works, Infrastructure, Natural Resources and Environment (Ministério
	das Obras Públicas, Infraestrutura, Recursos Naturais e Ambiente)
MIP	Management Improvement Plan
MIS	Management Information System
MPFEA	Ministry of Planning, Finance and the Blue Economy (Ministério do Planeamento,
	Finanças e Economia Azul)
MV	Medium Voltage
MW	Megawatt
NDC	Nationally Determined Contribution
NGO	Nongovernmental Organization
NPV	Net Present Value
0&M	Operations and Maintenance

OM	Operational Manual
PDO	Project Development Objective
PIU	Project Implementation Unit
PPSD	Project Procurement Strategy for Development
PPP	Purchasing Power Parity
PSRP	Power Sector Recovery Project
RPP	Revenue Protection Program
SDR	Special Drawing Rights
SOE	State-owned Enterprise
STP	São Tomé and Príncipe
VAT	Value-added Tax

Democratic Republic of São Tomé and Príncipe Additional Financing to São Tomé and Príncipe Power Sector Recovery Project (P169196)

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BASIC INFORMATION – PARENT (STP Power Sector Recovery Project - P157096)

Country Sao Tome and Principe	Product Line IBRD/IDA	Team Leader(s) Nicolas Jean Marie Sans		
Project ID	Financing Instrument	Resp CC	Req CC	Practice Area (Lead)
P157096	Investment Project Financing	IAFE4 (10079)	AFCC1 (6544)	Energy & Extractives

Implementing Agency: Agencia Fiduciaria de Administracao de Projeto (AFAP)

Bank/IFC Collaboration

No

Approval Date	Closing Date	Expected Guarantee Expiration Date	Original Environmental Assessment Category	Current EA Category
05-Jul-2016	30-Jun-2021		Partial Assessment (B)	Partial Assessment (B)

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



Development Objective(s)

The project development objectives are to (i) increase renewable energy generation and (ii) improve the reliability of the electricity supply.

Ratings (from Parent ISR)

	Implementation					Latest ISR
	19-Apr-2017	10-Oct-2017	25-Apr-2018	15-Oct-2018	02-May-2019	13-Dec-2019
Progress towards achievement of PDO	S	S	S	S	S	S
Overall Implementation Progress (IP)	S	S	S	S	S	S
Overall Safeguards Rating	S	S	S	MS	MS	MS
Overall Risk	S	S	S	S	S	S

BASIC INFORMATION – ADDITIONAL FINANCING (Power Sector Recovery Project Additional Financing - P169196)

Project ID	Project Name	Additional Financing Type	Urgent Need or Capacity Constraints
P169196	Power Sector Recovery Project Additional Financing	Cost Overrun, Restructuring	No
Financing instrument	Product line	Approval Date	
Investment Project Financing	IBRD/IDA	06-Apr-2020	
Projected Date of Full Disbursement	Bank/IFC Collaboration		
30-Oct-2024	No		



Is this a regionally tagged project?	
No	
Financing & Implementation Widdalities	
[] Series of Projects (SOP)	[] Fragile State(s)
[] Disbursement-Linked Indicators (DLIs)	$[\checkmark]$ 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)	

[] Contingent Emergency Response Component (CERC)

Disbursement Summary (from Parent ISR)

Source of Funds	Net Commitments	Total Disbursed	Remaining Balance	Disbursed
IBRD				%
IDA	16.00	4.98	10.61	32 %
Grants				%

PROJECT FINANCING DATA – ADDITIONAL FINANCING (Power Sector Recovery Project Additional Financing - P169196)

FINANCING DATA (US\$, Millions)

SUMMARY (Total Financing)

	Current Financing	Proposed Additional Financing	Total Proposed Financing
Total Project Cost	29.00	12.00	41.00
Total Financing	29.00	12.00	41.00
of which IBRD/IDA	16.00	12.00	28.00



Financing Gap	0.00	0.00	0.00			
DETAILS - Additional Financing World Bank Group Financing						
International Development Association (IDA)			12.00			
IDA Grant			12.00			

IDA Resources (in US\$, Millions)

	Credit Amount	Grant Amount	Guarantee Amount	Total Amount
Sao Tome and Principe	0.00	12.00	0.00	12.00
National PBA	0.00	12.00	0.00	12.00
Total	0.00	12.00	0.00	12.00

COMPLIANCE

Policy

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

[] Yes [√] No

Does the project require any other Policy waiver(s)?

[] Yes [√] No

INSTITUTIONAL DATA

Practice Area (Lead) Energy & Extractives

Contributing Practice Areas

Climate Change and Disaster Screening

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



PROJECT TEAM

Bank Staff

Name	Role	Specialization	Unit
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Extended Team			
Name	Title	Organization	Location



I. BACKGROUND AND RATIONALE FOR ADDITIONAL FINANCING

A. Introduction

1. This Project Paper seeks the approval of the Executive Directors for a proposed additional financing (AF) in the amount of US\$12 million equivalent by the International Development Association (IDA) in the form of a grant to the Democratic Republic of São Tomé and Príncipe (STP) for the Power Sector Recovery Project (PSRP) (P157096). US\$10 million of the AF will cover cost overruns for the rehabilitation of the Contador hydropower plant, increasing the installed capacity from 2.2 megawatt (MW) to 3.2 MW, and US\$2 million is toward the replacement of incandescent bulbs (ILs), compact fluorescent lamps (CFLs) and fluorescent tube lights (FTLs) with high-efficiency light emitting diode (LED) lamps. This Project Paper also includes the extension of the parent project closing date by 36 months, from June 30, 2021 to June 28, 2024, to allow most of the project commissioning by end of 2022 but also ensuring proper management of defect liability insurance of key equipment to be supplied over the last two years of the project till July 2024.

2. The parent project, financed through an IDA grant in the amount of SDR 11.3 million (US\$16 million equivalent) and co-financed by the European Investment Bank (EIB) in the amount of US\$13 million, was approved by the Board of Executive Directors on July 5, 2016, and became effective on November 1, 2016. The Project Development Objectives (PDOs) of the parent project are to (i) increase renewable energy generation and (ii) improve the reliability of the electricity supply. The parent project aims to support sector recovery by financing the most critical infrastructure investments and providing technical assistance for capacity-building and sector reforms. The project is also aligned with the World Bank Group's Performance and Learning Review of the Country Partnership Strategy for the Democratic Republic of São Tomé and Príncipe for the period FY14-18¹. It contributes to the Theme One: Supporting Macroeconomic Stability and Inclusive Growth by supporting the Government's effort to implement sector reforms through reducing the fiscal impact of energy subsidies (currently estimated around 4 percent of gross domestic product (GDP)), ensure energy security through provision of clean energy and building capacity of the sector institutions.

3. The parent project has four components: (a) support for electricity institutional reform and sector planning; (b) strengthening operational performance and governance of the National Water and Electricity Utility (*Empresa de Água e Electricidade*, EMAE); (c) investing in enhanced reliability of electricity generation, transmission, and distribution; and (d) project implementation support.

4. The proposed AF is required to (a) cover a cost overrun of US\$10 million, which was identified during the preparation of the design studies supported by Subcomponent 3.1: 'rehabilitation of Contador hydropower plant and operations and maintenance support program' and (b) scale up the PSRP operation by adding a new subcomponent totaling US\$2 million to provide a comprehensive demand-side management program that will support energy efficiency improvement measures towards the mitigation of supply shortages and improve the availability of electricity in STP under Component 3 of the PSRP.

¹ Report No. 112944-STP; May 29, 2019.

5. The bulk of the AF will, therefore, cover the increase in cost as a result of a proposed increase in the installed capacity of the hydropower plant from 2.2 MW to 3.2 MW and associated significant increase in envisaged energy production, following the recommendations of optimization studies. Without the proposed AF, the recommended rehabilitation and expansion of the plant under Subcomponent 3.1 would not be possible, and the PDO of increasing renewable energy generation would not be achieved. The proposed AF will also expand and maximize the development impact of the project, by increasing the installed capacity of the Contador hydropower plant from 2.2 MW to 3.2 MW, which will significantly increase the proportion of reliable renewable energy in the country's energy mix. Finally, the new subcomponent on demand-side management will allow to better manage peak demand for the grid-based generation capacity by supplying 200,000 high-efficiency LED bulbs and 46,500 LED tube lights (collectively called LED lamps elsewhere in the document) in exchange for ILs, CFLs, and FTLs, considerably increasing the reliability of power supply, particularly in the current context of constrained production capacity in the island due to inadequate maintenance of power plants couple with restriction in fuel supply.

6. The proposed AF is in full compliance with the implementation of the Least-cost Power Development Plan (LCPDP) finalized for the country by Ricardo Energy and Environment in October 2018 and approved by the Government of São Tomé and Príncipe (GoSTP) under the PRSP. The choice of the proposed installed capacity of 3.2 MW has been informed by the results of the economic analysis available in the LCPDP, which showed that this option provided the least cost of generation (based on a comparison between the different levelized cost of electricity production). The development of the Contador hydropower plant has been identified as among the least-cost solutions to increase generation capacity in STP in the short to medium term and meet the renewable generation targets set by the GoSTP within the Nationally Determined Contribution (NDC) framework. The demand-side management program is in full compliance with recent commitments of the GoSTP to implement short-term actions to improve the financial sustainability of the EMAE, as part of a recent program approved by the International Monetary Fund (IMF) in October 2019.

7. The Environmental and Social Impact Assessment (ESIA) and the associated Environmental and Social Management Plan (ESMP) for the rehabilitation of Contador accounting for the expansion of the capacity of the hydropower plant from 2.2MW to 3.2MW were finalized, approved and disclosed in country on February 4, 2020 as well as by the World Bank on February 5, 2020. The anticipated impacts from the demand-side management program will be localized and mitigated through good design and operation, and none of the anticipated impacts will be irreversible. New safeguard policies will not be triggered and as such, the AF is classified as Category B, same as the parent project.

8. There will be no co-financing from other donors for this proposed AF.

9. The proposed AF activities are fully incorporated in the components of the parent project. Hence, *Agência Fiduciária de Administração de Projeto* (AFAP) - the Project Fiduciary Agency and the fiduciary agency for PSRP administration in STP - will remain as the implementing agency for the AF.

B. Country Context

10. São Tomé and Príncipe is a lower middle-income and small-island country facing typical challenges of small states. The country consists of two main islands in the Gulf of Guinea, with a surface area of 1,001 km², and is administratively divided into six districts, in addition to the Autonomous Region

of Príncipe (*Região Autonóma do Príncipe*). STP is a multiparty democracy and unitary state, with a total population of approximately 200,000 people, with 42.6 percent of the population at or below the age of 14. In 2018, the country's per capita gross national income was estimated at US\$3,430 in purchasing power parity (PPP), and its per capita GDP was US\$1,890. As a small-island country, STP is characterized by (a) a small population; (b) a small land area; (c) remoteness; and (d) a high fixed cost of public goods— all factors that affect the country's public capacity, trade, fiscal accounts, and human development.

11. **Poverty reduction appears to have been rather stagnant in STP since 2010.** Estimates based on growth and distribution assumptions indicate that around one-third of the country's population lives on less than US\$1.9 (2011 PPP) per day in 2019, a decline of roughly 2 percentage points relative to 2010. The change in poverty has been mainly attributed to economic growth (increases in the mean value of household income) rather than the redistribution of income across the population, and inequality in STP remains high for international standards (Gini index of 56.3 in 2017). The Human Development Index (HDI) stands at 0.59 for STP, lagging behind the average for Sub-Saharan Africa (at 0.62).

12. Economic growth, which has been overly reliant on public expenditure, has been declining due to reduced government funding (external loans, grants, and own-source revenues) and more recently due to the energy crisis. The country's GDP growth rate slowed from an average of 4.9 percent in 2010–2015 to 2.7 percent in 2018. In the same period, public investments dropped from an average of 22.1 percent of GDP to 9.0 percent, while grants declined from an average of 15.2 percent of GDP to 8.2 percent. Tax revenues also declined by about 3 percentage points of GDP between 2010–2015 and 2018. As a result, public debt increased significantly, reaching 118 percent of GDP as of June-2019. The rise in public debt was further propelled by a build-up of arrears of government enterprises and state-owned enterprises (SOEs) including EMAE, which increased domestic debt. While the agriculture and tourism sectors—where most private sector-led growth originates—grew in the last 10 years, they have not been able to replace the Government as the economy's main growth driver. The combination of a weak private sector and strained public sector reduced economic growth resulting in increasing energy outages, a liquidity crunch, and high exposure of banks to the public sector.

13. The macroeconomic situation remains challenging, but recent government measures and the new IMF program have been addressing these imbalances. The Government has acknowledged the severity of the country's current macroeconomic situation. The approved 2019 budget promotes fiscal consolidation of more than 1 percentage point of GDP. Moreover, a new IMF program has been approved by the IMF's Board of Directors in October 2019. The new three-year program is expected to be made available under the Extended Credit Facility modality and for a total of US\$19 million. It will focus on fiscal consolidation, SOE reform (including EMAE), and monetary tightening to support the country's currency peg.

14. The October 2018 elections and the subsequent change in administration reset the policy dialogue on critical reforms related to the energy sector. Parliamentary and local elections were held in October 2018, which yielded a coalition government that took office at the end of November 2018. Coalition governments are historically unstable in STP and have difficulty in advancing reforms. The change of governments also led to a reshuffle in most government positions while some expenditure and borrowing made at the end of 2018 delayed a thorough assessment of the macroeconomic picture. The new administration needed time to familiarize itself with the macroeconomic condition it had inherited as well as with the ongoing policy reforms.

15. Public debt has been increasing since STP had its debt forgiven in 2008 due to external borrowing, budget deficits, loss-making SOEs, energy subsidies, and government arrears. A large part of the public investment that boosted growth from 2001 to 2014 was paid for by external borrowing, leading to an increase in public debt. In recent years, the Government expanded the electricity grid, providing access to energy to more people in both islands. Greater access, however, came with the higher public debt since EMAE has seen its losses increasing with tariffs set on average at half of its costs, and its debt is covered by the Government to fail to pay its suppliers on time, accumulating arrears with EMAE, the telecom company and other suppliers, and most recently with domestic banks, which have financed investments of SOEs, autonomous agencies, and other sovereign powers, and the government payroll. Finally, the debt also increased during part of this period due to lower fuel prices in STP than abroad, creating a fuel subsidy that was assumed by the Government in the form of debt with the fuel supplier. This subsidy has been reverted since 2016 as domestic prices are now higher than international prices, and the difference is being used to reduce this debt.

16. The gross domestic income (GDI) is calculated for 166 countries and is based on the sexdisaggregated HDI, defined as a ratio of the female to the male HDI. The 2018 female HDI value for STP is 0.571 in contrast with 0.635 for males, resulting in a GDI value of 0.900, placing it into Group 5. In comparison, the GDI value for Cabo Verde is 0.984 and is 0.891 for Sub-Saharan Africa. Gender gaps are present in the country for attaining the secondary education level and beyond with 31.5 percent of adult women having reached at least a secondary level of education compared to 45.8 percent of their male counterparts. Economic opportunities are also widely different: female participation in the labor market is 43.3 percent compared to 76.2 for men according to recent UNDP Human Development Report 2019 for STP.

17. Outcomes of Poverty Assessment Report finalized by the World Bank Poverty and Equity Global Practice in December 2019 provides more details about the large differences in labor participation. While less than 10 percent of the males between the age of 25 and 59 are not participating in the labor market, about 40 percent of females are not participating, mostly due to high proportions of unpaid household labor undertaken by them. Women also have an unemployment rate three times higher than men with 14.5 percent compared to 5.0 percent. The unemployment rate is also higher among individuals with secondary level education. Individuals with an education attainment between 7 and 12 years have the highest unemployment rate, among all education levels, of 12.7 percent, while people post-secondary level have unemployment rates of 9.9 percent, respectively. This highlights that people with lower education and in particular women have less opportunities of participating in the formal labor market whereas individuals with a higher level of education have easier access to jobs.

18. Whereas data on female entrepreneurship is scarce for STP, Sub-Saharan examples indicate that women face challenges to access opportunities mainly due to barriers in accessing information and financing. Specifically, within the energy sector entrepreneurship opportunities related to renewables (retail, maintenance, importation, etc.) are at a very low level in the country, with an estimated number of 10 dedicated firms currently in STP, of which none are female-headed. For energy sector employment limited sex-disaggregated data is available for STP in general, but the number of female employees at the EMAE of 11 or a percentage of 2.6 in technical roles and is in accordance with global data that indicates that women are underrepresented in both technical and non-technical roles and that the sector is male dominated.



C. Sector Context

19. The power sector in STP is small, and the institutional actors are commensurately few. Nonetheless, they have varying degrees of capacity and overlapping mandates. The Ministry of Planning, Finance and the Blue Economy (*Ministério do Planeamento, Finanças e Economia Azul,* MPFEA) oversees EMAE's financial performance and is responsible for approving tariffs. Although EMAE's finances are consolidated and published in the EMAE's annual report, these accounts are not audited by an independent body and accounting methods are opaque. The Ministry of Public Works, Infrastructure, Natural Resources and Environment (*Ministério das Obras Públicas, Infraestrutura, Recursos Naturais e Ambiente,* MOPIRNA) oversees EMAE's technical performance but has few technical resources of its own. The General Regulatory Authority (*Autoridade Geral de Regulação,* AGER) is the multisector regulatory agency with mandates in the telecommunications, water, post offices and electricity sectors. In December 2014, it was mandated with regulating the energy sector, including regulating tariff, permitting, and overseeing long-term sector planning. A planning entity was also recently created under MOPIRNA.

20. **Electricity supply is constrained in STP**. The current installed generation capacity is 26 MW of which around 20 MW was available in 2017 comprising 92.4 percent thermal (18.35 MW) and 7.6 percent hydro (1.50 MW). This is insufficient to meet the maximum demand, which was estimated to be just less than 21 MW.

21. The already sluggish economy was adversely affected by an energy crisis in the second half of 2018 with effects lingering until 2019. STP experienced a severe energy crisis in late 2018 as energy production capacity dropped from 20 MW to as low as 7 MW as diesel generators systematically failed, a result of inadequate infrastructure maintenance. The water and energy utility company, EMAE, responded to the crisis by cutting the electricity supply, leaving parts of the country with energy access for only a few hours a day and other areas without energy for several days. The ensuing protests and widespread popular discontent led to roadblocks that constrained fuel distribution in the country. Both the electoral period and the energy crisis caused a significant slowdown in economic activity that led to lower tax collection, a scarcity of goods, higher inflation, and lower foreign exchange inflows. The Government still has not been able to settle the payment arrears to suppliers nor the bank loans taken to pay salaries.

22. On the energy side, STP was able to bring energy production back to 16 MW in February 2019, reducing and rationalizing the blackouts. A contract for procurement of a total of around 10 MW thermal plants financed by British Petroleum was signed in August 2019, which will allow energy supply to be reestablished to the full demand level and conduct proper maintenance of the other generators. On the other hand, the National Fuel Company (*Empresa Nacional de Combustíveis*, ENCO), reduced the quantity of fuel import and raised its prices for EMAE due to the growing payment arrears from EMAE.

23. The World Bank has been supporting the Government with a transaction advisor to find a shortterm solution while fast-tracking the implementation of medium- to long-term options determined by an LCPDP study financed under the parent PSRP. The study identified the development of the limited hydro potential combined with solar and thermal power plants.

24. Electricity coverage in STP extends to about half the population, and electricity access is currently estimated at 59 percent with transmission and distribution networks totaling over 306 km.



The electricity access rate is relatively high than most countries in Sub-Saharan Africa. However, the network infrastructure is old and poorly maintained leading to reported frequent and prolonged outages.

25. **Financials of the sector are also poor.** Despite having one of the highest tariffs in the region with an average retail electricity tariff of US\$0.22 per kilowatt hour (kWh), EMAE, the national utility, is unable to recover costs due to a generation mix that is overwhelmingly reliant on inefficient thermal capacity and expensive fuel imports. This combined with network losses of 37 percent, of which over 20 percent are non-technical losses, keeps worsening the financials of the national utility. The high commercial losses are largely due to theft through illegal connections as customers are unwilling to pay for low quality and unreliable power supply coupled with the perceived fallacy that stealing a bit of electricity from EMAE will not jeopardize EMAE's operational performance. Other factors contributing to the culture of theft and nonpayment include the public's lack of trust, perceived lack of fairness, and limited transparency of EMAE.

D. Original Project Description and Performance

Parent Project Description

26. **Component 1: Support for electricity institutional reform and sector planning (IDA US\$1.2 million equivalent).** This component is financing a combination of capacity building, action plans, road maps, and studies that will (a) strengthen the capacity of the regulatory agency and (b) prepare plans for optimum investments needed to develop the power sector in STP, from electricity generation to the effective connection of end users. Subcomponents include the following:

- (a) Subcomponent 1.1: Reinforcement of the power sector regulatory agency (IDA US\$0.5 million equivalent). This subcomponent provides technical assistance to AGER to (i) organize its regulation function; (ii) train the recipient's staff working on energy sector regulation; and (iii) develop procedures for the interaction between MOPIRNA, AGER, EMAE, and potential private investors.
- (b) Subcomponent 1.2: Development of an integrated Least Cost Power Development Plan (IDA US\$0.4 million equivalent). This subcomponent is supporting consultancy services to carry out the preparation of an LCPDP to define the investments needed in all the segments of the electricity supply chain (from generation, transmission, and distribution to consumers' connection).
- (c) Subcomponent 1.3: Electricity Demand Forecast for STP (IDA US\$0.1 million equivalent). The study under this subcomponent is reviewing and establishing the annual load growth forecast for the EMAE power system.
- (d) Subcomponent 1.4: Tariff Study (IDA US\$0.2 million equivalent). The study under this subcomponent will recommend a tariff structure and level for a five-year period that will enable EMAE, through its sales revenue collections, to (i) restructure/rationalize the consumer categories to better reflect the cost of supply and the GoSTP's social objectives; (ii) move toward cost recovery of electricity service to its consumers; (iii) reach a reasonable



level of rate of return on revalued assets; and (iv) be protected from inflation and foreign exchange risks.

27. **Progress.** The final electricity demand forecast and integrated LCPDP was delivered in October 2018 and approved by the GoSTP in April 2019 as one of the prior actions of the recently approved 'Third Strengthening Growth and Fiscal Policy Development Policy Financing' (P164321). The LCPDP model incorporated the results of the optimization studies for the rehabilitation of Contador hydropower plant and led to the choice of the recommended alternative of 3.2 MW. The LCPDP also identified hydropower as a priority source of energy to be developed in STP to attain the NDC targets.

28. A specialized consulting firm was hired to set up the legal and institutional framework for the electricity regulator, AGER. An institutional assessment was carried out to identify gaps in the legislation to allow AGER to fully play its regulatory role in the sector, leading to better control on the quality of service provided by EMAE. This led to a signing of a Concession Agreement between EMAE and the GoSTP that defines the performance rules of the public utility and clear indicators in May 2019. The final report of the tariff study was submitted by the consulting firm on May 31, 2019 with recommended an updated tariff grid and an impact analysis of the realignment of the tariff structure towards progressive cost recovery. GoSTP approval of the study and launch of implementation of its recommendations are expected in April 2020. This is a key part of the strategy to improve sector financial viability.

29. The performance of this component is currently rated satisfactory.

30. **Component 2: Strengthening operational performance and governance of EMAE (US\$7.5 million, of which IDA US\$2.3 million equivalent and EIB US\$5.2 million).** This component comprises the preparation and endorsement of a Management Improvement Plan (MIP) for EMAE for a three-year period, focused on improving efficiency, transparency, and accountability of EMAE's performance in the key operational areas of electricity supply, commercial functions, and management of corporate resources, with specific emphasis on better service quality and nontechnical loss reduction. Key activities under this component include the following:

- (a) Subcomponent 2.1: Installation of a new Management Information System at EMAE (IDA US\$1.0 million equivalent). In line with the MIP, this subcomponent supports the purchase and installation of a new Management Information System (MIS), which will include a commercial management system, an integrated distribution management system, and an enterprise resource planning system, to make the development of processes and activities in all business areas more efficient, transparent, and accountable. This subcomponent will include training of staff on the new MIS.
- (b) Subcomponent 2.2: Preparation of a Management Improvement Plan for EMAE (IDA US\$0.9 million equivalent). This subcomponent supports the preparation of a MIP for EMAE. The MIP focuses on improving efficiency, transparency, and accountability of EMAE's performance in the key operations areas of electricity supply, commercial functions, and management of corporate resources, with specific emphasis on better service quality and nontechnical loss reduction.



- (d) Subcomponent 2.4: Installation of statistical meters (EIB US\$0.3 million). This subcomponent will finance the installation of around 170 statistical meters. These meters can be remotely monitored on different feeders of the network to establish exact losses in different parts of the network. This will pave the way for the implementation of selective and effective loss-reduction programs and will help define the sequencing of intervention for Subcomponent 2.5 (see below).
- (e) Subcomponent 2.5: Second phase RPP replacement of all remaining meters (EIB US\$3.7 million). The second-phase RPP will consist of the installation of Advanced Metering Infrastructure, comprising consumption meters and devices for remote communication at the premises of around 16,000 users (single-phase connection) with recorded monthly consumption and installation of another 2,000 meters for large customers (triphasic connection) not yet metered and not covered under the first-phase RPP. Old meters will be replaced as part of this process.
- (f) Subcomponent 2.6: Gender-sensitive community engagement and outreach campaign (IDA US\$0.4 million equivalent). As part of a proposed 'soft approach' to address commercial losses, the project is developing a community engagement and outreach campaign employing women's groups for social change focusing to engage both men and women at the household level. Specifically, 17 women will be trained and employed as agents for community outreach. These agents will (i) inform the community about ongoing utility activities and their progress; (ii) promote messages related to the benefits of having a safe and legal connection and positive attitudes toward bill payment; (iii) support customer complaint mechanisms; and (iv) gather feedback from the community on consumer satisfaction and perceptions. Finally, the campaign will also include utility-level interventions to promote a culture of transparency and trust among electricity customers, such as the public dissemination of the utility's monthly key performance indicators. A pilot where local women will provide electricity services at community level will be also implemented to promote service decentralization and improve customer relations.

31. **Progress.** A specialized consultant was hired to prepare the MIP and technical specifications for the procurement of a state-of-the-art MIS. MIP was delivered in September 2018 and approved by the GoSTP. Its implementation is ongoing, and additional support is being provided by the project on its operationalization, including recruitment of a specialized HR firm to competitively select EMAE directors working under the General Manager.

32. The design of an RPP and its implementation to ensure sustainable reduction of nontechnical losses through systematic remote recording and monitoring of consumption of large users is ongoing under the EIB financing. The metering campaign will be rolled out in April 2020, once procurement is launched in March 2020.

33. To prepare the community engagement and outreach campaign to address commercial losses through employing women and promote change of behaviors related to this practice, a nongovernmental organization (NGO) was hired to design, implement, and supervise the campaign and other related activities. A behavioral diagnostic identifying main bottlenecks and obstacles to legal connection and more responsive electricity consumption behaviors was carried out and its results used to inform the campaign's design. The campaign is currently under design and is expected to be rolled out in April 2020. Following the campaign, the pilot intervention on electricity community services will commence.

34. The performance of this component is currently rated satisfactory.

35. **Component 3: Investing in enhanced reliability of electricity generation, transmission, and distribution (US\$18.4 million, of which IDA US\$10.6 million equivalent and EIB US\$7.8 million).** This component finances priority investments in the rehabilitation and potential expansion of the Contador small hydropower plant, the rehabilitation of the Contador evacuation line and medium voltage (MV) network, and the upgrading of existing low voltage (LV) network in selected districts of the country.

- (a) Subcomponent 3.1: Rehabilitation of Contador hydropower plant and operations and maintenance support program (IDA US\$9.1 million equivalent). This subcomponent will finance the works for the rehabilitation of the plant. Optimization studies analyzed the potential for expansion of the power plant with the current nominal installed capacity of 2.2 MW. A concurrent operations and maintenance (O&M) support program ensures the technical sustainability of the rehabilitated hydropower plant by financing procurement and storage of spare parts as well as training of EMAE staff for O&M of the plant during the early stage of project implementation. This subcomponent also covers engineering aspects (design and supervision of works) and preparation of related safeguards documents to support the technical and environmental and social (E&S) implementation choices.
- (b) Subcomponent 3.2: Rehabilitation of key components of Contador medium voltage evacuation line (IDA US\$1.5 million equivalent). This subcomponent is financing priority investments on the electricity network to ensure increased reliability of the MV network for the evacuation line from Contador to São Tomé as well as implementation of a network protection study.
- (c) Subcomponent 3.3: Low voltage network rehabilitation (EIB US\$7.8 million equivalent). This subcomponent will finance the rehabilitation of target areas of the LV network by replacing existing infrastructure, which is currently in very poor condition, leading to unreliable distribution and allowing electricity theft, a large cause for nontechnical losses.

36. **Progress.** The design of the works supported under the EIB co-financing is ongoing, through a specific technical assistance mobilized by EIB. All tender documents are now ready, and the procurement process of the works will start in March 2020.

37. Regarding the design studies for the rehabilitation and expansion of the Contador hydropower plant, a specialized consulting firm was hired and delivered optimization studies in June 2018. After careful analysis of the proposed options, it was found that an alternative with 3.2 MW was the optimum least-cost option for STP. It was therefore agreed to start detailed design studies on this basis, despite the identified financing gap due to cost overruns. The consultants delivered the final version of the detailed studies in September 2019. Following approval of ESIA and associated ESMP, procurement of works and equipment is expected to be completed by July 2020. The commissioning of the plant is expected by the end of year 2022, requiring the extension of the closing date of the parent project up to June 2024 to adequately cover the defect liability period of the contract and O&M capacity-building initiatives for the rehabilitated plant.

38. The ESIA for the recommended 3.2 MW expansion of the Contador Hydropower plant has been finalized by JGP, a firm specialized in E&S assessments. Final deliverables including the public consultation were cleared by the World Bank on January 31, 2020 and subsequently disclosed in country on February 4, 2020 and by the World Bank on February 5, 2020.

39. The implementation of these components and subcomponents is on track and requires securing the additional funds before the start of the works for the rehabilitation works of the Contador hydropower plant planned for July 2020.

40. The performance of this component is rated satisfactory.

41. **Component 4: Project implementation support (IDA US\$1.9 million equivalent).** This component supports project implementation, including training for AFAP, on procurement and fiduciary duties. Technical training is also provided to EMAE technical staff supervising project implementation.

42. **Progress.** Qualified staff have been engaged to reinforce the capacity of AFAP and facilitate project implementation. In addition, appropriate training and capacity-building programs for EMAE and AFAP staff are ongoing. An external auditor has been recruited to prepare the financial audit of the project.

43. The performance of this component is rated satisfactory.

44. **Compliance with legal covenants.** The GoSTP is in full compliance with all legal covenants under the parent project. The Steering Committee and working group are in place and meet regularly. The EIB co-financing is effective. The status of the legal covenants of the parent project are as follows:

Table 1. Covenants and compliance			
Covenant	Status		
Finance Agreement: For purposes of facilitating the implementation of the Project, the	Complied with		
Recipient shall maintain AFAP with staff in numbers and with responsibilities acceptable to			
the Association, as set forth in the Operational Manual.			
The Co-financing Deadline for the effectiveness of the Co-financing Agreement is March 31,	Complied with		
2017.			
For purposes of ensuring technical coordination with EMAE for the implementation of Parts 2	Complied with		
and 3 of the Project, the Recipient shall maintain the EMAE Ministerial Order			

Table 1. Covenants and Compliance



Covenant	Status
No later than ninety (90) days after the Effectiveness Date, the Recipient, through AFAP shall	Complied with
update, and thereafter maintain and carry out the Project, in accordance with the provisions	
of a manual (the Operational Manual) acceptable to the Association.	
For purposes of providing general Project oversight and coordination, the Recipient shall operate and maintain throughout the implementation of the Project, a Steering Committee, with functions, responsibilities and composition including representatives of MOFPA, MINRA, MOEIC, EMAE and AFAP, all acceptable to the Association and as set forth in the Operational Manual.	Complied with
For purposes of facilitating the implementation of the Project, the Recipient shall operate and maintain throughout the implementation of the Project, a Working Group, with	Complied with
functions, responsibilities and composition including representatives of MINRA, EMAE, AGER and AFAP, all acceptable to the Association, and as set forth in the Operational Manual.	

Note: MOEIC = former Ministry of Economy and International Cooperation.

45. A summary of the different components, subcomponents, and the allocated financing for the parent project is as follows:

Project Components	Project Cost (US\$, millions)	IDA (US\$, millions)	EIB (US\$, millions)
Component 1: Support to institutional reform and sector planning	1.20	1.20	0.00
Subcomponent 1.1: Reinforcement of the power sector regulatory agency	0.50	0.50	0.00
Subcomponent 1.2: Development of an integrated Least Cost Power Development Plan	0.40	0.40	0.00
Subcomponent 1.3: Electricity Demand Forecast for STP	0.10	0.10	0.00
Subcomponent 1.4: Tariff Study	0.20	0.20	0.00
Component 2: Strengthening operational performance and governance of EMAE	7.50	2.30	5.20
Subcomponent 2.1: Installation of a new Management Information System at EMAE	1.00	1.00	0.00
Subcomponent 2.2: Preparation of a Management Improvement Plan for EMAE	0.90	0.90	0.00
Subcomponent 2.3: First phase Revenue Protection Program - meters for large customers	1.20	0.00	1.20
Subcomponent 2.4: Installation of statistical meters	0.30	0.00	0.30
Subcomponent 2.5: Second phase RPP - replacement of all remaining meters	3.70	0.00	3.70
Subcomponent 2.6: Gender-sensitive community engagement and outreach campaign	0.40	0.40	0.00
Component 3: Investing in enhanced reliability of electricity generation,	18.40	10.60	7.80
transmission, and distribution.			
Subcomponent 3.1: Rehabilitation of Contador hydropower plant and operations and maintenance support program	9.10	9.10	0.00
Subcomponent 3.2: Rehabilitation of key components of Contador medium voltage evacuation line	1.50	1.50	0.00
Subcomponent 3.3: Low voltage network rehabilitation	7.80	0.00	7.80

Table 2. Parent Project Components and Costs



Project Components	Project Cost (US\$, millions)	IDA (US\$, millions)	EIB (US\$, millions)
Component 4: Project implementation support	1.90	1.90	0.00
Total Project Costs	29.00	16.00	13.00

46. **Overall performance of the parent project.** The progress toward the achievement of the PDO and overall implementation progress have been rated satisfactory over the past 36 months, as recorded in the project Implementation Status and Results Reports (ISRs). The ratings of PDO and implementation progress and the disbursement rate of the project are as follows:

	ISR of April 2018	ISR of October 2018	ISR of November 2019		
PDO rating	Satisfactory	Satisfactory	Satisfactory		
Implementation progress rating	Satisfactory	Satisfactory	Satisfactory		
Disbursement ratio (%)	14	17	29		

Table 3. ISR Ratings and	l Disbursement Ratios
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47. Overall, project implementation is on track. Progress has been satisfactory in the implementation of Components 1, 2, 3, and 4. This includes components co-financed by EIB that, despite some delays in reaching effectiveness and recruitment of technical assistance, are expected to enter procurement phases for prepaid meters in March 2020.

E. Rationale for AF

48. **Rationale for AF is to ensure implementation of rehabilitation of the Contador hydropower plant as originally planned under the parent project.** The rehabilitation of the existing Contador hydropower plant has been identified as a priority project by the GoSTP and confirmed in the recently finalized LCPDP, as the plant, in its current condition, is facing the risk of ceasing to operate as a result of lack of O&M (lack of spare parts for outdated equipment) and ageing of the facility. The proposed upgrade of capacity from 2.2 MW to 3.2 MW will lead to significant increase of renewable energy in the overall energy mix of the country at the date of commissioning (end of year 2022). This will help replace a large amount of thermal generation, ensure better reliability of the overall energy system, decrease cost of generation, and improve quality of service to the end user. Effort to decrease cost of generation, in addition to the large reform program being implemented under the project, are also aligned with the overall objective of GoSTP to ensure financial sustainability of EMAE.

49. **There is a need to increase the proposed hydropower plant capacity.** In the original financing plan approved by the Board of Directors of the World Bank, Subcomponent 3.1 aimed at financing the works for the rehabilitation of the Contador hydropower plant to the current installed capacity of 2.2 MW. However, the Project Appraisal Document and other project documents indicated clearly that optimization studies would need to be carried out in the first phase of the project to analyze the potential for expansion of the power plant's installed capacity up to 4 MW.

50. The studies finalized by the Consultants in June 2018, explored several technical options with installed capacity ranging from 1.9 MW (reinstating the existing capacity) to 11.6 MW, fully utilizing the water resource that has been underexploited so far. Depending on the scenario, the average annual

energy generation could range from 7.2 Gigawatt hours (GWh) per year to 25 GWh per year (compared to annual energy generation in STP of 86 GWh per year). The consultant's analysis highlighted the issue of high construction and supply costs associated with all options due to (a) difficult geological conditions on site with several potentially unstable landslides along the channel route that would require stabilization works and tunnel crossings that were not identified at appraisal stage of the parent project; and (b) remoteness/absence of economy of scale in STP for relatively large civil works, leading to high unit rates. The construction costs, which do not include E&S costs, varied from US\$8.3 million to almost US\$36 million with a construction period spanning from two years to four years.

51. For all options, civil works will comprise rehabilitation works on the load chamber, channel, and tunnel portions, mechanical and electrical equipment will need to be replaced to reach the final optimum installed capacity. The system will be designed to operate as a peaking plant, with the creation of an additional daily storage capacity in the form of a concrete water tank, to ensure adequate load factor to the power plant. Some of the alternatives proposed with large installed capacity (mainly above 3.2 MW) would involve significant changes in the channel section, creation of long underground tunnels, and addition of a new penstock and therefore higher construction costs. As it can be seen in Table 4 below, most of the costs are for the civil works, and in particular, related to mitigation measures for geological risk and channel works for expansion of the channel capacity which applies to all the alternatives.

Costs including contingencies	Budget
Preliminary works	US\$1,397,922.00
Intake	US\$536,000.00
Channel works	US\$6,395,800.00
Underground works	US\$2,971,100.00
Forebay	US\$1,898,000.00
Penstock	US\$1,265,000.00
Powerhouse for 3.2 MW	US\$2,726,000.00
E&S provisions	US\$1,910,178.00
	US\$19,100,000.00

52. The cost difference between the selected 3.2 MW with the 2.2 MW alternative is mainly limited to the difference in cost of equipment.

53. These results raised the question of the necessity of a cost-benefit analysis of each option, against other potential sources of generation on the island to ensure the most optimum use of the IDA resources for the project. The firm in charge of deriving the LCPDP for the country was therefore asked to test all rehabilitation/expansion alternatives against alternate sources of generation available in STP. This led to deriving a ranking of all generation alternatives, based on levelized cost of electricity, including cost of connecting to the grid. It was clearly demonstrated by the LCPDP model that the optimum option to be implemented at this stage is a rehabilitation and expansion of the Contador hydropower plant up to 3.2 MW.

54. This option would double the annual energy generation from the Contador hydropower plant and correspondingly inject a significant amount of clean energy in the STP energy mix, within a two-year time frame from the start of construction. Beyond 3.2 MW, the model shows that it would not be justified to extend further the generating capacity, mainly due to the additional costs of civil works cost (additional tunnels and different penstock routes).

55. This most optimal option would cost about US\$18 million of direct costs for the rehabilitation of Contador hydropower plant. The allocation under the parent project design is only US\$9.1 million leading to a financing gap of about US\$10 million, including expected E&S costs and increased contingencies (17 percent). The engineering firm carried out the detailed studies to prepare the tender design required to start the procurement of the works. The latest procurement schedule, prepared by the firm, foresees the launch of the bidding process in March 2020 with a start of the works in July 2020. The commissioning of the plant is planned by the end of 2022 with the end of the defect liability period in June 2024, which is beyond the current closing date of the parent project (June 30, 2021).

56. There is a need to implement a comprehensive electricity demand-side management (DSM) plan. A survey and follow-up assessment carried out by the World Bank team for STP has established the significant benefits of replacing inefficient ILs in the country. Lighting load represents about 70 percent of the electricity demand including during peak hours in STP. Incandescent lamps (ILs) are based on an old, conventional technology that consumes five times more energy for the same light (lumens) output. Some residential consumers use CFLs and FTLs, which are more energy efficient than ILs but half as energy efficient as LED lamps (both LED bulbs and LED tube lights). Public facilities (offices, schools, hospitals, etc.) use mostly FTLs. The assessment showed that deployment of an estimated 200,000 LED bulbs and 46,500 LED tube lights as a replacement of ILs, CFLs, and FTLs in households and FTLs in public facilities will reduce the demand by at least 8 MW of peak electricity load and corresponding 15 GWh of energy consumption, that is, about 17 percent of EMAE annual generation. The impact of power shortages due to the lack of generation capacity margin, particularly at evening peak hours or in case of maintenance of the existing plants, has been particularly severe in STP and negatively affected the country's economy in 2018 and early 2019.

57. The speedy implementation of such a demand-side energy efficiency improvement program is needed while efforts are under way to increase the generation capacity, and at the same time, electricity deficits continue to increase as the demand grows further. The approach of bulk procurement of energy efficient lighting products by the electric utility and their distribution to its consumers to replace inefficient lighting stock have been applied in multiple countries, including many financed by the World Bank. Until a few years ago, the CFLs were used to replace ILs. However, in the last five years, LED lamps have emerged with many advantages and are used instead. Examples of successful projects include Uganda, Rwanda, Ethiopia, Ghana, Bangladesh, Mexico, South Africa, Philippines, and India. Use of the DSM approach by the utility results in energy saving and peak load shaving but also are cost-effective than adding new generation and much quicker to implement.

58. In light of this, the GoSTP in June 2019 communicated its intention to initiate, under a World Bank funding, a program of electricity DSM activities through the introduction of energy-efficient LED lamps (LED bulbs and LED Tube lights) on a large scale in the residential household and public facilities segments. A limited variety of LED lamps are available in STP, but the consumer uptake, especially for household consumers, has been low due to the high cost and poor quality of available products. The proposed AF



will, therefore, support the deployment of high-quality LED lamps, procured in bulk through competitive bidding (to ensure competitive pricing) and target the residential households and public facilities segment of the customer base.

59. In parallel, with the support of the proposed AF, the GoSTP will initiate the process of formulating an import ban or phaseout policy for ILs in STP. The process of imposing a ban on ILs have been used in several countries and will include drafting the IL phaseout policy in conjunction with the updating of the customs list and schedule, consultation with relevant stakeholders (customs department, importers, wholesalers, and retailers), raising awareness with consumers, and the required processing of approvals within the GoSTP.

60. The proposed AF will help to enhance the reliability of electricity supply by implementing a comprehensive demand-side management plan. The proposed budget allocation for the new subcomponent on DSM to mitigate supply shortages and improve reliability of electricity supply, particularly at evening peak hours (5:00 p.m. to 10:00 p.m.) is US\$2 million. A part of the AF will be used to purchase and distribute about 246,500 high-quality LED lamps - 200,000 LED bulbs and 46,500 LED tube lights - to replace mostly ILs and some CFLs and FTLs in most of the grid-connected households (billed and paying customers) and to replace FTLs in most public facilities. Residential consumers will be provided with up to five LED lamps, free of charge, in exchange for the ILs, CFLs and FTLs currently in use in their household. Deployment of LED lamps will lower consumer electricity bills, thereby making it easier for phasing out subsidies on consumer electricity tariffs as any potential increase in tariffs will be partly offset by the reduced energy consumption for meeting lighting needs. Furthermore, the LED bulbs not only consume 80 percent less energy (and demand) compared to ILs but also have 15-20 times longer life and better-quality light output. Replacing CFLs and FTLs with LED bulbs and LED tube lights respectively, reduces energy consumption by half. Once the initial distribution of LED lamps is completed, the market acceptability is tested, and benefits are demonstrated with the deployment and use of LED lamps, it is expected that the subsequent roll out could be on commercial basis, supported by a policy on phase out of incandescent bulbs.

61. The GoSTP, in a letter dated July 22, 2019, requested the World Bank to provide AF to cover the financial gap created by the revised upward scale of the hydropower system, which will alleviate a major bottleneck on the critical path for planned procurement of the works and support in rapidly implementing the large-scale demand-side management plan, aiming at replacement of ILs, CFLs and FTLs in residential households and FTLs in public facilities by more efficient and reliable LED lamps. The World Bank team explored different cofinancing options to support these initiatives but could not secure any opportunity aligned with the project time frames and the World Bank's Procurement Guidelines applicable to the project.



II. DESCRIPTION OF ADDITIONAL FINANCING

A. Proposed Changes

Description of New Activities

62. The bulk of the proposed AF (US\$10 million) will finance ongoing activities of the parent project, by covering the cost overruns identified in Subcomponent 3.1: Rehabilitation of Contador hydropower plant and operations and maintenance support program. The AF will also introduce one new Subcomponent, defined as follows:

63. *Subcomponent 3.4: Demand-side management for residential customers.* This subcomponent will finance the procurement of LED lamps to replace ILs, CFLs and FTLs in use in households and public facilities and includes the following implementation components and steps:

- (a) *Procurement of LED bulbs and LED tube lights.* EMAE, with support from AFAP, will bulk procure 200,000 LED bulbs and 46,500 LED tube lights. In addition to these LED lamps, the procurement package will include two lamp crusher devices for ILs, CFLs and FTLs.
- (b) Pre-shipment inspection, delivery, and storage of LED Bulbs and LED tube lights. An independent pre-shipment inspection of LED bulbs and LED tube lights will be conducted according to the testing protocol, before the shipment of the LED lamps consignment to STP. Depending upon the agreed terms of the contract, the LED lamps consignment will be delivered to STP by standard sea shipment or by expedited air shipment. Once delivered, the LED lamps will be stored in the EMAE warehouse.
- (c) As part of measures to close gender gaps for employment and entrepreneurship opportunities in the energy sector the AF will support the following sub-activities: a) technical training and hiring targeting young female graduates from universities and b) entrepreneurship training for women who would like to engage as importers, wholesalers, and retailers of electrical supplies such as lighting bulbs - LED in this particular case.

64. **Consumer awareness program.** About three months before the scheduled deployment of the LED bulbs and LED tube lights, a comprehensive consumer awareness program mainly targeted to residential household consumers will be initiated to inform the consumers about (a) the benefits of LED lamps over ILs, CFLs and FTLs regarding reduced energy consumption, reduced energy bills, better-quality light outputs, and longer life; (b) LED lamps distribution program for replacing ILs, CFLs, and FTLs, and the details (dates, venues, and process of distribution); (c) location of the ILs in the house that should be replaced with LED bulbs, that is, the lamps that are used for longer hours such as in kitchen, family room, outdoor security lights, and so on; and (d) non availability of ILs in the market in the long term (after the incandescent lamp phaseout policy came into effect). The LED lamps sensitization program will run in parallel with the commercial losses campaign and will be conducted by the same NGO currently developing the commercial losses awareness-raising and engagement initiative. This will ensure alignment and synchronization of the project's citizen engagement and awareness-raising interventions.

65. **Distribution of LED Bulbs.** The LED lamps will be distributed to EMAE electricity consumers through: (a) the existing EMAE commercial and payment center at the EMAE headquarters in STP (which service 90 percent of EMAE consumers, wherein they come to pay their monthly electricity bills); (b) mobile kiosks in five districts; and (c) at EMAE center office in the Island of Principe. In all cases, the EMAE official will check electricity bills, collect the up to five ILs, CFLs and/or FTLs and provide up to five LED lamps in exchange, and log this transaction with each of the consumers into a paper or an electronic log book that will be consolidated at the national level for monitoring and reporting purposes. The collected ILs, CFLs and FTLs will be stored in the EMAE warehouse (for later destruction with the crusher procured under the same program). In case of public facilities, EMAE staff will go to the consumer premises for replacement of FTLs with LED tube lights.

66. **Destruction of incandescent lamps, FTLs and CFLs.** The ILs, CFLs and FTLs, which are collected through the program, will be destructed by the lamp crusher devices in an environmentally-sound manner and using standard procedures to ensure that the collected lamps do not go back into circulation, are not reused by people, and do not affect the environment.

67. **Measurement and verification of energy and demand savings.** Before and after the distribution phase, the relevant hourly electrical load data (including kW, kWh, KVARh, KVAR, and pf) for a two-week period (including holidays) will be collected for selected sample substations of EMAE. In addition, an exante and ex post random sample survey of about 400 consumers of EMAE will be carried out using standardized questionnaires. The above data will be analyzed to cross-check the 'deemed savings' from the LED lamp replacements to estimate the overall impact in terms of reduction of electricity demand and energy consumption due to LED lamps deployment.

68. **Phaseout policy for incandescent lamps.** To ensure long-term sustainability of the program, in parallel with the procurement and deployment phase, the GoSTP will initiate the process of formulating an import ban or phaseout policy for ILs, focusing on stopping the import of ILs into STP. The process will include drafting and designing of the IL phaseout policy in conjunction with updating of the customs list/schedule, in consultation with relevant stakeholders (customs department, importers, wholesalers, and retailers), raising awareness with consumers, and the required processing of approvals within the GoSTP. The implementation of the policy will be launched within two years from the start of the deployment program, which will require a strong market monitoring. To ensure the successful implementation of the IL phaseout policy, a comprehensive capacity building program of relevant stakeholders, including customs officials, importers, wholesalers, and retailers will be carried out along with consumer awareness campaigns with the support of the AF.

Citizen Engagement, Women's Employment and Female Entrepreneurship

69. Following the identification of gender gaps relevant for the project in (i) women's formal employment; (ii) low percentage of women at EMAE; and (iii) the absence of female-led enterprises in the renewable energy sector, interventions boosting women's employment and entrepreneurship opportunities were designed to close the gaps by (i) employing women as agents within the community awareness campaign; (ii) hiring women in technical positions created by the project; and (iii) enabling women to participate as entrepreneurs in the newly created opportunities related to renewable energy.



70. **The proposed AF is consistent with the parent project's objectives and aims at enhancing citizen engagement.** Through community engagement and mobilization, the project aims at working with citizens in finding solutions to electricity theft and in promoting energy efficiency and responsive behavior change. This approach is expected as well to bring back ownership to the community and promote transparency and accountability among citizens. The implementation of the components under the parent project is on track, particularly Subcomponent 2.6 that is supporting gender-focused behavioral change and citizen engagement approaches to address the challenge of nontechnical losses. Women play a critical role in this process as they are the main actors engaged in promoting behavior change and engagement interventions among communities. They will also support pilots on decentralization of energy services among communities as EMAE ambassadors. Women's engagement and positive role modelling will be also pursued along the AF through their continuous engagement in the LED awareness-raising campaign.

71. The AF will also support the increase in employment- and entrepreneurial opportunities for women in the electricity sector. As part of measures to close gender gaps for employment and entrepreneurship opportunities in the energy sector the AF will support the following sub-activities: a) technical training and hiring targeting young female graduates from universities and b) entrepreneurship training for women who would like to engage as importers, wholesalers, and retailers of electrical supplies such as lighting bulbs - LED in this particular case. For sub-activity "a" the project will specifically target recruiting up to six young women STEM (Science, Technology, Engineering and Mathematics) graduates from universities in STP based on criteria to be established by a Human Resource firm being hired under the parent project. For the selection process, the firm will assess the barriers a graduate would face in reaching the labor market and aspects around recruiting, retaining and promoting women in the energy sector. These include: legal barriers preventing women from entering an industry or advancing to certain roles; limited transport and insufficient workplace infrastructure; inadequate institutional sexual harassment policies and reporting mechanisms; regressive organizational culture; gender pay gaps resulting from occupational segregation and unequal pay for equal work; and a lack of care services. The findings will inform the selection- and subsequent training and employment of graduates. The recruits will be directly attached to the project management and implementation units at AFAP/EMAE and AGER and will be involved in all project activities spanning from technical studies and preparatory work, procurement, financial management (FM), commercial- and communication activities, safeguards, project supervision and closing activities over the next 42 months. The objective is to increase the number of highly educated women employed in the energy sector by targeting school-to-work transition for women STEM graduates. The sub-activity "b" will finance entrepreneurship capacity building for 20 women that will enable them to become new entrants to the sector which will also increase total number of potential importers, wholesalers and retailers of LED lamps and will potentially raise the percentage of female-led firms involved in the energy sector from 0 to 50 percent. These women will have therefore built the capacity to facilitate subsequent LED programs that will follow this initial program and when the incandescent ban policy is put in place by end of year 2022, thereby increasing sustainability both for the project objectives and the economic opportunities of project beneficiaries.

Project Development Objectives

72. No changes to the PDO are being proposed. The new activities under the proposed AF are aligned with the parent project PDO as the reduction in the demand (particularly at peak hours) will improve the reliability of the electricity supply.



Results Framework

73. The PDO indicators of the parent project are (a) Generation capacity of hydropower constructed or rehabilitated under the project (MW) (aggregated by rehabilitated); (b) Direct project beneficiaries (number) (aggregated by female beneficiaries (percentage); (c) Electricity losses per year in the project area (percentage). The project's Results Framework will be updated to reflect the increase in installed capacity of the hydropower plant from 2.2 MW to 3.2 MW for the first PDO indicator.

74. The PDO and intermediate-level indicators will be updated to include revised targets and indicators on the new subcomponent supported by the AF as follows:

New Indicator	Description	Baseline	Target	Target Date	Database	Responsibility for Data
						Collection
Energy Savings	Projected annual energy savings in MWh	0	15,000	December 31, 2021 (12 months after all of the 225,500 LED lamps have been distributed)	EMAE Annual Report	EMAE
Peak Load Reduction	Peak Load reduced in MW	0	8.0	December 31, 2020	EMAE Annual Report	EMAE
Energy Production	Energy produced by Contador in 12 months following full commissioning and star of operation date in MWh	0	15,698	December 31, 2023	EMAE Annual Report	EMAE
Replacement of energy inefficient lamps with high efficiency LED lamps	Number of LED lamps used to replace incandescent lamps, compact fluorescent lamps, and fluorescent tube lights	0	225,500	December 31, 2020	Data collected by EMAE at the national level	EMAE
	Monthly reporting showing number of LED lamps replacing Incandescent lamps, compact fluorescent lamps and fluorescent tube lights					

Table 5. Updated Intermediate-level indicators



New Indicator	Description	Baseline	Target	Target Date	Database	Responsibility for Data Collection
Phaseout policy for incandescent lamps	Launching of incandescent bulbs phaseout policy by the Government of STP	No	Yes	December 31, 2022	Project Report	EMAE / AFAP
Percentage of Female technical Experts	Number of employed female STEM graduates in energy sector/at EMAE (from 11 to 17)	2.5 percent	4 percent	28 June 2024	Project Report	AFAP / EMAE
Number of women employed in awareness- raising campaign	Increased number of formally employed women in relation to electricity	0	17	30 June 2021	Project Report	AFAP / EMAE
Percentage of potential female- led enterprises	Number of potential female-led firms entering the market	0	50 percent	30 June 2021	Project Report	AFAP / EMAE

Institutional and Implementation Arrangements

75. Under the parent project, AFAP is the Project Implementing Entity for the project administration in STP. AFAP has a track record in the implementation of projects financed by the World Bank and has the responsibility for the day-to-day management of the project and coordination of project-related activities. The current institutional and implementation arrangements will be maintained, and there will be no change to implementation arrangements.

Procurement Arrangements

76. All financing under Investment Project Financing (IPF), including the AF, identified on or after July 1, 2016, are subject to the World Bank Policy 'Procurement in IPF and Other Operational Procurement Matters', dated July 2016, and are required to apply the Procurement Regulations for IPF Borrowers, dated July 2016 and revised in November 2017 and August 2018. The PSRP (P157096) is subject to the Procurement Guidelines and Consultant Guidelines, dated January 2011 and revised in July 2014. Taking advantage of the AF, which will be subject to the Procurement Regulations, upon the approval of the AF, both the parent project and the AF will be subject to the Procurement Regulations of July 2016 revised in November 2017 and August 2018 to (a) ensure consistency in the use of procurement instruments within the same project; and (b) take advantage of innovations introduced by the Procurement Regulations throughout the project implementation phase. As some procurement activities have begun for the parent project, the PSRP (P157096) procurement will fall under the new Procurement Regulations from the date of the AF approval onward. The Financing Agreement of the original project will be amended accordingly to incorporate the move to the new Procurement Regulations. For the preparation of the AF, a Project Procurement Strategy for Development (PPSD), limited to the AF part of the project, along with the related Procurement Plan have been prepared by the Recipient. The PPSD established appropriate procurement



approach for activities under the AF and assessed that the project implementation agency, AFAP has adequate capacity to manage the procurement activities.

Climate Impacts

77. By increasing the use of clean renewable energy in the grid and promoting the use of energyefficient LED lamps, the proposed AF will contribute to mitigation of climate change impacts by displacing a larger amount of thermal generation than initially foreseen in the project. The climate change dimensions of the project have been accounted for in the economic analysis to consider the impact of increased installed capacity through greenhouse gas (GHG) accounting and the resilience of the infrastructures to be built using the climate and disaster risk screening tool.

Closing Dates

78. The current closing date of the parent project financing is June 30, 2021. It is proposed to extend the closing date of the parent project financing by 36 months, to June 28, 2024, and establish June 28, 2024 as the closing date for the proposed additional financing to allow for completion of new activities and expected commissioning of the Contador hydropower plant by end of 2022 based on latest estimates of award of procurement and commissioning schedule, following by time period needed to cover the Defect Liability Period of the equipment that will be delivered and used by the client during the initial Operation and Maintenance phase of the project.

Implementation schedule

79. Implementation schedule of the project was revised to ensure completion of the original and new activities by the proposed closing dates of the original and additional financing. Implementation schedule for the rehabilitation of the Contador hydropower plant and the LED deployment program is presented in Annex 2.

B. Project Cost

80. The proposed AF will be financed by an IDA grant in the amount of US\$12 million. The total amount of funding including both the original and AF will amount to US\$41 million equivalent. The revised component costs are shown in Table 6.

Project Components		IDA Project	EIB Project	IDA	Revised
		Financing	Parallel Co-	Proposed	Project
			financing	AF	Cost
Component 1: Support to electricity institutional	1.20	1.20	0.00	0.00	1.20
reform and sector planning					
Component 2: Strengthening operational	7.50	2.30	5.20	0.00	7.50
performance and governance of EMAE					
Component 3: Investing in enhanced reliability of	18.40	10.60	7.80	12.00	30.40
electricity generation, transmission, and					
distribution					

Table 6. Summary of Revised Project Costs by Component (US\$, millions)



Project Components		IDA Project	EIB Project	IDA	Revised
		Financing	Parallel Co-	Proposed	Project
			financing	AF	Cost
Component 4: Project implementation support	1.90	1.90	0.00	0.00	1.90
Total project costs	29.00	16.00	13.00	12.00	41.00

III. KEY RISKS

81. **Risks**. The overall risk rating of the project is substantial. The key risks and, wherever relevant, mitigation measures are summarized in Section VI, Summary Table of Changes.

82. **Political and Governance.** This risk is rated substantial as for the parent project. While STP has shown relative political stability in recent years, demonstrating that through democratic back-to-back free and fair elections, though the country has a history of political turmoil and changes in leadership. Within a small country such as STP, changes in government could have significant ramifications on the various stakeholders of the project, including the implementing agency, AFAP, and could interfere in the successful implementation of all components of the project. The elections in October 2018 resulted in the establishment of a new government and change of high-level staff at the Ministry of Energy and EMAE. This could delay important decisions around the project implementation. The World Bank has been maintaining a strong sector dialogue to mitigate, to the extent possible, impacts of any political changes should they occur.

83. Sector Strategies and Policies. This risk is rated substantial as for the parent project. The Government seeks a phased approach to sector engagement with the World Bank, with an immediate focus on the rehabilitation of generation and transmission and also distribution enhancement to build confidence with customers for longer-term engagement in sector reform. To revive the electricity sector in STP from its current poor operational and commercial conditions, it is critical that the Government remains committed to a long-term reform vision with a coherent sector-wide strategy. The approvals of the MIP and LCPDP have been two key steps to show the GoSTP commitment in this regard. The approval of the MIP, in particular, has required strong commitment and leadership from government stakeholders to overcome internal resistance to the reform of a poorly performing utility. Reversal of such decision due to political pressure could, however, preclude improvement in the reliability of electricity supply. To mitigate the risk, the World Bank will continue a strong sector dialogue in this regard.

84. **Institutional Capacity for Implementation and Sustainability.** This risk is rated high as for the parent project. While the EMAE team shows technical capacity, technically qualified specialists are overstretched given the immense challenges facing the sector and the amount of work being carried out under the supervision of EMAE in São Tomé. Recent experience shows a lack of capacity in operating and maintaining the existing assets due to a lack of human and financial resources allocated to the task. This could challenge the technical sustainability of the assets proposed to be created or rehabilitated under the project and jeopardize the long-term increase in installed capacity and reliability of supply. Mitigation measures include (a) financing of adequate training on procurement, FM and safeguards of selected AFAP staff; (b) financing of adequate supervision of project activities (Owner's Engineer) and capacity building among EMAE with respect to the rehabilitation works and construction works and provision of assistance



to EMAE in finding sustainable solutions to operate and maintain the energy-generating assets on the island. The proposed investments also support system monitoring O&M automation to help address human resource constraints.

85. In addition, the project might face the risk of delays in implementation due to potential difficulties in getting contractors on the ground in São Tomé and/or increase in costs because of lack of bidders as a result of the remoteness of the island. These risks are mitigated by (a) adopting a simple project design; (b) launching the procurement process for works as early as possible during implementation based on sound design carried out by a qualified consulting firm; and (c) adopting a conservative budget and including an adequate level of price contingencies.

86. The project also risks challenges during implementation with the current version of the Operational Manual (OM) which is yet to be updated to incorporate necessary changes aligned with the new activities. To mitigate this risk, the OM will be updated to take into account the AF prior to implementation of any related activities.

87. E&S Risk. The E&S risks are considered substantial. Most of the expected E&S risks associated with the Contador hydropower plant rehabilitation shall occur during civil works and are related to labor influx, noise and vibration caused by machinery and earthmoving, health and safety of workers and communities, and construction waste. The environmental risk is substantial given the scale of works (related to Contador hydropower plant rehabilitation) to be undertaken. However, project implementation unit (PIU), which has been established under the parent project, has built significant capacity in handling safeguards issues according to the World Bank policies, including supervision of the preparation of the ESIA and ESMP by a specialized firm. In addition, potential negative environmental impacts will mainly result from construction activities and are not expected to have significant adverse or irreversible impacts and will be more readily avoided or mitigated. Regarding the social aspects, risks are deemed moderate and are mainly related to labor influx. The project is unlikely to result in land acquisition or resettlement as the rehabilitation and expansion works are mostly contained in the current Contador hydropower plant site. A total of about 400 workers are expected to be required for the rehabilitation and expansion works. The majority of the labor force (approximately 90 percent) will be recruited locally from within the beneficiary communities for unskilled labor tasks. Specialized external workers will comprise around 5–10 percent of the total labor force and will be hosted in base camps. Cohabitation between local communities and workers might raise social concerns, including services availability, gender-based violence (GBV), and transactional sex. To prevent these potential risks, contractors are required to develop ad hoc ESMPs before works start to ensure relevant measures are planned, implemented, and supervised to prevent labor influx risks and to facilitate, among others, pacific cohabitation between and provision of services to hosting communities and workers. Contractors and supervising engineers' contracts will incorporate provisions, such as code of conduct and training for contractors' workers and supervisors, including on GBV and child protection.

88. There is a full-time and dedicated focal point within AFAP specialized in E&S issues, ensuring the coordination with the project beneficiary and other relevant government institutions. The focal point has also received training from the World Bank, in safeguards policies and grievance redress mechanism (GRM). To address potential adverse E&S risks and impacts, the Client has prepared, consulted upon and disclosed an ESIA-ESMP in country and at the World Bank website. Government entities, NGOs, and local communities, among others, have been consulted in three main public sessions and several bilateral



meetings. During public consultations, participants had the opportunity to express their doubts, expectations and opinions regarding the project, its potential impacts and mitigation measures to be adopted. The project has finalized the design of a GRM, which will be functional before works start. The GRM will integrate specific procedures for potential GBV cases, including confidential reporting with safe and ethical documenting of GBV cases as well as a referral pathway to appropriate support services for GBV survivors.

89. Risks associated with the LED lamps program shall include material and waste management mainly from bulb disposal by consumers and risks during installation and maintenance including health and safety issues. The collected incandescent bulbs shall be stored in the EMAE warehouse and later destructed by crusher devices to ensure that the bulbs do not go back into circulation. Measures for the proper and safe disposal of waste (ILs, CFIs, and FTLs) shall be included in the bidding documents for suppliers. Additionally, the anticipated impacts and risks will be manageable through good design, operation, appropriate mitigation measures, and close monitoring. Positive environmental impacts on deployment of LED lamps are the following: (a) the lifecycle environmental impacts of LED lamps are significantly less; (b) the use of LED lamps contribute to significant energy savings when compared to that of the alternatives such as incandescent bulbs; and (c) the use of LED lamps contributes to improved quality of life for consumers.

90. **Stakeholders.** This risk is considered substantial. Successful completion of several integral subcomponents, that is, rehabilitation of low voltage network and installation of new meters, under the parent project parallel-financed by the EIB parallel is crucial for the achievement of project objectives. This risk is being mitigated through close coordination, joint project supervision missions and periodic meetings with all parties.

Climate Change

91. A climate and disaster-related risk screening was carried out for the proposed project. The screening identified current and future key drivers of risks in this area as extreme precipitation flooding and temperature increase. The team will ensure that the technical specifications for equipment and works will take into consideration these risks and that focused training on extreme events and preventive maintenance (for example, cleaning of drainage infrastructure before rainy season) will be provided within the project scope.

IV. APPRAISAL SUMMARY

A. Economic and Financial Analysis

92. **Rationale for public financing.** The rationale for public sector financing for investments under the proposed project rests primarily on the present characteristics of the sector: (a) upgrading of generation assets, which is not normally conducive to public-private arrangements, particularly if those investments are not linked to a private and bankable project; and (b) the scale of investments required and associated long payback periods. It is highly unlikely that a private investor will finance the proposed investments given the status of the sector.

93. **World Bank's added value.** The World Bank is already a close partner of the GoSTP in the development of its electricity sector through the support to the development of PSRP, the reform of EMAE, and the Development Project Operation that includes support to the energy sector. The World Bank is, therefore, well positioned to continue its commitment to assist the GoSTP to sustain the reform of EMAE and building on its experience in similar programs in the region.

Economic Analysis of the Infrastructure Investment

94. **Economic analysis.** Consistent with the evaluation of the parent project, the economic analysis focused on the benefits from Components 2 and 3. The analysis has been undertaken deploying a standard cost-benefit methodology for the enhanced scope, comprising both the original parent project and the proposed AF (US\$12 million equivalent). It resulted in an economic internal rate of return (EIRR) of 52 percent and net present value (NPV) of US\$179 million, which indicates a robust economic viability of the project. GHG accounting and valuation were also carried out. Results are shown in Annex 1.

95. **Project financial analysis.** A financial analysis has been carried out to assess the financial viability of the project. The analysis focuses on the financial cost and revenue to EMAE, which generates its own revenue. In line with the economic analysis, the financial analysis was solely focused on benefits from the implementation of Component 2 and 3. The analysis shows that the project will result in a financial internal rate of return (FIRR) of 33 percent and NPV of US\$109 million, indicating the project's financial viability for EMAE. Results are shown in Annex 1.

96. **EMAE financial analysis.** A financial analysis of EMAE has been carried out to show the expected impacts of the project on future financial performance and sustainability of the utility. For many years, EMAE's financial performance has been very poor, with the company unable to recover even its operating costs from its revenue. This is due to the high costs of energy purchases and fuels for own generation, combined with high system (technical and nontechnical) losses. The financial projection has shown that the poor financial performance of EMAE will continue in the near term albeit with lower subsidy requirements. Further sector reforms such as reducing the high costs of thermal generation by exploring technologies with lower fuel costs would be required to further reduce the subsidy requirement. Results are shown in Annex 1.

Economic and Financial Analysis of the Demand-side Management Subcomponent

97. The AF will finance the deployment of 178,500 LED lamps and 46,500 LED tube lights in all gridconnected households. Although the GoSTP's ultimate goal would be to replace all ILs, CFLs, and FTLs nationwide in the long term, 178,500 LED lamps and 46,500 LED Tube lights will be distributed under this program to the high-priority customer segment (residential and public facilities).

98. The cost of the proposed LED lamps and tube lights deployment program will be the cost of procurement of the energy-efficient and high-quality LED lamps and LED tube lights and the cost of distributing them to the households to replace ILS, CFLs and FTLs and to public facilities to replace FTLs. In addition, there will be costs associated with designing and implementing consumer awareness programs and monitoring and evaluation plans. LED lamps and tube lights are more expensive than incandescent lamps, CFLs and FTLs. However bulk procurement of LED lamps and tube lights will ensure competitive price, even in a remote market such as STP. The higher cost of LED lamps and Tube lights is



offset by the fact that LED lamps and Tube lights last about 10–15 times longer than incandescent lamps and consume 80 percent less energy for the same light (lumens) output and consume 50 percent less in case of CFLs and FTLs.

99. The Government intends to distribute the first replacement LED lamps and tube lights free (limit of up to five per EMAE household consumer), and therefore, there will be no cost to the consumer other than the remaining value of IL, CFL or FTL, which they will bring to the office of the electric utility as an exchange with the LED bulbs and tube lights. The benefit to the consumer will be the reduction of electricity consumption and hence the monthly electricity bill, which they accrue for the life of the LED lamps, and also the avoidance of the replacement cost of ILs, CFLs and FTLs, which would have been there during this life of the LED lamps and tube lights had the consumer continued to use incandescent lamps.

100. Detailed discussion on the assumptions used to calculate the EIRR and FIRR for this component is provided in Annex 1.

101. The FIRR and EIRR of the program are 31 percent and 74 percent, respectively.

B. Technical

Infrastructure Investment

102. The proposed design for infrastructure investments (see Figure 1) has been derived by an international consulting firm hired under the parent project, with large experience of hydropower projects in similar mountainous contexts, and is based on an updated assessment of (a) the topography of the site through LiDAR survey; (b) the geology of the channel site through onsite reconnaissance; (c) an update of the hydrological data and estimate of inflows available for energy generation estimates; and (d) a detailed cost estimate based on the international market price for similar contexts and unit prices from ongoing water project contracts in STP. The updated data have been reviewed by the Client, their technical advisors, and the World Bank team and found to be robust and reliable.

103. The investment component of the project uses well-proven technologies and presents no unusual installation, commissioning, or operational challenges. The equipment and the technologies to be used in rehabilitation of the Contador hydropower plant will be of international standard.

104. Regarding project implementation, the international consultants hired to support the design of activities under Subcomponent 3.1 in line with best practices and will oversee the supervision of the construction contract, including safeguards monitoring. It is expected that EMAE will also mobilize a team of technical experts for close follow-up of the project implementation and on-the-job training, in anticipation of the operational phase.



Figure 1. Overall Project Layout and Scope of Works²

C. Financial Management

105. The AFAP has the overall responsibility for project FM. The agency has been working to ensure compliance with the FM requirements in World Bank-funded operations, and there are no outstanding interim unaudited financial reports (IFRs) or audit report under this operation. AFAP has been submitting acceptable quarterly IFRs to the World Bank. The recent FM supervision and latest audit report did not reveal significant issues under the project. The FM performance of the project is deemed satisfactory.

106. The FM and disbursement arrangements in place for the ongoing project will also apply for the AF, and changes to those arrangements are not expected. Therefore, the project funds, expenditures, and resources will be accounted for using the existing automated accounting software and the accounting will be on cash basis. Disbursement of IDA funds will be done on transactions basis (Statements of Expenditures). The proposed project will make use of advances, direct payments, reimbursement, and special commitment methods for disbursements. AFAP will prepare quarterly IFRs and provide such reports to the World Bank within 45 days of the end of each calendar quarter. The project financial statements will be audited annually by the independent auditor in accordance with International Standards on Auditing as issued by the International Auditing and Assurance Standards Board within the International Federation of Accountants.

107. The project's FM arrangements have an overall residual FM risk rating of moderate, which satisfy the World Bank's minimum FM requirements under the World Bank Policy and Directive for IPF.

² Source: Stucky design report.



D. Procurement

108. Taking advantage of the AF, which will be subject to the Procurement Regulations, upon approval of the AF, both the parent project and the AF will be subject to the Procurement Regulations of July 2016 revised in November 2017 and August 2018. All activities of the project (parent and AF) for which the procurement process did not start will fall under the Procurement Regulations from the date of the AF approval onward. The Financing Agreement of the original project will be amended accordingly to incorporate the move to the new Procurement Regulations.

109. The procurement activities of the project will be implemented by AFAP. The agency is implementing the parent project and has experience with the World Bank procurement process and policies. The procurement risk is maintained as substantial. This is mainly due to the changes in conditions of implementation and the requirements of the Procurement Regulations for IPF Borrowers. The risk will be mitigated through regular reporting on the progress and implementation of fiduciary activities, World Bank supervision, World Bank procurement team hands-on support in-country when required, and further capacity building.

110. The project OM will be updated in accordance with these documents and detailed procedures for the administration and handling of procurement-related complaints. For the preparation of the AF, a Project Procurement Strategy for Development, limited to the AF part of the project, along with the related Procurement Plan have been prepared by the Recipient, with support of the World Bank, as needed. A Contract Management Plan for the main contract (Contador hydropower rehabilitation) will be submitted by the Recipient before the start of the works.

E. Social (including Safeguards)

Neither the parent project nor the AF trigger social safeguards policies, given that the project is 111. unlikely to result in land acquisition or resettlement causing physical or economic displacement. The rehabilitation and expansion works are mostly occurring in the current Contador hydropower plant site. The construction of the new tunnels is also site specific and developed along public lands where there is no population or private asset. As part of the AF rehabilitation work, eight old tunnels will be rehabilitated. The tunnels are currently used by the local population to access agricultural plots and cultural sites and by tourists to access touristic spots in the forest. After their rehabilitation, the access to the eight tunnels will be limited to technical personnel and to sporadic and scheduled touristic visits. At this end, the project has integrated in its design the opening of alternative paths to grant continuous access to those sites that are currently accessible through the eight tunnels. The AF's ESIA and ESMP indicate the plan to implement such measures. Potential social risks are thus mostly related to the timely and correct application of these measures. Coordination between the closing of the old tunnels and the opening of the alternative paths is of foremost importance to ensure that the tunnels' users will not incur in economic displacement. The PIU, together with the ESMP's contractors and supervising engineers' contractors, will continue conducting their due diligence to ensure works will not lead to involuntary resettlement and ESMP measures are timely implemented and correctly supervised.

112. Although labor influx related to the rehabilitation and construction works will be limited, it might still lead to social impacts, including basic services availability, GBV, transactional sex, and sexually transmitted infections. A total of about 400 workers is expected to be required for the works of the



hydropower plant, of whom about 90 percent will be recruited locally from within the beneficiary communities for unskilled labor tasks. Only 5–10 percent of the technical workers will be based in base camps. Contractors are required to develop ad hoc ESMPs before works start to ensure relevant measures are planned, implemented, and supervised to facilitate pacific cohabitation between and provision of services to hosting communities and workers. Specific measures will be put in place to prevent any potential risks to communities related to GBV, child labor, and increased HIV/AIDS incidence. Contractors and supervising engineers' contractors will incorporate standard World Bank Environmental, Social, Health, and Safety clauses requiring the contractors to apply the workers' code of conduct, measures against child labor and GBV, and labor influx guidelines.

113. The project's main social risk might be linked as well to energy clients and consumers' behavior change related to illegal connections, meter tampering, and bill payment. Behavior change is indeed a long and complex process requiring the collaboration among different actors, including supplier's commitment to ameliorate client services and consumers and clients' more responsible attitude toward energy use. To support this transformative process, the project has put in place a series of interventions to promote consumers' and clients' behavior change, including a gender-sensitive engagement campaign and pilot interventions developed at the community level to provide energy services closer to clients. A GRM will be soon operational to provide a communication and grievance channel between the project and its beneficiaries.

F. Environment (including Safeguards)

114. The AF shall address cost overrun due to the engineering design selected for rehabilitation and expansion of the Contador hydropower plant and a demand-side management component, corresponding to the purchase of about 200,000 high-efficiency LED bulbs and 46,500 LED tube lights (collectively called LED lamps elsewhere in the document) in exchange for ILs, CFLs, and FTLs, in households and public buildings in STP. Similar to the parent project, OP/BP 4.01 (Environmental Assessment) and OP/BP 4.04 (Natural Habitats) are triggered. The activities that the AF will support will not trigger new safeguard policies, and the EA category is expected to remain B as most of the potential adverse E&S impacts associated with the project investments will be avoided and/or mitigated through provisions that will be adopted during project preparation and/or the design stage. Replacement of incandescent lamps is expected to have a positive overall environmental impact: (a) the lifecycle environmental impacts of LED bulbs are significantly less; (b) the use of LED bulbs contributes to significant energy savings when compared to that of the alternatives such as incandescent bulbs; and (c) the use of LED bulbs contributes to improved quality of life for consumers.

115. **Environmental Assessment - OP/BP 4.01.** The project is classified as Category B in the World Bank's Environmental Assessment classification due to the small size and site-specific nature of its anticipated social and environmental risks and impacts. Potential negative impacts likely to be caused by the project are site-specific, limited, and mostly temporary. An Environmental and Social Impact Assessment has been prepared, consulted upon and disclosed on February 4, 2020 in country and on February 5, 2020 by the World Bank.

116. **Natural Habitats - OP/BP 4.04.** Part of the infrastructure that makes up the project, including six water catchments and part of the adduction channel, is located within the National Park Ôbo although mostly in the secondary forest zone. The Angolar intake (which is subject to a visited waterfall) is an



exception as there will be a reformulation of its design to better cope with the debris that gets into this very small intake system. Potential negative impacts on biodiversity will depend on the extent and location of the interventions to be undertaken. The ESIA prepared by client has identified likely negative impacts and includes mitigation measures. Moreover, the Contractor shall also include mitigation measures in the C-ESMP.

117. During rehabilitation, mitigation measures will include standard construction pollution prevention and control measures such as (a) solid and hazardous waste handling and disposal; (b) domestic and camp wastewater treatment; (c) storage and handling of hazardous materials; (d) housekeeping; (e) control of erosion and storm water runoff; and (f) noise, vibrations, and dust abatement measures, among others. These mitigation measures will be outlined by contractors for civil works in their ESMP (that is, waste management plan, hazardous materials management plan, and effluents management plan). Each contractor will produce a site-specific Occupational, Health, and Safety Plan and related procedures that refer to identifying and minimizing hazards to workers; providing appropriate equipment; identifying preventive and protective measures; training of workers; and documenting and reporting accidents, diseases, incidents, and near misses.

118. Concerning the deployment of LED bulbs, no adverse effects that are sensitive, diverse, and unprecedented on the environment and people are foreseen. Risks associated with the program include material and waste management mainly from bulb disposal by consumers and risks during installation and maintenance including health and safety issues. The program has a free replacement scheme and shall include in the procurement package crusher devices to ensure proper and safe disposal of the incandescent bulbs. Measures for the proper and safe disposal of waste (incandescent bulbs) shall be included in the bidding documents for suppliers. Additionally, the anticipated impacts and risks will be manageable through good design, operation, appropriate mitigation measures, and close monitoring.

119. **E&S management instruments.** To address any adverse E&S impacts, the Client has prepared, consulted upon and disclosed an ESIA for the proposed alternative and an ESMP to mitigate any adverse impacts identified. The ESIA/ESMP associated with the rehabilitation works has been cleared by the World Bank Regional Safeguards Advisor and disclosed in STP on February 4, 2020 and internally by the World Bank on February 5, 2020. The E&S clauses for contractors will be duly incorporated in the bidding documents for the rehabilitation works. The PIM will be updated to incorporate key safeguard measures in accordance with the ESIA and ESMP.

120. Contractors will have to submit their C-ESMPs as part of the tendering requirements. The C-ESMPs will be revised and cleared 30 days before the commencement of construction works to ensure they have the capacity and procedures in place to manage identified E&S risks. Mitigation measures linked to rehabilitation and LED replacement activities will be incorporated in the bidding documents and contractual arrangements.

121. As this AF is processed to address cost overruns on the infrastructure investment of the parent project and demand-side management, according to the applicable procedures, safeguards policies will continue to apply. The E&S safeguard ratings are deemed moderately satisfactory according to the latest Integrated Rating Tool (May 2019) and implementation support mission (September 2019). The rating refers to coordination challenges and recurrent delays in the finalization of the AF safeguards instruments, the GRM operationalization, and the commercial losses interventions' implementation.



G. Other Safeguard Policies

Safety of Dams – OP/BP 4.37

122. OP 4.37 (Safety of Dams) is not triggered for the project as the rehabilitation of the Contador hydropower plant does not comprise any dam structure. The water storage required for peaking capacity is being ensured by a small storage tank along the waterway.

Gender

123. The gender gap that the project is aiming to address is twofold: (a) women are often underrepresented and left out of the talent pool in the energy sector and the energy transition in-country; and (b) women often face barriers to enhance their productivity and income generating opportunities as entrepreneurs.

124. Beyond community benefits a tailored intervention on women's employment in technical roles in the energy sector will be implemented to ensure better balance and that the talent pool is enhanced. Additionally, a community awareness campaign is under development to inform people in target areas of the benefits and costs of electricity services, as well as the payment mechanisms, procedures and safety practices. Lastly there will be a focus on closing gender gaps between women and men related to enterprises focusing on boosting women's enterprises in the electricity sector through targeted training.

V. WORLD BANK GRIEVANCE REDRESS

125. 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 please visit (GRS), 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 www.inspectionpanel.org.



ANNEX 1: ECONOMIC AND FINANCIAL ANALYSIS

Economic Analysis

1. The economic analysis has been undertaken for the project as a whole, capturing both the original parent project (US\$29 million equivalent) and the proposed AF (US\$12 million equivalent). The project component structure remains the same as the original project; (a) Component 1: Support for electricity institutional reform and sector planning; (b) Component 2: Strengthening operational performance and governance of EMAE; (c) Component 3: Investing in enhanced reliability of electricity generation, transmission and distribution; and (d) Component 4: Project Implementation Support.

2. The analysis has been carried out using a standard cost-benefit analysis. Consistent with the parent project, the analysis focused on Components 2 and 3. This is due to the fact that Components 1 and 4 will finance technical assistance activities for which the economic benefits cannot be logically quantified. A summary of costs and benefits captured in the analyses is provided below as well as in Table 1.1.

3. **Cost:** The project cost primarily arises from capital cost for Components 2 and 3. These include investments in meters to optimize EMAE's revenue, as well as rehabilitation and expansion of Contador Hydropower Plant, a key asset in EMAE's generation system and reinforcement works on the grid, expected to improve reliability of transmission and distribution of electricity in the grid. The costs are exclusive of value-added tax (VAT), which is a pure financial transfer within the economy and therefore is excluded from the economic analysis. Furthermore, it is assumed that 2 percent of accumulative capital cost will be needed for operation and maintenance of the assets.

4. **Benefit:** The primary benefits captured in the economic analysis are twofold. EMAE will also benefit from increased revenue through the RPP, but this is considered to be a financial transfer from electricity users to EMAE, which does not result in overall economic benefit. The second is the avoided generation resulting from technical and commercial losses reduction through the grid reinforcement and rehabilitation under Component 3, as well as improvement of operational performance of EMAE, with implementation of MIP. It is estimated that the investment will reduce the technical loss from 12 percent to 10 percent.³ The avoided generation is valued at US\$0.36/KWh, based on STP's cost of thermal generation.

5. **Discount Rate:** The discount rate has been determined based on the World Bank's internal guidance⁴ which recommends using twice the prospect real per capita GDP growth as a proxy of the discount rate. As the IMF forecasts an average growth rate of approximately 3 percent in STP, the discount rate of 6 percent is employed.

³ These targets are in accordance with the loss reduction objectives agreed upon with IMF under the recently approved program.

⁴ OPSPQ (Operations Policy and Quality). 2016. Discounting Costs and Benefits in Economic Analysis of World Bank Projects.



Table 1.1. Kev Assumptions used for Economic Analys

Genera		
-	Project lifetime	20 years starting 2020
-	Discount rate	6 percent
Cost		
-	Capital cost (exclusive of VAT)	US\$7.5 million (Component 2), 19 percent disbursed from 2016-2019 and future disbursements of 14 percent in 2020, 37 percent in 2021, 23 percent in 202 and 8 percent in 2023 US\$9.3 million (Component 3 Part A), 13 percent disbursed from 2016- 2019 and future disbursements of 14 percent in 2020, 37 percent in 2021, 23 percent in 2022, 8 percent in 2023 and 6 percent in 2024 US\$19.1 million (US\$9.1 million - Component 3 Part B + US\$10 mn AF: Contador Hydro Project Cost overruns), future disbursements of 30 percent each year from 2020- 2022 and balance 10 percent in 2023
-	O&M cost	2 percent of capital cost
-	Cost of Hydro Electricity	US\$0.9/kWh
Benefit		
-	Effective Cost of Electricity	US\$0.36/kWh (2019 cost of thermal generation)
-	Commercial losses	From 25 percent in 2018 to 15 percent in 2023
-	Technical losses	From 12 percent in 2018 to 10 percent in 2022
-	GHG Grid Emission Factor	0.66 tCO ₂ /MWh avoidance per generated electricity

6. The analysis has resulted in an EIRR of 52.4 percent and NPV of US\$179 million, demonstrating a sound economic viability of the project.

7. **Benefit from avoided GHG emissions:** The project will deliver additional benefit through avoidance of GHG emissions, thanks to reduced thermal generation. Across the 20 years of economic life, it is estimated that 192,566 tCO_2 of GHG emissions will be avoided. By including these global environmental benefits of GHG abatement, the EIRR increases to 52.9 percent, and NPV to US\$181 million.

Table 1.2. Result of Economic Analysis

	EIRR (percent)	NPV (US\$, million)
Base case	52.4	179
Inclusion of GHG abatement benefits	52.9	181

Table 1.3. Total Energy Generated and Distributed (First Five Years)

	Units	Year->	2019	2020	2021	2022	2023	2024
Workings								
Contador Generation								
Days of Operation			0	0	0	214	365	365
Annual Generation	MWh		0	0	0	9,204	15,698	15,698
Scenario A - Without Project								
Energy generated	MWh		125,618	124,305	133,964	153,620	154,085	157,359
Less: Auxiliary consumption	MWh	4%	5,004	4,952	5,337	6,120	6,138	6,269
Energy injected into grid	MWh		120,614	119,353	128,628	147,501	147,947	151,090
Technical & commercial losses	%		37%	37%	37%	37%	37%	37%
Technical & commercial losses	MWh		46,479	45,993	49,567	56,840	57,011	58,223
of which outage from Contador	MWh	90	90	90	90	90	90	90
Energy delivered to customers	MWh		74,135	73,360	79,061	90,661	90,935	92,867
Scenario B - With Project								
En ergs concentral	b mark		125 618	124 205	122.064	162 824	160 793	173.057
Energy generated	MW	40/	125,018	124,305	5 2 2 7	102,824	6 764	1/3,05/
Less: Auxiliary consumption	MWN	476	5,004	4,952	5,337	6,487	6,764	6,894
Energy injected into grid	MWN n		120,614	119,353	128,628	156,338	163,019	166,162
Technical & commercial losses	76		3/%	3/%	31%	2/%	25%	25%
Technical & commercial losses	MWh	4.0	46,479	45,993	41,529	43,963	42,446	43,264
of which outage from Contador	NWh	18	90	90	90	18	18	18
Energy delivered to customers	MWh		74,135	73,360	87,099	112,375	120,573	122,898
Energy benefits:								
Demand-side energy saved	MWh		0	4,380	17,521	17,208	17,208	17,208
Increased energy generated	MWh		0	0	0	9,204	15,698	15,698
Avoided blackout	MWh		0	0	0	72	72	72
Reduction in losses	MWh		0	0	8,038	12,877	14,566	14,959
Total energy benefits	MWh		0	4,380	25,559	39,360	47,543	47,936
Depreciation								
Gross block	USD MM		4.59	14.81	26.92	36.76	40.18	41.00
Net block	USD MM							
Opening balance	USD MM		4.59	5.70	15.12	25.91	34.08	35.83
Add: Addition	USD MM		1.32	10.22	12.11	9.84	3.42	0.82
Less: Depreciation	USD MM		-0.21	-0.80	-1.32	-1.67	-1.68	-1.66
Closing balance	USD MM		5.70	15.12	25.91	34.08	35.83	34.99



Table 1.4. Economic Analysis Results

Economic Analysis	Units	Year->	2019	2020	2021	2022	2023	2024
Incremental costs		Total						
Capital expenditure	USD MM	-37.9	-0.7	-10.0	-11.9	-9.6	-3.2	-0.6
Operating expenditure	USD MM	-15.1	-0.1	-0.3	-0.5	-0.7	-0.7	-0.8
Additional operating cost of hydro	USD MM	-33.6	0.0	0.0	0.0	-0.9	-1.5	-1.6
Total costs	USD MM	-86.6	-0.8	-10.3	-12.4	-11.2	-5.5	-2.9
Incremental economic benefits		Total						
Avoided cost of thermal energy	USD MM	151.8	0.0	0.0	0.0	3.6	6.4	6.6
Avoided blackout	USD MM	0.7	0.00	0.00	0.00	0.04	0.04	0.04
Avoided cost of losses	USD MM	246.4	0.0	0.0	3.1	5.1	5.9	6.2
Avoided cost of higher consumption	USD MM	177.5	0.0	1.6	6.7	6.8	7.0	7.2
Total benefits	USD MM	576.4	0.0	1.6	9.7	15.5	19.3	20.0
Total economic flows	USD MM		-0.8	-8.6	-2.7	4.3	13.8	17.1
NPV of economic flows	USD MM	179						
Economic IRR (EIRR)	%	52.4%						
Avoided GHG emissions		Total						
Replaced diesel generation	MWh	291,766	0	0	0	9,204	15,698	15,698
CO2 emissions displaced	ton	192,566	0	0	0	6,074	10,361	10,361
GHG reduction benefit	USD MM	6	0.0	0.0	0.0	0.2	0.3	0.3
Total economic flows incl. GHG ben	efits		-0.8	-8.6	-2.7	4.5	14.1	17.4
NPV of economic flows incl. GHG I	USD MM	181						
Economic IRR (EIRR) incl. GHG ber	%	52.9%						

Project Financial Analysis

8. A financial analysis has been carried out to assess the financial viability of the project. The analysis focuses on financial cost and revenue to EMAE, the national energy utility that generates its own revenue. In line with the economic analysis, the financial analysis solely focused on Component 2 and Component 3.

9. The financial cost of the project is the capital cost to implement Components 2 and 3, as well as its O&M cost. The revenue is derived from two sources:

- (a) Increased revenue from implementing Component 2. This is calculated based on the annual sales of EMAE, expected reduction of non-technical losses, and tariff reform.
- (b) Technical loss reduction. EMAE will financially benefit from technical loss reduction. The revenue is based on annual electricity demand in targeted areas under Component 3, expected technical loss reduction and cost of electricity service.
- (c) Increased hydropower generation and replacement of thermal production as part of the rehabilitation and expansion of Contador hydropower plant.

General	
 Project lifetime 	20 years starting 2020
- Discount rate	6 percent
Cost	
- Capital cost	 US\$7.5 million (Component 2), 19 percent disbursed from 2016-2019 and future disbursements of 14 percent in 2020, 37 percent in 2021, 23 percent in 202 and 8 percent in 2023 US\$9.3 million (Component 3 Part A), 13 percent disbursed from 2016-2019 and future disbursements of 14 percent in 2020, 37 percent in 2021, 23 percent in 2022, 8 percent in 2023 and 6 percent in 2024 US\$19.1 million (US\$9.1 million - Component 3 Part B + US\$10 million AF: Contador Hydro Project Cost overruns), future disbursements of 30 percent each year from 2020- 2022 and balance 10 percent in 2023
- O&M cost	2 percent of capital cost
- Cost of Hydro Electricity	US\$0.9/kWh
Benefit	
- Cost of Service	US\$0.30 /kWh
- Commercial losses	From 25 percent in 2018 to 15 percent in 2023
- Revenue collection	From 91 percent in 2018 to 95 percent in 2022
- Technical losses	From 12 percent in 2018 to 10 percent in 2022
- Average Tariff	US\$0.22 /kWh at US\$1= STN 21.69

Table 1.5. Key Assumptions used for Financial Analysis

10. Based on these assumptions, the project will result in an FIRR of 33 percent, and an NPV of US\$109 million, indicating the project's financial viability for EMAE.



Table 1.6. Result of Financial Analysis

	FIRR (percent)	NPV (US\$, million)
Base Case	33 percent	109

Table 1.7. Financial Analysis Results

Financial Analysis	Units	Year->	2019	2020	2021	2022	2023	2024
Incremental costs		Total						
Capital expenditure	USD MM	-38	-0.7	-10.0	-11.9	-9.6	-3.2	-0.6
Operating expenditure	USD MM	-15	-0.1	-0.3	-0.5	-0.7	-0.7	-0.8
Additional operating cost of hydro	USD MM	-33.6	0.0	0.0	0.0	-0.9	-1.5	-1.6
Total costs	USD MM	-87	-0.8	-10.3	-12.4	-11.2	-5.5	-2.9
Incremental financial benefits		Total						
Tariff subsidy per unit	USD/kWh	10101	0.08	0.08	0.09	0.09	0.10	0.11
Demand-side energy saved	MWh	348.850	0	4,380	17.521	17.208	17.208	17.208
Hydro energy generated	MWh	293.130	0	0	0	9,276	15,770	15,770
Reduction in losses	MWh	466,202	0	0	8,038	12,877	14,566	14,959
Tariff subsidy savings	USD MM	169	0.0	0.4	2.3	3.7	4.8	5.1
Incremental energy billed	MWh	746,345	0	0	8,038	21,714	29,638	30,031
Incremental billings at retail tariff	USD MM	213	0.0	0.0	1.9	5.1	7.1	7.4
Collection rate	%		91%	91%	92%	95%	95%	95%
Incremental income	USD MM	203	0.0	0.0	1.7	4.9	6.8	7.0
Energy billed to consumers - witho	MWh	2,854,561	74135	73360	79061	90661	90935	92867
Billing at retail tariff	USD MM	806	16.4	16.6	18.2	21.3	21.8	22.7
Collection rate	%		91%	91%	92%	95%	95%	95%
Incremental collection	USD MM	33	0.00	0.00	0.20	0.94	0.96	1.00
Total benefits	USD MM	405	0.0	0.4	4.2	9.5	12.5	13.1
Total financial flows			-0.8	-9.9	-8.2	-1.7	7.0	10.1
NPV of financial flows	USD MM	109						-314
Financial IRR (FIRR)	%	32.9%						



Utility Financial Analysis: Impact of the Project on Financial Performance of EMAE

11. An analysis of expected impacts of implementation of PSRP on the financial performance of EMAE was carried out to show how the project can potentially contribute to the financial turnaround of the utility. For many years, EMAE's financial performance has been very poor. EMAE has been unable to recover its operation cost from its revenue; between 2013-2018, EMAE's operating cost has averaged approximately 75 percent higher than its revenue. Consequently, EMAE did not record any positive gross profit. The summary of EMAE's income statement is provided in Table 1.8

EMAE Electricity - P&L (without Pr	oject)	2013	2014	2015	2016	2017	2018
Income		0.7	10.7	13.1	13.0	14.5	14.2
Electricity color	USD IVIIVI	9.7	10.7	12.1	12.0	14.5	19.2
Water cales		9.2	10.0	11.0	12.2	15.8	15.1
water sales		0.0	0.0	0.0	0.0	0.0	0.0
Own consumption		0.1	0.1	0.1	0.1	0.1	0.2
Constalized eveneses		0.1	0.1	0.1	0.1	0.1	0.1
Capitalized expenses		0.0	0.0	0.0	0.0	0.0	0.0
Other operating income		0.3	0.5	0.4	0.5	0.6	0.8
Operating costs	USD MM	17.0	19.1	20.4	22.4	24.7	25.5
%Income	%	176%	178%	168%	176%	170%	180%
Diesel ElectroGeneration	12	13.1	14.3	15.6	18.0	19.8	19.5
Electricity Purchase		1.0	0.9	0.8	0.5	0.4	0.5
Expense with staff		1.4	1.7	2.0	2.1	2.4	2.5
Other purchases and services		1.5	2.3	2.0	1.8	2.1	3.0
Lubricating oils		0.4	0.3	0.2	0.3	0.3	0.3
Maintenance Generators and Plants		0.2	0.9	0.6	0.4	0.6	0.9
Transmission and Distribution Networks		0.3	0.2	0.3	0.3	0.2	0.8
Supplies and external services		0.3	0.3	0.4	0.4	0.4	0.4
Other services consumed		0.2	0.3	0.3	0.3	0.4	0.4
Miscellaneous Operating Costs and Losses		0.1	0.1	0.1	0.1	0.1	0.1
Indirect Taxes		0.1	0.1	0.1	0.1	0.1	0.1
Gross profit	USD MM	-7.3	-8.4	-8.3	-9.7	-10.2	-11.4
% Income	%	-76%	-78%	-68%	-76%	-70%	-80%
Amortization / Depreciation		1.9	2.1	2.0	1.9	2.3	3.4
Operating profit	USD MM	-9.2	-10.5	-10.3	-11.6	-12.5	-14.8
% Income	%	-95%	-97%	-85%	-91%	-86%	-104%
Profit before tax	USD MM	-9.3	-10.5	-10.4	-11.7	-12.6	-15.1
% Income	%	-96%	-98%	-86%	-92%	-87%	-106%
Exceptional items	USD MM	1.1	2.0	1.4	1.3	1.8	2.5
% Income	%	11%	18%	12%	10%	12%	17%
of which patronage donations		0.0	0.0	0.0	0.0	0.0	0.0
of which share of investment grants		1.0	2.0	1.3	1.3	1.6	2.2
Net profit	USD MM	-8.3	-8.6	-9.0	-10.4	-10.8	-12.6
% Income	%	-85%	-80%	-74%	-82%	-74%	-89%
Operating cash flow	USD MM	-6.4	-6.5	-7.0	-8.5	-8.5	-9.2
% Income	%	-66%	-60%	-58%	-67%	-58%	-65%

Table 1.8. Summary of EMAE's Income Statement

12. EMAE's deteriorating financial performance is largely driven by increased cost of fuel and fixed tariffs which are below cost recovery level. Generation costs in 2018 accounted for approximately 76



percent of EMAE's operational cost, with EMAE paying US\$20 million for fuel cost, an increase of 50 percent over 2013. A contributing factor to this increasing fuel cost is that many thermal plants are operating with more expensive diesel fuel.

13. EMAE's revenue increased, but at a much slower pace than its operational cost. In 2018, EMAE has recorded an electricity sales revenue of US\$13.1 million, a 40 percent increase from 2013. In 2018, EMAE's average tariff is estimated to be US¢22/KWh, whereas the cost of electricity service is estimated to be US¢30/KWh. Consequently, EMAE is able to recover only 70 percent of its cost of service from its tariff.

14. In addition, STP has been subsidizing the fuel cost of EMAE by USc6 /KWh generated. Without a turnaround in EMAE's financial performance, the required subsidy from STP will keep increasing and will pose an additional challenge to STP's fiscal health.

15. EMAE's revenue suffers from significant system loss, which is approximately 37 percent including both technical and non-technical losses. This means one-third of EMAE's potential revenue is lost before reaching the consumer.

16. With PSRP, EMAE's projected financial performance for the period of 2019–2024 is provided in Table 1.9.

EMAE Electricity - P&L (with Projec	:t)	2019	2020	2021	2022	2023	2024
Income	USD MM	16.6	17.2	23.0	32.7	41.0	43.5
Electricity sales		16.1	16.7	22.5	32.2	36.1	38.4
Own consumption		0.0	0.0	0.0	0.0	0.0	0.0
Transmissionation of fuel for own account		0.0	0.0	0.0	0.0	0.0	0.0
Other operating income		0.5	0.5	0.5	0.5	4.9	5.2
Operating costs	USD MM	25.9	26.3	26.8	27.3	27.6	28.2
% Income	%	156%	153%	116%	83%	67%	65%
Gross profit	USD MM	-9.3	-9.1	-3.8	5.4	13.4	15.3
% Income	%	-56%	-53%	-16%	17%	33%	35%
Amortization / Depreciation		2.5	3.3	3.9	4.5	4.8	5.4
Provisions (Net)							
Operating profit	USD MM	-11.8	-12.3	-7.7	1.0	8.6	9.9
% Income	%	-71%	-72%	-33%	3%	21%	23%

Table 1.9. Summary of EMAE's Income Statement Projections

17. The impact of PSRP on the Income, Gross Profit and Operating Profit of EMAE is depicted in the graphs below



Graph 1.1. Graph depicting EMAE Income Statement Projections - Without PSRP





18. In the context of EMAE's financial sustainability challenge, PSRP plays a critical role. These include: (a) Component 2: strengthening operational performance and governance of EMAE resulting in a 17 percent reduction in technical and non-technical losses and 4 percent increase in collection rates; (b) Component 3: Investing in enhanced reliability of electricity generation, T&D through enhancing the Contador Hydro project capacity to 3.2 MW therefore replacing the more expensive thermal power and distribution of 200,000 high-efficiency LED bulbs and 46,500 LED tube lights in exchange for ILs, CFLs, and FTLs.



ANNEX 2: IMPLEMENTATION SCHEDULE

				YR 2020 YR 2021					YR 2022				YR 2023				YR 2024			
1tem	Project	Activities	Planned Target date	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
	L																			1
ntadoi		Submission of Final Tender documents to WB for No-Objection	March 30, 2020																	
		Launch of Tender Documents (CW/EHM)	April 13, 2020																	-
	Pau Pau	Deadline for Submission of Tenders	May 25, 2020																	
1 0	ie o	Tender Evaluation and Recommendation Report Submitted to WB	June 8, 2020																	1
1	ŏ tio	Completion of Negotiations	June 22, 2020	-																
	ypı	Contract Signatures	July 6, 2020																	1
	царі	Works Commencement	July 27, 2020																	1
	Seh	Construction Phase																		1
		Plant Commissioning	December 30, 2022																	
		Defect Liability Period																		

Table 2.1. Implementation schedule for the rehabilitation of the Contador hydropower plant

Table 2.2. Implementation schedule for the LED deployment program

				YR 2020									
1tem	Project	Activities	Planned Target date	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
	-												
	ar	Preparation of the tender documents and No-Objection from WB	March 30, 2020										
	180	Launch of the international call for tenders	April 6, 2020										
	t P	Receipt of bids from tenderers	June 1, 2020										
2	len	Bid evaluation and No-Objection from WB	June 15, 2020										
1	۲ <u>۲</u>	Negotiation and signing of the contract	June 29, 2020										
	d	Pre-shipment Inspections	August 24, 2020										
	Ď	Supplies of lamps	September 21, 2020										
		Distribution and installation	October 19, 2020										
	-	Post evaluation	December 28, 2020										•

VI SUMMARY TABLE OF CHANGES

	Changed	Not Changed
Results Framework	\checkmark	
Components and Cost	\checkmark	
Loan Closing Date(s)	\checkmark	
Procurement	\checkmark	
Implementing Agency		\checkmark
Project's Development Objectives		\checkmark
Cancellations Proposed		\checkmark



Reallocation between Disbursement Categories	\checkmark
Disbursements Arrangements	\checkmark
Safeguard Policies Triggered	\checkmark
EA category	\checkmark
Legal Covenants	\checkmark
Institutional Arrangements	\checkmark
Financial Management	\checkmark
APA Reliance	\checkmark
Other Change(s)	\checkmark

VII DETAILED CHANGE(S)

COMPONENTS

Current Component Name	Current Cost (US\$, millions)	Action	Proposed Component Name	Proposed Cost (US\$, millions)
Support to institutional reform and sector planning	1.20	Revised	Support to electricity institutional reform and sector planning	1.20
Strengthening operational performance and governance of EMAE	7.50		Strengthening operational performance and governance of EMAE	7.50
Investing in enhanced reliability of electricity generation, transmission and distribution	18.40	Revised	Investing in enhanced reliability of electricity generation, transmission and distribution	30.40
Project Implementation Support	1.90		Project Implementation Support	1.90
TOTAL	29.00			41.00

LOAN CLOSING DATE(S)

Ln/Cr/Tf	Status	Original Closing	Current Closing(s)	Proposed Closing	Proposed Deadline for Withdrawal Applications
IDA-D1260	Effective	30-Jun-2021	30-Jun-2021	28-Jun-2024	28-Oct-2024



Expected Disbursements (in US\$)

Fiscal Year	Annual	Cumulative
2017	1,379,585.24	1,379,585.24
2018	1,157,979.68	2,537,564.92
2019	1,620,332.03	4,157,896.95
2020	1,651,038.19	5,808,935.14
2021	1,599,064.86	7,408,000.00
2022	8,236,900.00	15,644,900.00
2023	9,307,162.00	24,952,062.00
2024	2,245,559.73	27,197,621.73
2025	802,378.27	28,000,000.00

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Latest ISR Rating	Current Rating
Political and Governance	Substantial	Substantial
Macroeconomic	Moderate	Moderate
Sector Strategies and Policies	Substantial	Substantial
Technical Design of Project or Program	Moderate	Moderate
Institutional Capacity for Implementation and Sustainability	• High	• High
Fiduciary	Moderate	Moderate
Environment and Social	Substantial	Substantial
Stakeholders	Substantial	Substantial
Other		
Overall	Substantial	Substantial

LEGAL COVENANTS – Power Sector Recovery Project Additional Financing (P169196)

Sections and Description



Schedule 2, Section I, A, 1: For purposes of providing general Project oversight and coordination, the Recipient shall operate and maintain throughout the implementation of the Project, a Steering Committee, with functions, responsibilities and composition including representatives of MPFEA, MOPIRNA, EMAE and the Project Implementing Entity, all acceptable to the Association and as set forth in the Operational Manual.

Schedule 2, Section I, A, 2: For purposes of facilitating the implementation of the Project, the Recipient shall operate and maintain throughout the implementation of the Project, a Working Group, with functions, responsibilities and composition including representatives of MOPIRNA, EMAE, AGER and the Project Implementing Entity, all acceptable to the Association and as set forth in the Operational Manual.

Schedule 2, Section I, B, 1(a-h): No later than ninety (90) days after the Signature Date, the Recipient shall cause the Project Implementing Entity to update, and thereafter maintain and carry out the Project, in accordance with the provisions of a manual (the Operational Manual) acceptable to the Association, which shall include, inter alia: (a) a detailed description of Project activities and institutional arrangements for the Project; (b) the Project administrative, accounting, auditing, reporting, financial (including cash flow aspects in relation thereto), procurement and disbursement procedures; (c) the monitoring indicators for the Project; (d) the institutional and administrative mechanisms established to ensure inter-institutional coordination; (e) the functions, responsibilities and composition of the Steering Committee and the Working Group; (f) the criteria for EMAE customers to receive high efficiency light bulbs; (g) the criteria for the selection of women STEM graduates to receive capacity building on entrepreneurship; and (h) the ESMF, ESIA, ESMP, SS-ESMPs and C-ESMPs.

Conditions

Type Disbursement	Description Schedule 2, Section III, B, 1(b): No withdrawal shall be made under Categories (1) and (2) unless the Operational Manual has been updated in a manner acceptable to the Association.
Type Disbursement	Description Schedule 2, Section III, B, 1(b): No withdrawal shall be made under Categories (1) and (2) unless the Subsidiary Agreement has been executed on behalf of the Recipient and the Project Implementing Entity and is legally binding upon the Recipient and the Project Implementing Entity.



VIII. RESULTS FRAMEWORK AND MONITORING

Results Framework

COUNTRY: Sao Tome and Principe Power Sector Recovery Project Additional Financing

Project Development Objective(s)

The project development objectives are to (i) increase renewable energy generation and (ii) improve the reliability of the electricity supply.

Project Development Objective Indicators by Objectives/ Outcomes

Indicator Name	DLI	Baseline		End Target								
			1	2	3	4	5					
Increase renewable energy generation and improve the reliability of the electricity supply												
Generation Capacity of Hydropower constructed or rehabilitated under the project (Megawatt)		0.00	0.00	0.00	3.20	3.20	3.20	3.20				
Action: This indicator has been Revised	Action: This indicator has been Revised											
Generation Capacity of Hydropower rehabilitated under the project (Megawatt)		0.00	0.00	0.00	3.20	3.20	3.20	3.20				
Direct project beneficiaries (Number)		0.00	0.00	90,000.00	90,000.00	90,000.00	90,000.00	90,000.00				
Action: This indicator has been Revised												



Indicator Name	DLI	Baseline		End Target				
			1	2	3	4	5	
Female beneficiaries (Percentage)		0.00	0.00	51.00	51.00	51.00	51.00	51.00
Action: This indicator has been Revised								
Electricity losses per year in the project area (Percentage)		40.00	40.00	38.00	36.00	34.00	33.00	33.00
Action: This indicator has been Revised								

Intermediate Results Indicators by Components

Indicator Name	DLI	Baseline		Intermediate Targets						
			1	2	3	4	5			
Support for electricity instit	Support for electricity institutional reform and sector planning (Action: This Component has been Revised)									
Least cost power sector development plan prepared and adopted by MINRA (Text)		No	No	Prepared	Adopted by the MINRA, MoFPA, and EMAE	Implementation underway	Implementation underway	Implementation underway		
Action: This indicator has been Revised										
Strengthening operational	perfor	mance and governa	ance of EMAE							
Management information, system installed, populated, in use (Text)		No	No	MIS installed	MIS Populated with data	In use for sector monitoring and reporting	In use for sector monitoring and reporting	In use for sector monitoring and reporting		



Indicator Name	DLI	Baseline		End Target				
			1	2	3	4	5	
Action: This indicator has been Revised								
Management improvement plan prepared and adopted by MINRA (Text)		No						Under implementation
Action: This indicator is New								
Investing in enhanced relia	bility o	of electricity generatio	n, transmission and dis	stribution				
Meters installed under the project (Number)		0.00	0.00	3,000.00	10,000.00	15,000.00	21,000.00	21,000.00
Action: This indicator has been Revised								
Distribution lines constructed or rehabilitated under the project (Kilometers)		0.00	0.00	25.00	50.00	100.00	100.00	100.00
Action: This indicator has been Revised								
Distribution lines rehabilitated under the project (Kilometers)		0.00	0.00	25.00	50.00	100.00	100.00	100.00
Action: This indicator has been Revised								
Gender-sensitive community outreach and communication campaign prepared and implemented, with regular feedback mechanism to sector stakeholders (e.g., EMAE,		No	Campaign prepared	Quarterly report prepared and feedback provided to sector stakeholders.	Quarterly report prepared and feedback provided to sector stakeholders.	Quarterly report to sector stakeholders.	Quarterly report prepared and feedback provided to sector stakeholders.	Quarterly report prepared and feedback provided to sector stakeholders.



Indicator Name	DLI	Baseline		l	Intermediate Targets				
			1	2	3	4	5		
relevant ministries, AGER, AFAP) (Text)									
Action: This indicator has been Revised									
Energy Production (Megawatt hour(MWh))		0.00	0.00	0.00	0.00			15,698.00	
Action: This indicator is New									
Replacement of energy inefficient lamps with high efficiency LED lamps (Number)		0.00						225,500.00	
Action: This indicator is New									
Phaseout policy for incandescent lamps (Yes/No)		No						Yes	
Action: This indicator is New									
Percentage of female technical experts (Percentage)		2.50						4.00	
Action: This indicator is New									
Number of women employed in awareness- raising campaign (Number)		0.00						17.00	
Action: This indicator is New									
Percentage of potential female-led enterprises		0.00						50.00	



Indicator Name	DLI	I Baseline	Intermediate Targets								End Target
			1	2		3	4		5		
(Percentage)											
Action: This indicator is New											
Energy Savings (Megawatt hour(MWh))		0.00									15,000.00
Action: This indicator is New											
Peak Load Reduction (Megawatt)		0.00									8.00
Action: This indicator is New											
Project Implementation Su	pport										
Women's group trained as community outreach and consumer feedback agents. (Text)		No	No	Yes		/es	Yes		Yes		Yes
Action: This indicator has been Revised											
			Monitor	ing & I	Evaluation P	an: PDO Indicat	ors				
Indicator Name			Definition/Descriptio	n	Frequency	Datasource	1 (Methodology Collection	for Data	Respo Collec	onsibility for Data ction

Generation Capacity of Hydropower constructed or rehabilitated under the project	This indicator measures the capacity of hydropower constructed or rehabilitated under the	Annual	EMAE reporting	Project Report	EMAE/AFAP



	project. For indicators measuring access provided to households or through community connections, refer to "T&D of electricity" (LT) sector code. The baseline value is expected to be zero.				
Generation Capacity of Hydropower rehabilitated under the project					
Direct project beneficiaries	Direct beneficiaries are people or groups who directly derive benefits from an intervention (i.e., children who benefit from an immunization program; families that have a new piped water connection). Please note that this indicator requires supplemental information. Supplemental Value: Female beneficiaries (percentage). Based on the assessment and definition of direct project beneficiaries, specify what proportion of the direct project beneficiaries are female. This indicator is calculated as a percentage.	Annual	EMAE reporting	Project Report	EMAE/AFAP



Female beneficiaries	Based on the assessment and definition of direct project beneficiaries, specify what percentage of the beneficiaries are female.	Annual	National Institute of Statistics	Project Report	EMAE/AFAP
Electricity losses per year in the project area	This indicator is calculated by dividing total electricity losses at the point of sale (that is, the sum of technical and nontechnical losses at the point of sale: total GWh dispatched to the system minus total GWh billed to customers) by the total net dispatched generation. The baseline is the actual total electricity losses on the island of Sao Tome at the beginning of the project. Technical and nontechnical losses cannot be disaggregated given an insufficiency of utility data.	Annual	EMAE reporting	Project Report	EMAE/AFAP

Monitoring & Evaluation Plan: Intermediate Results Indicators							
Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection		
Least cost power sector development plan prepared and adopted by MINRA	This indicator measures whether a least cost power	Annual	Annual report	Project Report	EMAE/AFAP		



Management information, system installed, populated, in use	sector development plan has been prepared, adopted by the Government and utility. This indicator measures whether updated management information systems have been	Annual	EMAE reporting/EIB	Project Report	EMAE/AFAP
Management improvement plan prepared	integrated into EMAE day- to-day operations.				
and adopted by MINRA					
Meters installed under the project	This indicator measures the number of meters installed under the project.	Annual	EMAE reporting/EIB	Project Report	EMAE/AFAP
Distribution lines constructed or rehabilitated under the project	This indicator measures the length of the distribution lines constructed or rehabilitated/upgraded under the project. The baseline value for this indicator is expected to be zero.	Annual	EMAE reporting	Project Report	EMAE/AFAP
Distribution lines rehabilitated under the project		Annual	EMAE reporting	Project Report	EMAE/AFAP
Gender-sensitive community outreach and communication campaign prepared and implemented, with regular feedback mechanism to sector stakeholders (e.g., EMAE, relevant ministries, AGER, AFAP)	This indicator measures whether a gender-sensitive communication campaign has been implemented under the project and if a formal feedback has been gathered during	Annual	AFAP reporting	Project Report	EMAE/AFAP



	consultation process under the form of a quarterly report being fed back to sector stakeholders.				
Energy Production	Energy produced by Contador in 12 months following full commissioning and start of operation date in MWh	Annual	EMAE	Annual Report	EMAE
Replacement of energy inefficient lamps with high efficiency LED lamps	Number of LED lamps used to replace incandescent lamps, compact fluorescent lamps, and fluorescent tube lights Monthly reporting showing number of LED lamps replacing Incandescent lamps, compact fluorescent lamps and fluorescent tube lights.	Once	EMAE	Project report	EMAE
Phaseout policy for incandescent lamps	Adoption of incandescent bulbs phaseout policy by the Government of STP	Once	Project report	EMAE	EMAE
Percentage of female technical experts	Number of employed female STEM graduates in energy sector / at EMAE (from 11 to 17)	Once	Project Report	Project report	AFAP
Number of women employed in awareness-raising campaign	Increased number of formally employed women in relation to electricity sector	Once	EMAE / AFAP	Project Report	AFAP



Percentage of potential female-led enterprises	Number of potential female-led firms entering the market	Once	AFAP	Project Report	AFAP
Energy Savings	Projected annual energy savings in MWh 12 months following distribution of 225,500 LED lamps	Once	EMAE	EMAE Annual Report	EMAE
Peak Load Reduction	Peak Load reduced in MW after the distribution of all 225,500 LED lamps	Once	EMAE	EMAE Annual Report; Meter readings from EMAE substation reports	EMAE
Women's group trained as community outreach and consumer feedback agents.	This indicator measures whether women groups have been trained as community outreach and consumer feedback agents.	Annual	AFAP reporting	Project Report	EMAE/AFAP