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IDA/R2017-0160/1

May 19, 2017

Closing Date: Thursday, June 8, 2017 at 6 p.m.

FROM: Vice President and Corporate Secretary

Burkina Faso - Electricity Sector Support Project

Additional Financing

Project Paper

Attached is the Project Paper regarding a proposed additional credit to Burkina Faso for an Electricity Sector Support Project (IDA/R2017-0160), which is being processed on an absence-of-objection basis.

Distribution:
Executive Directors and Alternates
President
Bank Group Senior Management
Vice Presidents, Bank, IFC and MIGA
Directors and Department Heads, Bank, IFC and MIGA

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The World Bank

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Report No: PAD2268

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT PAPER

ON A

PROPOSED ADDITIONAL CREDIT

IN THE AMOUNT OF EUR74.9 MILLION

(US$80 MILLION EQUIVALENT)

TO

BURKINA FASO

FOR THE

BURKINA FASO ELECTRICITY SECTOR SUPPORT PROJECT

MAY 11, 2017

Energy and Extractives Global Practice
Africa Region

CURRENCY EQUIVALENTS
(Exchange Rate Effective as of March 31, 2017)

Currency Unit = EUR
US$ = 0.93624192 EUR

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
AfDB	African Development Bank
AFD	*Agence Française de Développement* (French Development Agency)
ARSE	*Autorité de Régulation du Sous-secteur de l'Electricité* (Electricity Sector Regulatory Authority)
DDO	Diesel Distillate Oil
DGE	Directorate General of Energy
DPO	Development Policy Operation
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
ESSP	Electricity Sector Support Project
EU	European Union
FDE	*Fonds de Développement de l'Electrification* (Electrification Development Fund)
FIRR	Financial Internal Rate of Return
GHG	Greenhouse Gas
GRS	Grievance Redress Service
HFO	Heavy Fuel Oil
HV	High Voltage
IDA	International Development Association
IFC	International Finance Corporation
IPP	Independent Power Producer
LOLL	Loss of Load
LTMC	Long-term Marginal Cost
LV	Low Voltage
MV	Medium Voltage
MWp	Megawatt Peak
NPV	Net Present Value
O&M	Operations and Maintenance
OPEX	Operating Expenditure
PDO	Project Development Objective
PNDES	*Plan National de Developpement Economique et Social* (National Economic and Social Development Plan)

PPA	Power Purchase Agreement
PPP	Public-private Partnership
PV	Photovoltaic
SONABEL	*Société Nationale d'Eléctricité du Burkina* (National Electricity Utility)
SONABHY	*Société Nationale Burkinabè d'Hydroc*arbures (National Hydrocarbons Agency)
UGP	*Unité de Gestion du Project* (Project Coordination Unit)
WAPP	West African Power Pool
WBG	World Bank Group

Regional Vice President:	Makthar Diop
Country Director:	Pierre Frank Laporte
Country Manager:	Cheick F. Kante
Senior Global Practice Director:	Riccardo Puliti
Practice Manager:	Charles Joseph Cormier
Task Team Leaders:	Alexis Madelain and Alassane Agalassou

BURKINA FASO
ADDITIONAL FINANCING TO THE ELECTRICITY SECTOR SUPPORT PROJECT (P160344)

CONTENTS

ADDITIONAL FINANCING DATA SHEET

Burkina Faso

Burkina Faso AF to Electricity Sector Support Project (P160344)

AFRICA

Energy and Extractives Global Practice

Basic Information - Parent			
Parent Project ID:	P128768	Original EA Category:	B - Partial Assessment
Current Closing Date:	30-Sep-2019		

Basic Information - Additional Financing (AF)			
Project ID:	P160344	Additional Financing Type (from AUS):	Restructuring, Scale Up
Regional Vice President:	Makhtar Diop	Proposed EA Category:	
Country Director:	Pierre Frank Laporte	Expected Effectiveness Date:	29-Aug-2017
Senior Global Practice Director:	Riccardo Puliti	Expected Closing Date:	30-June-2021
Practice Manager/Manager:	Charles Joseph Cormier	Report No:	PAD2268
Team Leader(s):	Alassane Agalassou, Alexis Madelain		

Borrower				
Organization Name	Contact	Title	Telephone	Email
Ministry of Finance	Hadizatou Rosine Coulibaly/Sory	Minister		

Project Financing Data - Parent (Burkina Faso Electricity Sector Support Project-P128768) (in US$, millions)

Key Dates

Project	Ln/Cr/TF	Status	Approval Date	Signing Date	Effectiveness Date	Original Closing Date	Revised Closing Date
P128768	IDA-52910	Effective	30-Jul-2013	08-Oct-2013	27-Feb-2014	30-Sep-2018	30-Sep-2018
P128768	IDA-54910	Effective	13-Jun-2014	15-Jul-2014	09-Oct-2014	30-Sep-2019	30-Sep-2019
P128768	IDA-H9660	Effective	13-Jun-2014	15-Jul-2014	09-Oct-2014	30-Sep-2019	30-Sep-2019

Disbursements									
Project	Ln/Cr/TF	Status	Currency	Original	Revised	Cancelled	Disbursed	Undisbursed	% Disbursed
P128768	IDA-52910	Effective	SDR	33.40	33.40	0.00	13.79	19.61	41.29
P128768	IDA-54910	Effective	SDR	5.20	5.20	0.00	0.22	4.98	4.28
P128768	IDA-H9660	Effective	SDR	17.50	17.50	0.00	0.74	16.76	4.24

Project Financing Data - Additional Financing Burkina Faso AF to Electricity Sector Support Project (P160344) (in US$, millions)

[ ] Loan [ ] Grant [] IDA Grant

[X] Credit [ ] Guarantee [ ] Other

Total Project Cost:	81.28	Total Bank Financing:	80.00
Financing Gap:	0.00		

Financing Source – Additional Financing (AF)	**Amount**
BORROWER/RECIPIENT	1.28
International Development Association (IDA)	80.00
Financing Gap	0.00
Total	81.28

Policy Waivers

Does the project depart from the CAS in content or in other significant respects?	No
Explanation	
Does the project require any policy waiver(s)?	No
Explanation	

Team Composition

Bank Staff

Name	**Role**	**Title**	**Specialization**	**Unit**
Alexis Madelain	Team Leader (ADM Responsible)	Energy Specialist	Energy and Economics	GEE07
Alassane Agalassou	Team Leader	Senior Energy Specialist	Energy	GEE07
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		Officer		
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Sunil W. Mathrani	Team Member	Senior Energy Specialist	Energy	GEE07
Issa Thiam	Team Member	Finance Officer	WFAFO	WFAFO
Mariangeles Sabella	Team Member	Senior Counsel	Legal	LEGEN

Institutional Data

Parent (Burkina Faso Electricity Sector Support Project-P128768)

Practice Area (Lead)

Energy and Extractives

Contributing Practice Areas

Additional Financing Burkina Faso AF to Electricity Sector Support Project (P160344)

Practice Area (Lead)

Energy and Extractives

Contributing Practice Areas

Locations

Country	First Administrative Division	Location	Planned	Actual	Comments
Burkina Faso	Nord	Ouahigouya	X		Other localities to be determined
Burkina Faso	Est	Fada Ngourma	X		Other localities to be determined

I. Introduction

1. This Project Paper seeks the approval of the Executive Directors to provide an additional financing (AF) credit in the amount of EUR 74.9 million (US$80 million equivalent) to the Burkina Faso Electricity Sector Support Project (ESSP, P128768). The ESSP, financed through an IDA credit in the original amount of SDR 33.4 million (US$50 million equivalent), was approved by the Board on July 30, 2013. A first AF (Burkina Faso - Additional Financing Electricity Sector Support Project, P149115) in the amount of SDR 22.7 million (US$35 million equivalent), of which SDR 17.5 million credit and SDR 5.2 million grant, was approved by the Board on June 13, 2014. This would be the second AF for the ESSP, bringing total IDA resources under the project to US$165 million equivalent, of which US$138 million credit and US$27 million grant.

2. The proposed AF would scale up and maximize the development impact of the ESSP by supporting: (a) introduction of low-cost solar resources in Burkina Faso's energy mix; (b) reinforcement of the network to allow for integration of more intermittent solar power; and (c) technical assistance to sector entities for capacity building and transaction advisory services to develop private sector-led independent power producer (IPP) projects. The proposed AF would scale up activities under the ESSP, particularly Component 1 (Improving the Reliability of Energy Supply) and Component 4 (Institutional Strengthening and Capacity Development). The project would also be restructured to provide for a closing date extension to June 30, 2021 to allow for completion of activities under the project, particularly for the proposed AF. The disbursement estimates, implementation schedule and results framework will also be revised in line with the proposed new activities and closing date.

3. The activities supported by the AF are consistent with the existing Project Development Objective (PDO) of the ESSP, which is to contribute to (a) increasing access to electricity; (b) improving the reliability of electricity supply; and (c) improving efficient use of energy in targeted areas.

II. Background and Rationale for Additional Financing

A. Country Context

4. **Burkina Faso is a landlocked, low-income country in Sub-Saharan Africa, with high demographic growth and high levels of poverty.** Per capita gross national income (Atlas method) was US$660 in 2015 and 45 percent of the population lived in poverty (2014). The population, which is growing at about 3 percent per year, was about 18.11 million in 2015, and it is estimated that it will reach 21.5 million by 2020. The country was ranked 183 out of 188 countries on the 2015 United Nations Development Programme Human Development Index.

5. **In spite of limited natural resources, recent economic performance has been relatively strong, but is not translating into substantial poverty reduction.** Burkina Faso's economy is heavily reliant on agricultural production, with close to 80 percent of the active population employed in the sector. Cotton is the country's most important cash crop, while gold exports have gained importance in recent years. Over the last 15 years, economic growth has averaged about 5.5 percent. However, the recent fall in gold and cotton prices, combined with

drops in grain production and political instability, have contributed to low-tax revenue collection leading to a slowdown in poverty reduction. The sharp decrease in overall poverty rates from 54.6 percent in 1998 to 46.7 percent in 2009 has stagnated. Urban poverty has almost doubled, rising from 10.4 percent in 1994 to 20 percent today. The country also faces increasingly harsh climatic conditions, which hinder efforts to reduce extreme poverty.

6. **In 2015, Burkina Faso turned a new page in its history.** One year after the popular uprising of October 2014, the country has successfully held presidential and legislative elections, restoring rule of law and democracy. Municipal elections were held in May 2016. In July 2016, the Government adopted a new development strategy, set forth in the 2016–2020 *Plan National de Developpement Economique et Social* (National Economic and Social Development Plan, PNDES), including strategic directions for the energy sector.

B. Sector and Institutional context

7. **Burkina Faso faces many challenges to achieve its ambitious objectives for developing electricity services.** The electrification rate in Burkina Faso has barely grown over the past five years and remains low by regional standards. Burkina Faso's access rate is about 40 percent in urban areas and 3 percent in rural areas. The Government aspires to provide secure and affordable electricity to 100 percent of its urban population and 40 percent of its rural population by 2025. To achieve this objective, the main challenges to be addressed are (a) expanding generation capacity to reduce electricity shortages and meet increasing demand for energy services while ensuring security and reliability of energy supply; (b) shifting the thermal-intensive energy mix toward cheaper sources, namely renewables and imports; and (c) positioning the utility on a financially stable trajectory to ultimately reduce budget transfers to the sector and improve the performance of the utility as an off-taker.

8. **The Government's strategy is to reduce dependency on imported and expensive fossil fuels and gradually shift the generation mix toward renewable energy and affordable imports of electricity.** This would also reduce overall cost of service, which remains high in Burkina Faso, as well as exposure to fuel price volatility and foreign exchange risks. This strategy requires a scale-up in power generation to fill the capacity deficit and meet the significant growth in demand. It also requires additional investments in the national grid to enable it to absorb intermittent solar power and will require the deployment of firm base load capacity, some of which can be sourced through regional interconnectors (

9.

10. Table ***1*** presents expected additional capacity in the short to medium term). In rural areas, the strategy will be to pursue decentralized generation in renewable energy in those areas where this technology is least costly. Burkina Faso's medium-term, least-cost electricity supply expansion strategy will rely on rapid expansion of three main pillars of electricity supply:

(a) **Scale-up Domestic Renewable Generation, primarily Solar Photovoltaic (PV).** The Government's strategy promotes a dramatic scale-up of renewable energies within the national energy mix by 2030. The Government had initially planned on commissioning 120 megawatt peak (MWp) of solar capacity by the end of 2018. However, only one

project, Zagtouli PV, which is publicly financed by the *Agence Française de Développement* (French Development Agency, AFD) and European Union (EU), has reached financial close and started construction. The Government launched two competitive bids in 2013 and 2016 for the development of 70 MWp and 80 MWp solar PV plants, respectively. The first bid led to the short-listing of five private developers with proposed tariffs and required guarantees under negotiation, however reaching an agreement that would be economically and financially sustainable for the country has proved challenging. The financial closure of Zina solar, a sole source 28 MWp solar PV IPP in which the International Finance Corporation (IFC) is participating, is expected by the end of June 2017 with commissioning expected in2019.

(b) **Increase Imports through Regional Integration.** To exit the vicious circle of increasing electricity demand paired with ever-costlier fuel-based generation, Burkina Faso is actively engaging in regional transmission and generation projects through its membership in the West African Power Pool (WAPP). The objective is to enhance its capacity to import power from both Côte d'Ivoire[1] (where there is an existing interconnector) and Ghana (where an interconnector is under construction with support of the World Bank, AFD, and the European Investment Bank [EIB]), and eventually Niger and Nigeria, through the proposed North Core interconnector project. WAPP: The First Phase of the Inter-Zonal Transmission Hub Project of the WAPP (APL3) Program (P094919),[2] which is supporting the interconnection with Ghana, is due to be completed and operational early 2018, adding an initial 40 MW of imports from Ghana, with further expansion possible depending on supply surpluses and advance of longer-term regional power projects (for example, Domunli and Maria Galeta), and the North Core interconnector, which is expected to become operational by 2021.

(c) **Develop Firm Base Load Capacity.** The increase in availability of domestic thermal generation capacity is urgently needed to fill the increasing capacity deficit, meet the significant growth in demand and, in the medium term, balance supply fluctuations resulting from the two pillars above. The Government would still need to bring online 80 MW to avoid severe load shedding in 2017 and 2018, and commission more than 150 MW by 2020 to meet demand, which peaks in the early evening. A recently completed long-term planning study on supply mix diversification[3] showed that the least-cost options to meet base load demand in Burkina Faso include a mix of rehabilitation of existing generation fired by heavy fuel oil (HFO), imported electricity from other West African countries, and greenfield fossil fuel generation.[4] With the cost of solar storage

[1] Côte d'Ivoire already increased exports to Burkina Faso from 50 MW to 80 MW in 2016. The further increase in exports up to 100 MW, once new generation assets in Côte d'Ivoire are commissioned in 2017–2018, would require further improvement of wheeling capacity on the interconnector on the Côte d'Ivoire side and improvement of transmission line efficiency on the Burkina Faso side (by means of capacitor banks in selected substations).
[2] Ghana (Bolgatanga)-Burkina Faso (Ouagadougou) interconnection transmission line in 225 kV.
[3] Burkina Faso Energy Mix Diversification, World Bank, 2017.
[4] While the Government of Burkina Faso requested World Bank AF for the rehabilitation of HFO-fired plants to reduce the energy deficit by the summer of 2017, the World Bank indicated its interest in supporting the shift toward renewable energy.

coming down, power storage options will be assessed in a comprehensive grid stability study for renewable energy integration to be supported under the proposed AF.

Table 1. Additional Generation Capacity Expected in Burkina Faso[a]

	Capacity	Commissioning	Financing	Status
Solar PV				
Zagtouli	33 MWp	2017	AFD, EU	Under construction
Zina	28 MWp	2019	IPP	Financial close expected by June 2017 (with IFC as mandated lead arranger)
Koudougou and Kaya regions PV plants	30 MWp	2019	IDA	Proposed under the AF
Imports				
Additional energy from Côte d'Ivoire	30 MW	2016	*Compagnie Ivoirienne d'Electricité*, CIE	Effective
Additional energy from Côte d'Ivoire (recovery of capacity)	5 MW	2018	*Société Nationale d'Eléctricité du Burkina* (National Electricity Utility, SONABEL)	Ongoing installation of capacitor banks in substation
Ghana interconnector (Bolgatanga-Ouagadougou)	40 MW	2018	IDA, AFD, EIB	Under construction
Additional energy from Ghana	100 MW	2020–25	Volta River Authority, VRA	
Northcore (imports from Nigeria)	200 MW	2021	IDA, African Development Bank (AfDB), EU, AFD	Financing pledged in November 2016
Thermal				
Urgent rehabilitation	30 MW	2017	SONABEL	Ongoing
Fada plant	7.5 MW	2018	IDA	Contract awarded
Additional units at Kossodo plant	50 MW	2019	Islamic Development Bank, IsDB	Under preparation
Ouagadougou Est	100 MW	To be determined	IPP	Bidding process launched February 2017

Source: IDA team.
Note: a. Only projects with reasonable visibility on financing and associated timeline.

11. **The establishment of an enabling framework is critical to scale up renewable energy.** As part of its ongoing engagement, the World Bank Group (WBG) is exploring means to help the Government reach financial closure of selected renewable IPP projects and to establish the enabling framework for competitive selection of least-cost generation, which includes: (a) enhanced planning capacity at the Ministry of Energy to develop least-cost options and to follow through on implementing these options; (b) enhanced capacity of the regulator to ascertain that proposed prices, in particular on negotiated deals, are in the consumer's interest; and (c) an improved regulatory and institutional framework and enhanced capacity to carry out an effective competitive bidding process. In the short term, given the high cost of fossil fuel generation and given the time it would take to finalize a new competitive procurement process, the Government

of Burkina Faso wishes to proceed with a second solar generation project with public sector funding, to shift the country's energy mix toward renewables and reduce dependency on high-cost thermal sources. Additional investments in the national grid will also be required to enable it to absorb intermittent solar power.

12. **Institutional arrangements of the sector need to be strengthened and capacity of key entities reinforced to implement this strategy in a timely and cost-effective manner.** The Ministry of Energy has recently implemented several changes that led to the fragmentation of mandates and responsibilities in the sector.[5] The *Autorité de Régulation du Sous-secteur de l'Electricité* (Electricity Sector Regulatory Authority, ARSE), created in 2007, remains marginalized in terms of influence over major sector regulatory aspects, such as tariff reviews, which are handled directly between the Ministry of Energy and SONABEL. SONABEL, the vertically integrated, state-owned utility, is not fully financially viable and relies on budget transfers to subsidize its fuel and operational costs.[6] The biggest hurdle to restore SONABEL's financial viability is the reduction of the cost of service for power generation and its dependency on expensive fossil fuel imports.[7] SONABEL is buying HFO and diesel distillate oil (DDO) from the *Société Nationale Burkinabè d'Hydrocarbures* (National Hydrocarbons Agency, SONABHY), a state-owned company with monopoly over all imports and storage of petroleum products. SONABHY's financial viability is characterized by high fuel purchase price, high transport costs, high losses, high financial charges amplified by the absence of forex hedging practices, and weak human resource policies.

13. **The new cabinet appointed in January 2016 embraced energy sector reform.** The reform process is sequenced as follows: (a) the clearance of cross-arrears and a new tariff regime will improve the financial situation of the utility and bring transparency and predictability in budget transfers,[8] allowing a gradual shift from limited to full fuel cost pass-through once the subsidy cap is reached in the medium term; (b) the implementation of a new energy sector law,[9] currently under preparation, seeks to organize the sector and define the roles of the different institutions and agencies—it will, among others, promote the capacity of the Ministry of Energy to plan and implement least-cost investments in a timely and transparent manner, strengthen the regulator's mandate, abrogate SONABEL's single buyer arrangement, and promote competition; and (c) the promotion of private investments is expected to play an important role in the medium term to accelerate the deployment of cost-effective generation, in particular for renewable energy. Crowding-in a significant amount of commercial financing would nonetheless require a fully creditworthy utility and, in the absence of this, well-designed operations that are significantly de-risked. IDA is supporting this reform process through a development policy operation (DPO) series (P157060) and possible IDA guarantee support going forward.

[5] The former Directorate General of Energy has been split in March 2016 into three separate entities: the Directorate General for Conventional Energy, the Directorate General for Renewable Energy, and the Directorate General for Energy Efficiency.
[6] Fuel price paid by SONABEL to SONABHY is revised monthly and capped to a ceiling defined on yearly basis, above which SONABHY receives subsidies to cover for induced loss.
[7] This represents 40 percent of the cost of electricity service.
[8] Coupling of oil price threshold triggering subsidies, with a subsidy cap triggering tariff adjustment. Interministerial decree no. 2016-343 MINEFID/MCIA/MEMC, dated October 2016.
[9] Expected to be submitted to the parliament before June 2017.

C. Parent Project Performance

14. **The parent project is rated moderately satisfactory for progress toward achievement of the PDO and overall implementation progress (and has been over the past 12 months).**.Due to the political upheaval in 2014–2015, and the new Government's focus in 2016 on consolidation, defining the reform path, and reorganization of the Ministry of Energy, project implementation has been significantly slower than expected. As a result, disbursements stand at 26.3 percent of the total IDA resources available (SDR 56.1 million) as of April 2, 2017. However, commitments have improved significantly, standing at 44.2 percent of total IDA resources. The Client has developed an action plan to improve disbursements. By the time the second AF is expected to become effective, commitments are projected to reach 97 percent and disbursements 40 percent. The Project is in compliance with the submission of audited financial statements, safeguard requirements and legal covenants.

15. **The PDO of the ESSP is to contribute to (a) increasing access to electricity; (b) improving the reliability of electricity supply; and (c) improving efficient use of energy in targeted areas.** The project has four components: (a) improving the reliability of energy supply; (b) increasing electricity access in target areas; (c) improving efficient use of energy in target areas; and (d) institutional strengthening and capacity development. The first AF scaled up activities under Components 2 and 4, by increasing the number of rural communities to be connected to the grid from about 40 to 120, and providing additional support to SONABEL for the development and implementation of a strategic plan, acquisition and implementation of a state-of-the art customer management system, undertaking of a fuel consumption audit, and technical assistance to improve private participation in the sector.

16. **A project restructuring was approved in November 2016.** The restructuring updated the project implementing agencies to reflect the Ministry of Energy's 2016 organizational changes. With the splitting of the Directorate General of Energy (DGE) into three separate units, project implementation responsibility for Components 3 and 4 was transferred from the DGE to a newly established *Unité de Gestion du Projet* (project coordination unit, UGP) reporting directly to the Minister of Energy. Former staff responsible for project implementation under DGE were transferred to UGP to ensure continuity, and a new Project Coordinator was engaged (as a result of the political upheaval, the project had been without a coordinator for a long period). The restructuring also modified activities under some components (consequently reallocating some funds) by dropping the construction of the greenfield 7.5 MW thermal power plant at Ouhigouya under Component 1 due to higher than anticipated cost, and dropping the elaboration and implementation of a new strategic plan for SONABEL under Component 3 given that the new Government has taken charge of setting strategic directions for the sector. The Results Framework was revised to reflect these changes. The Government's counterpart contribution was also significantly reduced.

17. After a slow start, the Project has reached cruising speed. The construction of the 7.5MW power plant in Fada is ongoing. 40 rural communities have been electrified, providing access to electricity to about 4,000 people. Progress under each of the parent project's four components is as follows:

(a) **Component 1: Improving the Reliability of Energy Supply (IDA US$17.71**

million equivalent). This component, implemented by SONABEL, supports the construction of a turnkey diesel power station of at least 7.5 MW convertible to HFO to reinforce the capacity in Fada—one of the country's regional growth poles—and provision of technical advisory services for construction and supervision. The contract for the construction of the power plant has been signed and the first disbursement made, while the contract for the owner's engineer to advise and help supervise the works has also been signed and the first disbursement made. Works have started on the ground and completion of the plant is expected at the end of 2018.

(b) **Component 2: Increasing Electricity Access in Target Areas (IDA US$49.72 million equivalent).** This component, implemented by the Rural Development Fund (*Fonds de Développement de l'Electrification*, FDE), supports grid expansion and installation of connections in about 120 rural communities initially. To achieve this, the project supports (i) grid expansion and installation of connections in selected communities through existing and new 33 kV transmission lines and the existing 34.5 kV Bobo-Dioulasso-Ouagadougou line; (ii) installation of hybrid mini grids and solar home systems in remote and poor localities; and (iii) installation of multifunctional platforms to foster income-generating activities in poor localities. To date, 40 rural communities have been electrified, comprising about 600 households that have received an electricity connection. The bidding documents for a further 79 communities to be electrified are currently being launched. Another bidding document for 70 localities to be electrified by grid and 18 others by mini-grid is under preparation to bring the total number of rural communities to 207, or 72.5 percent more than the originally envisaged number of 120.

(c) **Component 3: Improving Efficient Use of Energy in Target Areas (IDA UD$4.6 million equivalent).** This component, implemented by UGP, supports (i) strengthening the institutional, legal, and regulatory framework to support demand-side management and energy efficiency initiatives, including public lighting; (ii) investment in energy efficient equipment, such as public lightning equipment and economic lamps; (iii) awareness campaigns through the provision of information, education, and communication to promote the rational and efficient use of electricity; and (iv) implementation of Lighting Africa activities, including, among other things, provision of capacity training on off-grid lighting in rural electrification strategies, public service announcements and awareness campaigns to inform consumers of the benefits of solar lanterns and other good quality solar products, and deployment of around 25,000 solar lanterns in public schools (to support students studying after school/at night) focusing on those in off-grid communities. Implementation of most of the activities is progressing steadily.

(d) **Component 4: Institutional Strengthening and Capacity Development (IDA US$12.97 million equivalent).** This component, implemented by UGP, supports (i) strengthening the institutional capacity of SONABEL, FDE, and UGP for scaling up of energy service expansion as well as support to UGP to carry out the project; (ii) strengthening the capacity of energy service providers, including, among others, energy services cooperatives, local communities, nongovernmental organizations,

and private sector small- and medium-size enterprises; (iii) undertaking specific studies to analyze how to improve the country's energy mix, particularly in renewable energy over the medium term; (iv) acquisition and operationalization by SONABEL of customer management software and a customer call center, as well as implementation of a revenue protection program, including acquisition and operationalization of smart meters and associated software for utility fraud detection; (v) carrying out of a fuel consumption audit; and (vi) provision of support to the Ministry of Energy's units responsible for increasing private sector participation in the energy sector. Several activities have been completed, including a Burkina Faso energy mix study,[10] which explores the way to reduce energy production costs; capacity reinforcement in several areas, such as social and environmental aspects, fiduciary, and project monitoring and evaluation; and recruitment of an individual consultant who is currently assisting the Ministry of Energy in the assessment of IPP proposals. Ongoing studies and activities include assistance to SONABEL for the development and implementation of a state-of-the-art customer management system (bidding documents launched) and a fuel consumption audit to derive action plans to address fuel consumption losses in different thermal power plants has been launched and is expected to be finalized by the end of June 2017.

D. Rationale for Additional Financing

18. **For Burkina Faso to further reduce poverty and enhance development growth, there is a need to quickly scale up electricity supply at a sustainable cost to expand access to modern energy services.** The prevailing deficit of generation capacity constitutes a severe handicap to increasing access, including for the development of small- and medium-size productive enterprises, and to increasing the impact of social programs. Additional generation capacity is required to meet increasing demand for electricity services. Growth in domestic installed generation capacity over the past decade has not kept pace with Burkina Faso's increase in power demand, which is rising at a yearly compound average rate close to 10 percent. Installed capacity totals 315 MW, of which the overwhelming majority is thermal,[11] with 32 MW of ageing hydropower plants. Installed capacity is characterized by low availability, averaging 62 percent in early 2017. Burkina Faso relies on energy imports for 45 percent of its current energy supply, and regional supply constraints have affected the country in recent years. The network is interconnected with Côte d'Ivoire through a 225 kV transmission line, and a power purchase agreement (PPA) guarantees a 50 MW supply,[12] which is just enough to ensure an equilibrium between demand and supply during the non-peak period. Growth in installed capacity has not kept pace with power demand, which has led to load shedding averaging a 180 hour-equivalent outage time annually since 2009. The country relied on expensive emergency thermal rental power in 2011–2012 to meet electricity demand due to poor hydrology and interruptions of

[10] *Feuille de route pour la diversification de l'approvisionnement en électricité du Burkina Faso,* World Bank, 2017.
[11] Concentrated in four biofuel (HFO/DDO) plants: Komsilga (93.6 MW), Bobo II (68 MW), Kossodo (64.1 MW), and Ouaga II (38.4 MW), plus 16 DDO-fired plants.
[12] Increased to 80 MW and 85 MW in 2016 and 2018, respectively (see

Table ***1***).

supply from Côte d'Ivoire. The Government has recently taken measures to rehabilitate selected offline HFO plants owned by SONABEL to rapidly bring about 30 MW of capacity online, add new units to an existing plant for another 50 MW of baseload capacity with the support of the Islamic Development Bank, and launch a competitive bidding process for a new 100 MW HFO power plant.

19. **The proposed AF will contribute to increase reliable electricity supply in the short term, promptly support the diversification of the energy mix toward renewables and, going forward, help with attracting private investments in generation in a timely, transparent, and cost-effective manner.** The proposed AF will finance (a) solar PV plants (under Component 1); (b) new transmission lines to enable the grid to absorb more intermittent solar power (also under Component 1); and (c) capacity building for the Ministry of Energy and regulatory agency and advisory services and capacity building for sector entities to effectively leverage private sector financing for generation (under Component 4). IDA resources are necessary since the utility is not yet financially viable, and a framework to attract private capital on a competitive basis has yet to be established; thus, private sector financing for generation and grid investments is proving difficult to mobilize. This AF will further strengthen the Government's and SONABEL's knowledge on how to deal with solar project development and operation, and establishing an enabling framework to attract IPPs, which will lay a solid foundation for managing solar IPPs and/or public-private partnerships (PPPs) going forward. IDA resources are being used to enhance the impact of the ESSP as well as to support the DPO series, which includes energy sector actions. The DPO series provides complementary support for the Government to implement its energy sector vision and put the sector on a more financially viable path to secure needed private sector investment.

20. **Rationale for the shift toward solar energy.** The Government aims to reduce costs of generation by progressively shifting its energy mix toward cheaper imports and renewable energy,[13] which will reduce operating costs and mitigate sector dependency on oil, thereby also reducing risks associated with oil price fluctuations and foreign exchange exposure. The Government is committed to increasingly rely on private sector participation to bridge the energy generation gap going forward, with a mix of thermal capacity, regional interconnectors, and solar PV plants. According to the PNDES, the goal is to develop 210 MWp of solar energy over the period 2016–2020. While several solar IPP proposals have been presented to the Government (totaling 160 MWp), only the 28 MWp Zina solar IPP[14] is advancing. Mobilizing private financing for generation has proven more difficult and costly than expected due to the precarious financial situation of SONABEL and the Government's limited capacity to negotiate mutually beneficial contracts with sponsors (see the following sections). These needs will be addressed through the parallel DPO series and in part through additional support to be provided under Component 4 of the proposed AF. In the meantime, the Government wishes to pursue the commissioning of the proposed solar plants (for at least 30 MWp) through public financing, which will increase by 4 percent total installed electricity generation capacity. Grid-connected solar PV will increase from zero MWp in November 2016 to 91 MWp in 2019, once the Zina

[13] Mostly solar power since the country's limited hydropower potential has already been valorized (32 MW).
[14] With Windiga Energy as sponsor and the IFC as mandated lead arranger.

IPP (28 MWp), Zagtouli (33 MWp), and the 30 MWp of solar power financed by the proposed AF come online.

21. **Rationale for the provision of public financing for solar plants.** Despite private sector interest for investments in generation, none of the recently launched IPPs have been brought to financial close to date due to (a) limited transactional capacity within the Ministry of Energy and SONABEL; (b) the absence of standardized competitive process and bankable bidding documents available to select IPPs in a timely, transparent, and cost-effective manner; and (c) the non-creditworthiness of the utility. These factors have resulted in (a) protracted negotiations;[15] (b) the need for sovereign guarantees and credit enhancement mechanisms,[16] which add to contingent liabilities; and (c) proposed tariffs above the opportunity cost of electricity.[17] IDA is supporting the reform process engaged by the Government, which aims to position the utility on a financially stable trajectory and efficiently leverage private investments to diversify the energy mix toward cheaper energy sources in the medium term. This is done through the DPO series, with the first operation (P157060) approved in December 2016, and the proposed AF, which will strengthen the Government's capacity to select IPPs in a timely, transparent, competitive, and cost-effective manner. In the short term, the development of publicly financed PV plants appears to be the only cost-effective and timely solution for the country to continue, without delay, the transition toward cheaper, renewable electricity sources. The publicly funded PV plants supported by the proposed AF reinforce the demonstration effect for future solar PV developments in the country and will allow for SONABEL and the Ministry of Energy to gain experience that would then be applied to integrate intermittent electricity in the grid, while building its capacity to prepare, negotiate, and deliver PPP and IPP solar projects efficiently and effectively. Public financing will not crowd out private financing given the scale of Burkina Faso's planned renewable energy sector investments and needs going forward.[18] According to the recently completed sector study, additional baseload capacity sourced from regional interconnectors (see

22.

23. Table ***1***) will enable the grid to accommodate all of the planned solar PV plants scheduled to come online before 2020 (that is, Zagtouli, Zina, and the plants to be financed by the proposed AF).

24. **Rationale to finance the reinforcement of the transmission network.** The construction of new 90 kV transmission lines is necessary to allow for the integration of more renewable energy sources, as planned under the Government's strategy for the sector. Integration of a higher share of variable renewable sources in the grid will increase the risk of node congestion caused by higher variations of generation injected and lead to additional needs for transmission

[15] For example, some IPPs under negotiation have started as early as in 2009.
[16] For two IPPs for which concession and PPA contracts have been signed, the Government and SONABEL are required to set up escrow accounts with the equivalent of over two years and four months, respectively, of PPA payments.
[17] The tariffs for the first batch of solar IPP projects range between US$0.012 and 0.013 per kWh, compared to variable costs for thermal generation between US$0.010 and 0.011 per kWh.
[18] 400 MWp by 2030.

and distribution infrastructure, such as grid reinforcement. Integration of more renewable energy in the interconnected grid will not be possible without addressing existing bottlenecks in the system, including the need for transmission lines linking major growth poles and (n-1) security of substations through the provision of spare high voltage (HV) transformers to improve (n-1) security of substations. The selected investments to be financed under the AF were identified in Burkina Faso's Generation, Transmission, and Distribution Master Plan and in the recent Energy Sector Management Assistance Program-funded Burkina Faso mix energy study. World Bank funding in this area complements other donor investments in generation capacity, grid rehabilitation, and upgrade, including those of AFD, the AfDB, the West African Development Bank, and the Islamic Development Bank, all of which are supporting various critical transmission line reinforcements.

25. **Rationale to finance transaction advisory services and capacity building to sector entities.** The Government requires further assistance in the planning, procurement, and negotiation of IPP/PPP projects in the power sector. To this end, the proposed AF will finance a more complete package of transaction advisory assistance (covering technical, legal, and financial aspects) and associated capacity building for key energy sector entities, including the Ministry of Energy, SONABEL, and the new rural electrification agency. The aim is to facilitate private sector investments offering value for money in the generation segment by streamlining the selection and the closing of IPPs/PPPs in a timely, transparent, and cost-effective manner. This AF will also allow SONABEL and sector entities to better familiarize themselves with solar power generation preparation and operation (monitoring and control tools) so that they are better prepared to implement solar IPP/PPP projects in the future.

26. **Articulation with overall WBG support to the sector.** The Country Partnership Strategy for Burkina Faso (Report No. 78793-BF), endorsed by the Executive Board of Directors on September 19, 2013, recognizes that reducing energy infrastructure deficit is critical to accelerate inclusive and sustained The proposed AF is complementary to ongoing and planned interventions of IDA and IFC to support the Government in developing reliable and affordable electricity services for the population of Burkina Faso. Thus, this AF is part of the WBG's broader engagement in the sector, which includes (a) support to regional integration through the Bolgatanga-Ouagadougou interconnector (P094919) and the North Core interconnector that involves Nigeria, Niger, Benin, and Burkina Faso (under preparation); (b) support to the sector policy, institutional, and regulatory reform through the DPO series; and (c) support to private sector mobilization to increase generation capacity through a series of IDA guarantees (under preparation). IFC is the mandated lead arranger for the Zina solar PV IPP.

E. Consideration of Other Options

27. The World Bank considered preparing a new operation instead of AF. However, given the alignment of the proposed activities with the PDO of the ESSP, AF was seen as a more efficient option and one that can be processed relatively quickly in response to the Government's request for support by letter dated July 21, 2016. The provision of the AF resulted from a combination of factors, including the critical need to add additional capacity and pave the way for renewables integration, the availability of additional IDA resources, and the preparation by the Government of a new energy policy. There will be no changes to existing financial management or procurement arrangements as a result of the proposed AF. The use of the World

Bank's 'Guidelines: Procurement of Goods, Works, and Non-consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers' and 'Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers' was approved in line with Section VI, paragraph 3 of the World Bank Directive 'Procurement in IPF and Other Operational Procurement Matters' and point I.C (I) (Procurement During IPF Preparation - Additional Financing) of the table in Section III of World Bank Procedure Procurement in IPF and Other Operational Procurement Matters.

III. Proposed Changes

Summary of Proposed Changes	
The activities under the AF are aligned with the existing ESSP PDO and will be incorporated under existing project components, namely Component 1 (Improving the Reliability of Energy Supply), and Component 4 (Institutional Strengthening and Capacity Development). A closing date extension, to June 30, 2021, is proposed to allow for completion of activities under the project, particularly the proposed AF. The disbursement estimates and implementation schedule are revised in line with the proposed new activities and closing date. The project Results Framework has also been updated.	
Change in Implementing Agency	Yes [ ] No [X]
Change in Project's Development Objectives	Yes [ ] No [X]
Change in Results Framework	Yes [X] No [ ]
Change in Safeguard Policies Triggered	Yes [ ] No [X]
Change of EA category	Yes [ ] No [X]
Other Changes to Safeguards	Yes [ ] No [X]
Change in Legal Covenants	Yes [ ] No [X]
Change in Loan Closing Date(s)	Yes [X] No [ ]
Cancellations Proposed	Yes [ ] No [X]
Change in Disbursement Arrangements	Yes [ ] No [X]
Reallocation between Disbursement Categories	Yes [ ] No [X]
Change in Disbursement Estimates	Yes [X] No [ ]
Change to Components and Cost	Yes [X] No [ ]
Change in Institutional Arrangements	Yes [ ] No [X]
Change in Financial Management	Yes [ ] No [X]
Change in Procurement	Yes [ ] No [X]
Change in Implementation Schedule	Yes [X] No [ ]
Other Change(s)	Yes [ ] No [X]
Development Objective/Results	
Project's Development Objectives	

Original PDO

The objectives of the project are to contribute to (a) increasing access to electricity; (b) improving the reliability of electricity supply; and (c) improving efficient use of energy in targeted areas.

Change in Results Framework

Explanation:

The project Results Framework has been updated to reflect the impact of the AF activities, to consider the World Bank's new corporate results indicators, and to incorporate indicators on beneficiary feedback and gender. The end target dates have been extended to match them with the new closing date.

Compliance

Covenants - Additional Financing (Burkina Faso AF to Electricity Sector Support Project - P160344)

Source of Funds	Finance Agreement Reference	Description of Covenants	Date Due	Recurrent	Frequency	Action
IDA	Schedule 2, Section I.C.1	Applicability of Previous Service Agreement Obligations: the Provisions of Section I.D. of Schedule 2 to the Original Financing Agreement are incorporated herein and apply to this Agreement, mutatis mutandis, and the Recipient hereby undertakes to comply with the provisions thereof to the same extent as if such provisions had been set out in full in this Agreement.		☒		New
IDA	Schedule 2, Section I.C.2	The Recipient shall, and shall cause SONABEL and FDE to (a) ensure that any technical assistance financed under the project is carried out under terms of reference satisfactory to the Association following its review thereof and, to that end, said technical assistance shall duly incorporate the requirements of the Association's Safeguard		☒		New

		Policies and be publicly disclosed and consulted upon in accordance with the Association's Safeguard Policies; and (b) ensure that any capacity-building activities under the project are consistent with, and pay due attention to, the Association's Safeguard Policies.				

Conditions

Source of Fund	Name	Type
IDA	Service Agreement. Article IV, 5.01 (a) of the Financing Agreement	Effectiveness

Description of Condition

The Service Agreement entered into between the Ministry of Finance of the Recipient and SONABEL has been amended, in a manner satisfactory to the Association, to cover the execution of the additional activities to be carried out under the project.

Source of Fund	Name	Type
IDA	Amendment Letter. Article IV, 5.01 (b) of the Financing Agreement	Effectiveness

Description of Condition

The amendment letter to the Original Financing Agreement and to the First Additional Financing Agreement has been entered into between the Recipient and the Association.

Source of Fund	Name	Type
IDA	Project Manual. Article IV, 5.01 (c) of the Financing Agreement	Effectiveness

The Recipient has updated the Project Implementation Manual, in a manner satisfactory to the Association, to cover the execution of the additional activities to be carried out under the project.

Source of Fund	Name	Type
IDA	Ratification of the Service Agreement. Article IV, 5.02 of the Financing Agreement	Effectiveness

The Additional Legal Matter consists of the following, namely that the amendment to the Service Agreement referred under Section 5.01 (a) of this Agreement has been duly authorized or ratified by, and executed and delivered on behalf of, the Recipient and SONABEL, and is legally binding upon the Recipient and SONABEL in accordance with its terms.

Source of Fund	Name	Type

IDA	Ratification of this amendment. Article IV, 5.03 of the Financing Agreement	Effectiveness
The Additional Legal Matter consists of the following, namely that the amendment referred under Section 5.01 (b) of this Agreement has been duly authorized or ratified by, and executed and delivered on behalf of, the Recipient and is legally binding upon the Recipient in accordance with its terms.		

Risk	
Risk Category	**Rating (H, S, M, L)**
1. Political and Governance	Moderate
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	Substantial
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Moderate
7. Environment and Social	Moderate
8. Stakeholders	Moderate
9. Other (climate and disaster)	Moderate
OVERALL	Substantial

Finance

Loan Closing Date - Additional Financing (Burkina Faso AF to Electricity Sector Support Project - P160344)

Source of Funds	Proposed Additional Financing Loan Closing Date
IDA	30-Jun-2021

Loan Closing Date(s) - Parent (Burkina Faso Electricity Sector Support Project - P128768)

Explanation:

An extension of the project closing date to June 30, 2021 is proposed to allow for completion of activities, particularly those proposed under the second AF.

Ln/Cr/TF	Status	Original Closing Date	Current Closing Date	Proposed Closing Date	Previous Closing Date(s)
IDA-52910	Effective	30-Sep-2018	30-Sep-2018	30-Jun-2021	
IDA-54910	Effective	30-Sep-2019	30-Sep-2019	30-Jun-2021	30-Sep-2019
IDA-H9660	Effective	30-Sep-2019	30-Sep-2019	30-Jun-2021	30-Sep-2019

Change in Disbursement Estimates (including all sources of Financing, US$ millions)

Explanation:

Disbursement estimates are updated to reflect the additional activities to be supported under the AF and the proposed new closing date.

Fiscal Year	FY17	FY18	FY19	FY20	FY21
Annual	13.00	40.50	61.00	33.00	6.00
Cumulative	24.50	65.00	126.00	159.00	165.00

Allocations - Additional Financing (Burkina Faso AF to Electricity Sector Support Project - P160344)

Source of Fund	Currency	Category of Expenditure	Allocation	Disbursement % (Type Total)
			Proposed	Proposed
IDA	US$	(1) Goods, works, non-consulting services and consultants' services, Operating Costs and Training under Part (1)(b) and Part 1(c).	72.00	100.00
IDA	US$	(2) Goods, works, non-consulting services and consultants' services, Operating Costs and Training under Part 4(h), Part 4(i), Part 4(j) and Part 4(k).	8.00	100.00
		Total:	80.00	

Components

Change to Components and Cost

Explanation:

The proposed AF will finance additional activities under the existing ESSP components as described below.

Component 1: Improving the Reliability of Energy Supply (IDA US$72.0 million equivalent, Recipient US$1.28 million equivalent). The AF will finance selected activities of the master plan to strengthen SONABEL's network, reduce losses, and enable the grid to integrate more renewables. The Government of Burkina Faso will finance land acquisition and payment of compensations for people affected by the project, with a provisional budget of US$1.28 million equivalent. IDA-supported activities will include the following:

- **Transmission and Distribution Grid Improvement (IDA US$32.9 million equivalent).** The AF will support the construction of selected transmission and distribution improvements to allow for the absorption of intermittent solar capacity, including (with exact routings still to be determined):
    - 67 km 225 kV line to be operated at 90 kV between Zinare and Kaya and extension of the substation of Zinare by adding a new 90 kV line bay and a 90/33 kV substation in Kaya area equipped with 25 MVA transformer;
    - 57 km 90 kV line between Wona, Dedougou, and associated 90/33 kV substation at Dedougou and extension of the existing 90 kV substation of Wona;
    - 92.3 km 90 kV line between Pâ, Diébougou, and associated substation at Diebougou and extension of the substation of Pa by adding of 90 kV line bay to serve Diébougou. This will also include the insertion of the substation into the control system of the National remote control; and
    - Provision of three spare HV transformers for (n-1) security purposes for HTB substations.
- **Solar Power Plant (IDA US$39.1 million equivalent).** The AF will support costs associated with procurement and commissioning of at least 30 MWp of grid-connected solar power plants. The provision of technical advisory services for construction supervision will also be funded. The activities to be implemented under this subcomponent are mainly
    - Construction of two solar PV power plants of 20 MWp and 10 MWp around the city of Koudougou and Kaya, for which the exact location is to be identified (site expected to be selected by SONABEL as a result of final feasibility study around July–August 2017); and
    - Construction of HV lines to connect the plant to the Burkina Faso national grid through 33 kV new substation.

Component 4: Institutional Strengthening and Capacity Development (IDA US$8 million equivalent). The activities to be supported are aligned with the ESSP's provision of support to build the capacity of public sector entities for improving private participation in the energy sector. The proposed AF will support the preparation and closing of priority IPP/PPP projects in a timely, transparent, and cost-effective manner, through the provision of transaction advisory services (financial, legal, technical). The services will help the Ministry of Energy (with support from SONABEL) to prepare 'bankable' transactional documents and negotiate, on a level-playing field with the private sector actors, the selected IPP/PPP transactions. This support will be provided to the investment planning unit to be established

within the Ministry, with SONABEL support, which will also have the responsibility to keep the country's least-cost development plan systematically updated based on the competitively procured new generation plants. The proposed AF will also support solar PV integration into the network through a grid stability study and training on dispatching intermittent electricity; support for strengthening of the regulator, ARSE, whose mandate is being strengthened through the new energy law that is under preparation; and project implementation support, including on gender integration aspects. Further details of the proposed activities under the AF are provided in Annex 2.

The current and revised component costs are shown in the following table. With the AF, total resources under the project will amount to US$165 million equivalent.

Current Component Name	Proposed Component Name	Current Cost (US$, millions)	Proposed Cost (US$, millions)	Action
Component 1: Improving the reliability of energy supply	Component 1: Improving the reliability of energy supply	17.71	89.71	Revised
Component 2: Increase electricity access in target areas	Component 2: Increase electricity access in target areas	49.72	49.72	No Change
Component 3: Improve efficient use of energy in target areas	Component 3: Improve efficient use of energy in target areas	4.60	4.60	No Change
Component 4: Institutional Strengthening and Capacity Development	Component 4: Institutional Strengthening and Capacity Development	12.97	20.97	Revised
Physical and price contingencies	Physical and price contingencies	0.00	0.00	No Change
	Total:	**85.00**	**165.00**	

Other Changes

Implementing Agency Name	Type	Action
Fonds de Développement de l'Electrification (FDE)	Implementing Agency	No Change
Unité de Gestion du projet	Implementing Agency	No Change
Société Nationale d'Electricité du Burkina (SONABEL)	Implementing Agency	No Change
Unité de Gestion du Projet	Implementing Agency	No Change

Change in Implementation Schedule

Explanation:

The implementation schedule has been updated to reflect the new activities to be undertaken with support from the second AF and in line with the proposed new closing date. There are no changes to the implementation arrangements or implementing agencies.

Appraisal Summary

Economic and Financial Analysis

Explanation:

The economic and financial analysis focuses on new investment activities proposed under the second AF, that is, the development of two solar PV plants aimed at introducing affordable renewable electricity into the country's energy generation mix (Activity 1) and the strengthening of the network required to integrate additional renewable energy sources going forward (Activity 2).

Rationale for public sector provision/financing. Activity 1 will contribute to the diversification of the country's energy generation mix toward affordable renewable sources, in line with the national strategy for the sector. The current status of proposed solar IPP projects is characterized by high costs for the Government, in terms of sovereign guarantees required; associated contingent liabilities; and for the utility, in terms of PPA prices (due to the perceived riskiness of investment on the part of the private sector). For that reason, IPPs have faced undue delays in reaching financial close. Thus, in the short term, the development of publicly financed PV plants is the most cost- and time-effective solution for the country to continue the transition to renewable energy. In parallel, support to bolster the Government's capacity to negotiate mutually beneficial and bankable IPP agreements will be supported by technical and advisory assistance provided with this AF (under Component 4). This will help facilitate the selection of IPPs in a timely, transparent, and cost-effective manner going forward, and improve planning and regulatory functions. Activity 2 consists of upgrading the transmission network to improve (n-1) security, diversifying the energy mix, and extending access. Given the lack of commercial viability of the sector, public financing is considered the only way to achieve this objective. It will contribute to laying a foundation to attract private investments in the generation segment in the medium term.

Value added of World Bank support. The proposed AF leverages the World Bank's experience in neighboring countries and lessons learned from previous and ongoing projects in similar settings. The World Bank is strongly involved in the sector dialogue and reform process, notably through a DPO series largely focused on the energy sector.

Project benefits. The economic net present value (NPV) of the proposed AF is US$303 million with 23 percent economic internal rate of return (EIRR), and NPV of US$325 million with 24 percent EIRR when including greenhouse gas (GHG) accounting. The financial NPV is US$20 million with a 9 percent financial internal rate of return (FIRR). This difference between economic and financial returns reflects the fact that electricity consumers capture most benefits from induced access extension and improved service under Activity 2, while associated costs are borne by the utility, SONABEL. A detailed description of the assumptions used and the methodology for the economic analysis is presented in Annex 3.

- **Solar plants.** The 30 MWp solar PV plants will reduce fuel used for power generation, which is particularly costly in landlocked Burkina Faso. The average economic net benefit is US$0.09 per kWh produced, excluding GHG accounting. With 4 percent of the energy mix, it will reduce the cost of service by 1.3 percent from US$0.225 to US$0.222 per kWh, everything else being equal. The economic NPV of this activity is US$30 million with 14 percent EIRR and US$51 million with 19 percent EIRR including GHG. The financial NPV will be US$12 million with a 10 percent FIRR.

- **Network reinforcements.** Primary benefits from strengthening of the transmission network come from (a) increased reliability of supply (outage reduction); (b) transformer and lines loss reduction; and (c) increased consumption allowed by additional wheeling capacity. The economic NPV of this activity is US$175 million with 27 percent EIRR. The financial NPV is US$8 million with an 8 percent FIRR.

From a financial perspective, the relevant issue is not the financial justification of each individual investment, but the overall financial viability of the utility and of the sector. As a result of the energy

sector reform engaged by the Government with the support of the ongoing DPF series (P157060), in particular the new fuel price regime applicable as of May 2016, the financial situation of SONABEL has significantly improved, with a net result of US$10 million in 2016, compared to losses of US$ 30 and 20 million in 2015 and 2014 respectively. Debt Service Coverage Ratio should stabilize at 1.3 in 2017 and 2018, in compliance with the targets defined by the performance contract ("*Contrat Plan*"). However, the sector would still rely on budget transfers, through fuel subsidies, to bridge the gap between electricity tariff and actual cost of service. The proposed investments would contribute to reduce the average cost of generation by adding cheaper electricity in the country's energy mix.

Technical Analysis

Explanation:

The project uses well-established technologies and presents no unusual construction or operational challenges. The equipment and the technologies involved in construction and operation of substations and transmission lines are standardized and well-known. Project costs are based on estimates derived from recently commissioned lines and substations financed by SONABEL. The cost estimates have been evaluated and are aligned with current market prices. The ongoing detailed feasibility studies (with a prefeasibility study expected end-April 2017) will specify all preconstruction tasks, including installation design, detailed cost estimates, implementation schedules, procurement strategy, tender processes and documents, engineering-procurement-construction packaging, bid evaluations, and contract awards for physical implementation. As for project implementation, two owner's engineers will be contracted to support oversight of activities under Component 1. The owner's engineers will help to ensure that design, construction, and commissioning are carried out in accordance with international quality standards.

The technologies supported by the AF to strengthen and increase capacity of the network have been successfully implemented by SONABEL. Likewise, regarding the solar PV technology, SONABEL is implementing a similar 33 MWp solar plant with financing from other development partners.

Social Analysis

Explanation:

The proposed activities under the AF involve construction or civil works with minor social impacts. The social safeguard documentation of the parent project, including the Environmental and Social Management Framework and Resettlement Policy Framework, have been updated to reflect the revised project scope and were published by the World Bank on March 29, 2017, and in-country on March 31, 2017. The Integrated Safeguards Data Sheet has also been updated and disclosed. Preparation of the Environmental and Social Management Plan and Resettlement Action Plan will be financed through Components 1 and 2. A report on the implementation of social safeguards instruments for the electrification of the first 40 localities under the parent project has been completed with proposed recommendations to further improve the social impact of the project, notably on capacity reinforcement, training, grievance registration and awareness campaign.

Gender Analysis

Explanation:

Despite Government commitment and efforts to develop a policy and legal framework for an inclusive and equitable development, weak institutional capacity in the application of measures promoting gender equality still hinder the advancement of women in Burkina Faso. Gender disparities are visible in data related to access to education and agricultural productive resources—physical assets, health facilities, labor market and economic opportunities. The ratio of female to male primary school enrolment in 2013 was 96 percent and the ratio of female to male secondary enrolment was 87 percent, indicating a slight

bias in favor of men in both cases. The 2010 Demographic and Health Survey reports that 54 percent of men are the sole owners of a home, compared to 5 percent of women. Women are at a disadvantage with regard to access to bank loans. Despite the Government's concerted efforts, women continue to lag behind men in terms of human capital and labor market participation. In 2013, 80 percent of the female working-age population was part of the labor force, compared to 91 percent of the male working-age population in the labor force (World Bank Data). In 2014, nearly 19 percent of men worked in the non-agricultural sector, versus less than 17 percent of women, and 8.3 percent of men work for a wage versus only 3.6 percent of women.

As in any developing country, the majority of women in Burkina Faso are faced with challenges to access improved energy for domestic tasks and livelihood generation. Most women use kerosene lamps or battery-powered torches and rely on wood and/or charcoal to cook. The use of traditional fuels for cooking and lighting have negative socioeconomic, health, and environmental impacts; the smoke produced by firewood during cooking causes lung diseases with women and children as the main victims, whereas the overuse of wood fuel exacerbates deforestation and the greenhouse effect, increasing to this extent the vicious cycle of poverty among women. In Burkina Faso, the National Energy Policy does not address gender dimensions in its design, planning, and interventions. Hence, the progress on providing greater access to modern energy to women has not been significant.

Consequently, specific gender interventions will be integrated in the project as part of the AF with the support of the World Bank's Africa Renewable Energy Access Gender and Energy Program. These activities will include (a) a qualitative study to investigate women's and men's electricity needs; (b) training of FDE and SONABEL employees to raise awareness on the importance of integrating women's specific needs in any project design and execution; and (c) capacity-building activities among female and male beneficiaries on productive use of electricity and utilization of pre-paid meters.

Citizen Engagement/Beneficiary Feedback

Explanation:

A beneficiary survey, financed under the parent project, will be conducted in sample villages to gather baseline data to understand key issues around electricity connections, consumer satisfaction, communication with the utility, gender, and social issues. This survey will be done using a mixed methods approach of data collection, focus group discussions, and analysis and will be carried out in two stages: to gather baseline data and to gather impact-level data at project completion. The data collection and focus group discussions will provide a feedback mechanism and help donor and Government counterparts develop a more robust monitoring and evaluation system with regard to female and male consumers and reasonable indicators and targets to be considered under the project's Results Framework. The project will also provide support to improve the quality of services provides by SONABEL's new customer call center. An indicator to this effect has been added to the project Results Framework (see Annex 1).

Environmental Analysis

Explanation:

The proposed activities under the AF involve construction or civil works with minor environmental and social impacts. The safeguard documentation of the parent project, including the Environmental and Social Management Framework and Resettlement Policy Framework, have been updated, including an Environmental and Social Impact Assessment of the Fada N'gourma power plant (financed under the parent project), considering issues such as labor influx, security, citizen engagement, and public information to reflect the revised project scope. The updated safeguard instruments were published by the World Bank on March 29, 2017, and in-country on March 31, 2017. The Integrated Safeguards Data Sheet has also been updated and disclosed. Preparation of the Environmental and Social Management

Plan and Resettlement Action Plan will be financed through Components 1 and 2.

Risk

Explanation:

The overall risk rating for the project is Substantial. Key risks include the following:

- **Sector strategies and policies.** Risks in this area are assessed as Substantial. The energy sector is going through a change process, including institutional reforms, with a new draft law to be promulgated and a new organizational structure under implementation and some new structures still to be created. SONABEL's financial performance has also deteriorated over the last couple of years. The Government is committed to the sector reforms, engaging World Bank support, including through the DPO series to address the financial situation of the sector. However, it will take some time to reach financial equilibrium by shifting the energy mix toward cheaper sources. Both this AF and the ongoing project provide support to SONABEL for further improvements in its operations through strategic studies (energy mix) and technical assistance as well as targeted investments (for example, acquisition and operationalization of customer management software, the implementation of a revenue protection program, operationalization of a customer call center, and acquisition and operationalization of smart meters and associated software for utility fraud detection). Through the project, its AFs, and the DPO series, the World Bank team will maintain a close sector dialogue with the Government and SONABEL to mitigate risks in this area.

- **Institutional capacity for implementation and sustainability.** This risk is assessed as Substantial. Project performance has been improving substantially over the last 12 months. The project has therefore been rated Moderately Satisfactory in the most recent Implementation Status and Results Report (December 2016). However, some concerns remain regarding the capacity of the implementation agencies (UGP and SONABEL). With regard to the UGP, it has been agreed to address a few shortcomings highlighted by recent supervision missions by additional staff to address overstretched capacity. This is currently being addressed by the UGP. Similarly, with regard to SONABEL, which has excellent technical capacity, overstretched staff will be reinforced with additional technical support, operations and maintenance (O&M) technical assistance, and renewable planning tools to ensure smooth implementation and operation of the proposed activities. The Project will also benefit from SONABEL's experience with the O&M of Zagtouli Solar PV plant.

- **Climate and disaster risks.** The AF has been screened for risks related to climate change and disaster risk management. The potential impacts are expected to be negligible. There is a moderate potential impact of climate-related disasters on the network upgrade activities and solar power plants construction (high temperature, severe wind, and even severe flooding during the rainy season). Technical specifications of equipment to be installed will consider the extremely hot temperatures in Burkina Faso. The proposed AF will increase the renewable generation capacity in the country and, therefore, displace thermal power generation. The proposed AF will also increase efficiency in the whole electricity supply chain, reducing the overall losses and GHG emissions.

IV. World Bank Grievance Redress

21. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected

communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit http://www.worldbank.org/GRS. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

Annex 1. Revised Results Framework and Monitoring

Project Development Objective (PDO): The objectives of the Project are to contribute to: (a) increasing access to electricity; (b) improving the reliability of electricity supply; and (c) improving efficient use of energy in targeted areas.

		Project Development Objective Indicators								
	Baseline (Dec. 31, 2012)	Cumulative Targets								End Target (30-June-2021)
Indicator Name		**2013** *Actual*	**2014** *Actual*	**2015** *Actual*	**2016**	**2017**	**2018**	**2019**	**2020**	
Generation capacity of conventional energy constructed (MW)	0	0	0	0	0	0	7.5	7.5	7.5	7.5
Generation capacity of renewable energy constructed (MWp)	0	0	0	0	0	0	0	30	30	30
People provided with new or improved electricity service (number) (Corporate Results Indicator)	0	0	0	0	3,984	43,420	396,625	740,805	786,046	786,046
Availability of transmission lines in the project area (%)	95.1*	95.1	95.1	95.1	95.1	95.1	95.1	97.55	97.55	97.55
Cumulative increased transmission transfer capacity in project areas (MW)	0*	0	0	0	0	0	0	75.2	75.2	75.2
Power outages per year in substations concerned by the project (number)	129*	129	129	129	129	129	129	2	2	2
Total capacity (kW) of installed equipment replaced by more efficient equipment	00	00	00	00	54	375.4	575.4	575.4	575.4	574.4

** Dec. 31, 2016*

		Intermediate Indicators								
Indicator Name	**Baseline (Original Project = 31-Dec-2012; Second AF = Dec 31 2016)**	**Cumulative Targets**								**End Target (30-June-2021)**
		2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	
Distribution lines LV constructed under the project (km)	0	0	0	66	179	311	500	1,073.8	1,073.8	1,073.8

		Intermediate Indicators								
Indicator Name	**Baseline (Original Project = 31-Dec-2012; Second AF = Dec 31 2016)**	**Cumulative Targets**								**End Target (30-June-2021)**
		2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	
Distribution lines MV constructed under the project (km)	0	0	0	70	190	330	531.4	533.6	533.6	533.6
Transmission lines HV constructed under the project (km)	0	0	0	0	0	0	0	222	222	222
Transformers HV[a] (90/33) installed under the project (number)	0	0	0	0	0	0	0	3	6	6
People provided with access to electricity services under the project by household connections - grid (number) (Corporate Results Indicator breakdown)	0	0	0	0	664	3,320	9,877	15,687	15,687	15,687
People provided with access to electricity services under the project by household connections - off-grid (number) (Corporate Results Indicator breakdown) including solar, mini-grid, anything not grid	0	0	0	0	0	0	800	1,400	1,400	1,400
New community electricity services under the project (number) (Corporate Results Indicator breakdown)	0	0	0	0	40	200	590	1,035	1,035	1,035
Additional generation capacity under the project (off-grid) (kW) (Corporate Results Indicator)	0	0	0	0	0	0	260	690	690	690

		Intermediate Indicators								
Indicator Name	**Baseline (Original Project = 31-Dec-2012; Second AF = Dec 31 2016)**	**Cumulative Targets**								**End Target (30-June-2021)**
		2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	
Households provided with an electricity connection in rural areas under the project (number), of which female-headed households (number)	0	0	0	0	664	3,320	10,677	17,087	17,087	17,087
	0	0	0	0	66	332	1,068	1,709	1,709	1,709
Beneficiary Satisfaction Survey completed, published (Yes/No)	No	No	No	No	No	No	No	No	Yes	Yes
Number of households retrofitted with energy efficient equipment (number)	0	0	0	0	0	1,000	2,500	3,000	3,000	3,000
Solar lanterns deployed in public schools (Number)	0	0	0	0	0	17,500	25,000	25,000	25,000	25,000
Number of public sector energy staff and energy service providers trained on key thematic areas (number)	0	0	0	0	56	225	325	380	380	400
Feasibility studies for Bontioli, Folonzon, Gongourou (number)	0	0	0	0	0	0	1	3	3	3
Elaboration of fuel audit and action plan (Yes/No)	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Implementation of the customer management software (Yes/No)	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Agreement between the Government and SONABEL on selected binding operational performance indicators (Yes/No)	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Recruitment of transaction advisory firm with requisite	No	No	No	No	No	No	Yes	Yes	Yes	Yes

		Intermediate Indicators								
Indicator Name	**Baseline (Original Project = 31-Dec-2012; Second AF = Dec 31 2016)**	**Cumulative Targets**								**End Target (30-June-2021)**
		2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	
legal, financial, economic, and technical expertise to support the Government on assessment and negotiation of energy IPPs (Yes/No)										

Note: a. In addition to the three transformers (90/33 kV), the project will acquire two transformers (90/33 kV) and one transformer (90/15 kV) as spares.

PDO Indicators Description				
Indicator Name	**Description (Indicator Definition and so on)**	**Frequency**	**Data Source/Methodology**	**Responsibility for Data Collection**
Generation capacity of conventional energy constructed or rehabilitated (MW)	This indicator measures the total generation capacity in MW that is realized through either the construction of a new or the rehabilitation of an existing conventional power plant, in this instance, thermal under the project.	Annual	SONABEL reporting	SONABEL/Ministry of Energy
Generation capacity of renewable energy constructed (MWp)	This indicator measures the total generation capacity in MWp that is achieved through the construction of new renewable energy power plant (solar) under the project.	Annual	SONABEL reporting	SONABEL
People provided with new or improved electricity service (number) (Corporate Results Indicator)	This is the number of people in Burkina Faso who will benefit directly from the investments under the project either by getting connected to a network (either the national grid or isolated network) to enjoy electricity supply or already connected households that will have improved supply reliability and quality. It is estimated that the average occupancy per household is 4.	Annual	SONABEL reporting	SONABEL/FDE
Power outages per year in substations concerned by the project (number)	This indicator determines the number of individual power outages at the substations under the project. The outage to be considered should have occurred as a result of direct failure of an equipment at the substation in question and not as a result of outage of a transmission line or other network component outside the substation.	Annual	SONABEL reporting	SONABEL
Increased transmission transfer capacity in project area (MW)	This indicator is determined by the difference between the transfer capacity of transmission lines at existing 33 kV	Annual	SONABEL	SONABEL

PDO Indicators Description				
	and proposed 90 kV level in the project area.			
Availability of transmission lines in the project area (%)	This indicator is determined from the duration of various interruptions occurred at transmission level in project areas. The total annual operational hours of the transmission lines are divided by 8,760 hours.	Annual	SONABEL	SONABEL
Total capacity (kW) of installed equipment replaced by more efficient equipment (kVa)	This indicator is an aggregate of the capacities of installed equipment replaced by more efficient energy saving equipment under the project.	Annual	Ministry UGP Reporting	Ministry UGP
Intermediate Indicator Description				
Distribution lines LV constructed under the project (km)	This indicator is a measure of how many kilometers of LV (0.4 kV) distribution lines have been constructed as a result of contracts executed under the project.	Annual	SONABEL reporting	SONABEL
Distribution lines MV constructed under the project (km)	This indicator is a measure of how many kilometers of MV (33 kV) distribution lines have been constructed as a result of contracts executed under the project.	Annual	FDE reporting	FDE
Transmission lines HV constructed under the project (km)	This indicator is a measure of how many kilometers of high voltage (≥90 kV) transmission lines have been constructed as a result of contracts executed under the project.	Annual	SONABEL reporting	SONABEL
Transformers HV (90/33 kV) installed under the project (number)	This indicator is a measure of the number of high voltage (99/33 kV) power transformers installed as a result of contracts executed under the project.	Annual	SONABEL reporting	SONABEL
People provided with access to electricity services under the project by household connections - grid (number) (Corporate Results Indicator breakdown)	This is the number of households that will need to be connected directly to the national grid to enjoy electricity supply under the project. It is estimated that the average occupancy per household is 4.	Annual	SONABEL reporting	SONABEL
People provided with access to electricity services under the project by household connections - off-grid (number) (Corporate Results Indicator breakdown) including solar, mini-grid, anything not grid	This is the number of households that will enjoy electricity supply under the project by been connected to an isolated network. It is estimated that the average occupancy per household is 4.	Annual	FDE/Ministry UGP reporting	FDE/Ministry UGP
New community electricity services under the project (Corporate Results Indicator breakdown)	This indicator is a measure of new community electricity services that will be created as a result of the investments financed under the project.	Annual	Ministry UGP reporting	Ministry UGP

PDO Indicators Description				
Additional generation capacity under the project (off-grid) (kW) (Corporate Results Indicator)	This indicator signifies the augmentation in generation capacity measured in kW of off-grid connected generation realized as a result of contracts executed under the project.	Annual	FDE reporting	FDE
Households provided with an electricity connection in rural areas under the project (number), of which female-headed households (number)	This is the number of households in rural areas with a female family head that will benefit directly from the investments under the project either by getting connected the national grid or isolated network to enjoy electricity supply. Census database will be the basis for the measure of this indicator.	Annual	Ministry UGP/FDE reporting Gender Ministry/National Statistical Authority	Ministry UGP/FDE
Beneficiary Satisfaction Survey completed, published (Yes/No)	Citizen Engagement Indicator.This indicator establishes if a Beneficiary Satisfaction Survey has been completed and outcomes published.	Annual	Ministry UGP reporting	Ministry UGP
Number of households retrofitted with energy efficient equipment (number)	This is the number of households that would become beneficiaries of the project through the installation (retrofitting) of energy-efficient equipment in the household.	Annual	Ministry UGP reporting	Ministry UGP
Solar lanterns deployed in public schools (Number)	This indicator is an aggregate of solar lanterns that are deployed in public schools under the project.	Annual	Ministry UGP reporting	Ministry UGP
Number of public sector energy staff and energy service providers trained on key thematic areas (number)	This is the number of public sector energy staff and energy service providers trained on key thematic areas under the project.	Annual	Ministry UGP reporting	Ministry UGP
Feasibility studies for Bontioli, Folonzon, Gongourou (number)	This indicator shows whether feasibility studies for Bontioli, Folonzon, Gongourou hydropower plants have been completed.	Annual	SONABEL reporting	SONABEL/Ministry
Elaboration of Fuel Audit and Action Plan (Yes/No)	This indicator shows whether a Fuel Audit and Action Plan has been adopted to facilitate the auditing of fuel consumption by SONABEL.	Annual	Ministry UGP reporting	Ministry UGP
Implementation of the customer management software (Yes/No)	This is an indicator to show that customer management software has been acquired, installed, and become operationalized by SONABEL.	Annual	SONABEL reporting	SONABEL
Agreement between the Government and SONABEL on selected binding operation performance indicators (Yes/No)	This indicator signifies that an agreement has been reached between the Government and SONABEL on selected binding operation performance indicators.	Annual	SONABEL/Ministry UGP reporting	Ministry UGP/SONABEL
Recruitment of transaction advisory firm with requisite	This indicator establishes that a consulting firm with the requisite expertise has been recruited to support the	Annual	Ministry UGP reporting	Ministry UGP

PDO Indicators Description				
legal, financial, economic, and technical expertise to support the Government on assessment and negotiation of energy IPPs (Yes/No)	Government on assessment and negotiation of energy IPPs within the framework of this project.			

Annex 2: Detailed Project Description

Burkina Faso: Additional Financing to the Electricity Sector Support Project (P160344)

Project Development Objective and Components

1. The PDOs are to contribute to (a) increasing access to electricity; (b) improving the reliability of electricity supply; and (c) improving the efficient use of energy in targeted areas. The project has four components: (a) improving the reliability of energy supply; (b) increasing electricity access in target areas; (c) improving efficient use of energy in target areas; and (d) institutional strengthening and capacity development. The proposed AF is the second to the existing ESSP (P128768).

2. The proposed investments to be carried out under the AF aim to increase the percentage of renewables in the energy mix while increasing the country's total installed generation capacity with low-cost solar plants and also guarantee the reliability of the grid through reinforcement of the transmission networks to allow for integration of more renewable energy sources. The proposed operation also includes a technical assistance covering capacity building for institutions and transaction advisory services to develop private sector-led IPP projects. All activities identified in the investment components (Components 1 and 4) will be developed through supply and install contracts. Table 2.1 provides the overall cost estimation by component, further detailed by component hereafter.

Table 2.1. AF Costs and Financing by Component

	Component	Estimated Cost (US$, millions)	IDA Financing	Recipient Financing
1	**Improving the reliability of energy supply**	**73.28**	**72.00**	**1.28**
	Transmission and distribution grid improvement	32.90	32.90	—
	Grid connected solar power plant	39.10	39.10	—
	Implementation of safeguard instruments	1.28	—	1.28
4	**Institutional strengthening and capacity development**	**8.00**	**8.00**	**—**
	Support to IPP projects preparation/negotiation/closing	5.00	5.00	—
	Support to solar PV integration in Burkina's network	2.00	2.00	—
	Strengthening of the regulator	0.50	0.50	—
	Support for project implementation	0.50	0.50	—
	Total AF	**81.28**	**80.00**	**1.28**

Component 1: Improving the reliability of energy supply (IDA US$72 million equivalent, Recipient US$1.28 equivalent)

Transmission and distribution grid improvement (IDA US$32.9 million equivalent)

3. The proposed investments focus on segments of the national transmission and distribution network captured in SONABEL's network master plan that has been assessed as

critical to the integration of planned renewable energy power plants, more specifically, solar plants. The proposed investment interventions are also to reduce system losses, and improve quality and reliability. The intervention comprises of the following (with exact routings still to be determined):

(a) Construction of single circuit 67 km 225 kV line to be operated at 90 kV between Ziniare and Kaya, expansion of existing Ziniare substation by adding a new line bay, construction of 25MVA 90/33 kV substation at Kaya, and the construction of 6 km 33 kV lines. This will also include an installation of control system to integrate the substation at the National Control Center.

(b) Expansion of Wona substation by adding a new 90 kV line bay to serve Dedougou, construction of single circuit 65 km 90 kV line between Wona and Dedougou, and construction of 25 MVA 90/33 substation at Dedougou. This will also include an installation of control system to integrate the substation at the National Control Center.

(c) Expansion Pa substation by adding 90 kV line bay to serve Diébougou, construction of single circuit 92.3 km 90 kV line between Pâ and Diébougou, and construction of associated 25 MVA 90/33 kV substation at Diebougou. This will also include an installation of control system to integrate the substation at the National Control Center.

(d) Provision of three spare HV transformers (40MVA 90/15kV, 25MVA 90/33kV, and 40MVA 90/33kV) to reduce outage duration for replacement of existing transformers in the network that get damaged.

Figure 2.1. Project Area (source: SONABEL)

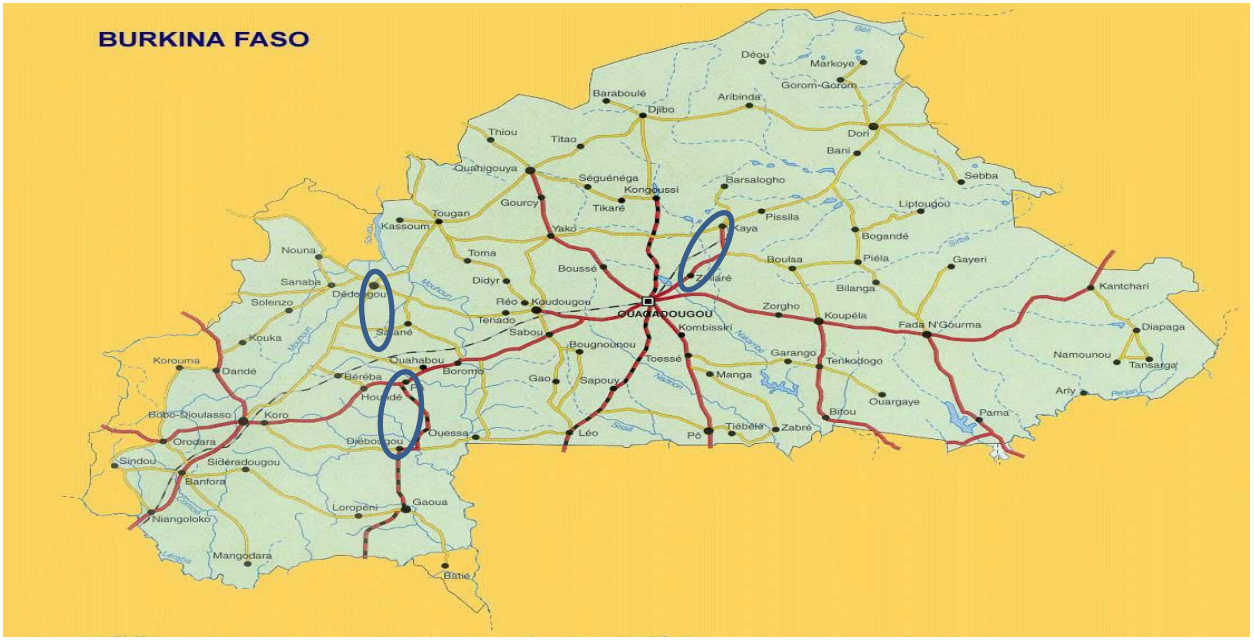

Table 2.2. Estimated Costs for Transmission and Distribution Grid Improvement

Item	Description	Estimated Cost (US$, millions)
1	67 km 225 kV at 90 kV Ziniare-Kaya interconnection, associated substation works and 6 km 33 kV lines	**11.00**
2	65 km 90 kV Wona-Dedougou interconnection and associated substation works	**8.00**
3	90 km 90 kV Pa-Diebougou interconnection and associated substation works	**10.00**
4	Spare transformers	**2.20**
5	Technical advisory services for construction supervision for transmission lines	**1.70**
	Total	**32.90**

Grid connected solar power plant (IDA US$39.1 million equivalent)

4. The AF will finance the development of at least 30 MWp of grid-connected solar power plants and associate evacuation circuits around Koudougou and Kaya regions.

(a) **30 MWp grid-connected solar power plants.** Solar power plants totaling at least 30 MWp (solar panels, inverters, power conditioning, unit, and grid connection equipment) will be installed somewhere near the cities of Koudougou, capital of the Central-West region, which is about 100 km from the national capital Ouagadoudou and Kaya, 100 km northeast of Ouagadougou (for 20 MWp and 10 MWp, respectively).

(b) The provision of one-year O&M assistance services for the PV plant and monitoring tools will be funded under this component.

(c) The provision of technical advisory services for (i) a detailed study and (ii) construction supervision for the solar power plants will also be funded under this component.

5. In addition, the Government of Burkina Faso will finance land acquisition and payment of compensations for people affected by the project with a provisional budget of US$1.28 million equivalent.

Figure 2.2. Geographical Location of Project Area (source: SONABEL)

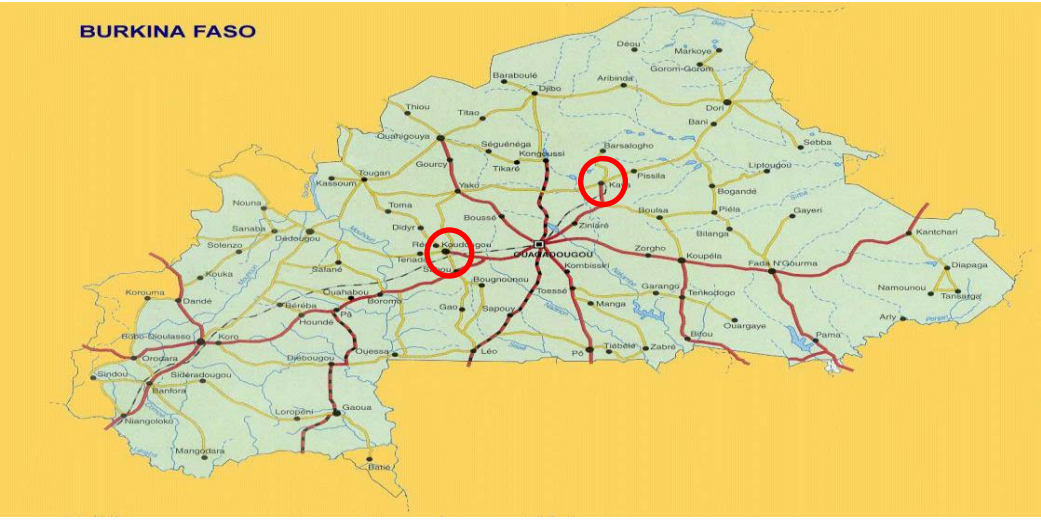

Table 2.3. Estimated Costs for the Grid-connected Solar PV Plants

Item	Description	Estimated Cost (US$, millions)
1	20 MWp grid solar power plant and associated equipment around Koudougou and associated evacuation circuit and 33 kV substations	**25.00**
2	10 MWp grid solar power plant and associated equipment around Kaya and associated evacuation circuit and 33 kV substations	**12.40**
2	O&M assistance for PV plant for one year	**0.50**
3	Technical advisory services for construction supervision for the solar power plants	**1.20**
	Total	**39.10**

Component 4: Institutional Strengthening and Capacity Development (IDA US$8 million equivalent)

6. The activities to be supported are aligned with the ESSP's provision of support to build the capacity of public sector entities for improving private participation in the energy sector. The AF will include support to the preparation and closing of IPP projects in a timely, transparent, and cost-effective manner, through transaction advisory services for (a) the preparation of state-of-the-art 'bankable' core transactional documents (including bidding documents, PPA, risks allocation, guarantees available to sponsors, and so on) and (b) financial, legal, and technical support for the negotiation of specific selected transactions. This support will be provided to the investment planning unit to be established within the Ministry of Energy, with SONABEL support, to keep the least-cost development plan systematically updated and competitively procure new generation plants, including through PPP arrangements. It will also support PV integration in the network through (a) the provision of consultancy services for a comprehensive grid stability study for renewable integration in Burkina Faso's interconnected grid, which will include the optimal deployment of storage capacity in the system and (b) operating and monitoring tools to support SONABEL and the Ministry of Energy in operating the solar PV plant to optimize the efficiency of PV plants in general, including by developing weather forecasting capacity in Burkina Faso with regard to the increasing number solar PV plants expected in the coming years. Support will be provided to the regulator, ARSE, whose mandate is being strengthened through the new energy law that is under preparation. The AF will finance

the preparation of a financial model for regulatory purposes and training needed for ARSE staff. It will enhance ARSE's capacity to (a) propose electricity tariff setting/yearly subsidy cap to ensure the sector financial equilibrium; (b) ascertain IPP's proposed tariffs, in particular on negotiated deals; and (c) protect consumer interest. Finally, the proposed AF will provide project implementation support to SONABEL and sector entities to ensure the delivery of planned activities in line with best quality standards and in a timely manner. It will notably include support for gender integration. The citizen engagement activities will be financed under the original financing.

Table 2.4. Estimated Costs for Institutional Strengthening and Capacity Development

Item	Description	Estimated Cost (US$, millions)
1	**Support to IPP projects preparation and closing**	**5.00**
1.1	Transaction advisory services for bidding and transactional documents	2.50
1.2	Transaction advisory services for preparation and negotiation of selected IPPs	2.50
2	**Support to solar PV integration in Burkina Faso's network**	**2.00**
2.1	Consultancy services for a grid stability study, including storage options	1.50
2.2	PV plants planning and optimization tools (including weather monitoring capacity)	0.50
3	**Strengthening of the regulator**	**0.50**
3.1	Preparation of energy sector financial model	0.30
3.2	Capacity reinforcement	0.20
4	**Support for project implementation**	**0.50**
4.1	Consultancy services for project implementation	0.30
4.2	Gender integration activities	0.20
	Total	**8.00**

Annex 3: Economic and Financial Analysis

Burkina Faso: Additional Financing to the Electricity Sector Support Project (P160344)

1. The economic and financial analysis focuses on new investments under the proposed AF, that is, the development of two solar PV plants aimed at introducing affordable renewable electricity into the country's mix (Activity 1) and the strengthening of the network required to integrate additional renewable energy sources looking forward (Activity 2). Both activities fit under Component 1, which aims to improve the reliability of energy supply in the country. Each activity is analyzed individually in the following sections to identify economic and financial net benefits.

2. The results of indicate that if AF is implemented successfully, using a discount rate of 6 percent, the economic NPV will be US$303 million with 23 percent EIRR and NPV of US$325 million with 24 percent EIRR including social cost of carbon emissions. The financial NPV will be US$20 million with a 9 percent FIRR. This difference between economic and financial returns reflects the fact that most benefits from induced access extension and improved service under Activity 2 are captured by electricity consumers, while associated costs are borne by the utility.

Table 3.1. AF Internal Rates of Return and NPVs

Items		Economic		Financial
		Without GHG	With GHG	
Total AF	IRR (%)	23	24	9
	NPV (US$, millions)	302.676	324.725	19.897
Activity 1 (Solar Plants)	IRR (%)	14	19	10
	NPV (US$, millions)	29.806	50.613	12.246
Activity 2 (Network Reinforcements)	IRR (%)	27		8
	NPV (US$, millions)	175.342		7.650

AF Activity 1: 30 MWp Solar PV Plants

3. The objective of this activity is to contribute to the diversification of the country's energy mix toward affordable renewable sources, in line with the national strategy for the sector.[19] Given the current status of solar IPPs pipeline of projects facing delays in preparation and high costs (including State's contingent liabilities), the development of publicly financed PV plants appears to be the most cost- and time-effective solution for the country to continue this transition in the short term.

4. Given its intermittent nature, PV solar technology will not address the peak power deficit which occurs in the evening in Burkina Faso. Without storage capacity, a technology that is not yet mature enough to be cost-effective will complement other generation plants offering firm, base load capacity. The economic justification of solar PV generation has been assessed by estimating the value of the PV plants' output based on displaced thermal energy running on

[19] Burkina Faso's Letter of Sector Policy, approved by the Council of Ministers on November 14, 2016, sets priorities in terms of investments, energy mix, and private sector participation in the energy sector to shift toward more affordable electricity and increased access.

expensive fossil fuel imports in landlocked Burkina. Avoided operating expenditure (OPEX) for HFO plants (fuel purchases and variable O&M) are compared with incremental investments and operating costs related to this additional generation. Social cost of carbon has also been included in the analysis. Table 3.5 details the assumptions used for the analysis.

5. The average economic net benefit is US$0.09 by kWh produced (CFAF 57), excluding social cost of carbon. With 4 percent of the mix, it reduces the cost of service by 1.3 percent from US$0.225 to US$0.222 per kWh (CFAF 139 to CFAF137), based on 2015 data, everything being equal. The economic NPV will be US$30 million with 14 percent EIRR, increasing to US$51 million with 19 percent EIRR including the social cost of carbon emissions. The financial NPV will be US$12 million with a 10 percent FIRR. Detailed results are presented in Table 3.3.

AF Activity 2: Strengthening of the Transmission Network

6. The objective of this activity is to address bottlenecks in the transmission system required to extend electricity service and integrate more renewable energy into the grid in the future. The AF will reinforce transmission lines linking major growth poles[20] from 33 kV to 90 kV and provide spare high voltage transformers to improve (n-1) security of substations.

7. Direct benefits from this activity are threefold: (a) increased reliability of supply and energy security; (b) loss reduction; and (c) additional wheeling capacity. The indirect benefit is the ability of the interconnected network to absorb additional intermittent renewable electricity to reduce the cost of electricity service. Although ultimately sought for, the latest relies on other investments outside the scope of the proposed AF.

8. The justification of the proposed activity has been assessed by estimating the value of the three expected benefits compared with incremental investments and operating costs. The valuation of induced economic and financial benefits is summarized in Table 3.2. Table 3.5 details further assumptions used for the analysis.

Table 3.2. Valuation of Economic and Financial Benefits from Network Investment (Activity 2)

Direct Benefits		Valued at:	
		Economic	Financial
1.	Avoided loss of load (LOLL)	Cost of unserved energy	Marginal cost of supply
2.	Loss reduction	Average cost of supply	
3.	Additional electricity transmitted	Consumer's surplus[a]	SONABEL profit per sales[b]

Note: a. Consumer's surplus = consumer's willingness to pay − Average cost of supply (economic); b. SONABEL profit = average tariff − long-term marginal cost (LTMC) of electricity.

9. From an economic perspective, avoided LOLL that is, increased reliability of electricity supply, is valued based on cost of unserved energy estimated with the captive generation method. Loss reduction is valued based on the cost of electricity services, deemed a—deliberately conservative—proxy for the opportunity cost of not doing the project. Benefits from incremental electricity allowed by additional wheeling capacity is valued at what consumers would be willing to pay for this energy minus the costs of supply (underlying investments being outside of the scope of the proposed AF).

[20] Pâ-Diébougou, Wona-Dédougou, and Ziniaré-Kaya.

10. From a financial standpoint, avoided LOLL and loss reduction are both valued at the cost of thermal generation, a proxy for the marginal cost of supply. Incremental electricity is valued at the utility margin per unit of sales, that is, the difference between the tariff and LTMC of electricity service. The latest is used to capture the benefits from future diversification of the energy mix, which will be facilitated by the proposed activity.

11. The economic NPV is US$175 million with 27 percent EIRR. The financial NPV is US$7 million with an 8 percent FIRR. Detailed results are presented in Table 3.4. Most induced net benefits from increased reliability and incremental access are indeed captured by final consumers.

Table 3.3. Analysis of Economic and Financial Benefits of Solar PV Plants (Activity 1)

Year		0	1	2	3	4	5	10	15	20
PV capacity	MWp		30	30	30	30	30	30	30	30
Electricity generated	MWh		48,600	48,114	47,633	47,157	46,685	44,397	42,221	40,152
Costs										
Investment costs	CFAF, millions	(21,985)								
Operating costs	CFAF, millions		(417)	(417)	(417)	(417)	(417)	(417)	(417)	(417)
Financing costs	CFAF, millions		(660)	(660)	(660)	(660)	(660)	(660)	(660)	(660)
Amortization	CFAF, millions		(834)	(834)	(834)	(834)	(834)	(834)	(834)	(834)
Generation cost per kWh (excl. financing)	CFAF/kWh		26	26	26	27	27	28	30	31
Generation cost per kWh (incl. financing)	CFAF/kWh		39	40	40	41	41	43	45	48
Benefits (avoided OPEX for HFO plants)										
Fuel costs	CFAF, millions		2,835	2,807	2,848	2,890	2,933	3,156	3,395	3,653
Other variable costs	CFAF, millions		632	625	619	613	607	577	549	522
Total benefits	CFAF, millions		3,467	3,432	3,467	3,503	3,540	3,733	3,944	4,175
Avoided cost per kWh (variable costs)	CFAF/kWh		71	71	73	74	76	84	93	104
GHG										
Social value of carbon	US$/tCO$_2$	30	30	30	30	35	35	35	50	50
Avoided carbon emission	tCO$_2$		32,902	32,573	32,247	31,925	31,606	30,057	28,584	27,183
Avoided cost of carbon	CFAF, millions		611	605	599	692	685	651	885	841
Total benefits including GHG	CFAF, millions		4,078	4,037	4,066	4,195	4,224	4,384	4,829	5,016
Economic Benefits										
Net economic benefits excluding GHG	CFAF, millions	(21,985)	3,050	3,015	3,050	3,086	3,122	3,315	3,527	3,758
Net economic benefits including GHG	CFAF, millions	(21,985)	4,078	4,037	4,066	4,195	4,224	4,384	4,829	5,016
Net economic benefits per kWh	CFAF/kWh		46	45	47	48	49	56	64	73
Financial Benefits										
Net financial benefits	CFAF, millions	(21,985)	2,390	2,355	2,391	2,426	2,463	2,656	2,867	3,098
Net financial benefits per kWh	CFAF/kWh		32	32	33	34	35	41	48	56

	EIRR		FIRR
	without GHG	with GHG	
Internal Rate of Return (%)	14	19	10
NPV (US$, millions)	US$29.806	US$50.613	US$12.246

Table 3.4. Analysis of Economic and Financial Benefits of the Strengthening of the Transmission Network (Activity 2)

Year	0	1	2	3	4	5	10	15	30

Year		0	1	2	3	4	5	10	15	30
Avoided LOLL	MWh		871	871	871	871	871	871	871	871
Losses reduction	MWh		12,329	12,329	12,329	12,329	12,329	12,329	12,329	12,329
Additional electricity transited and sold	MWh		4,171	5,035	5,985	7,030	13,523	76,329	168,294	174,029
Average cost of supply	CFAF/kWh		134.1	133.1	127.2	121.2	115.3	101.9	102.6	100.0
Average cost of electricity from thermal	CFAF/kWh		140.5	132.8	136.5	134.5	132.7	138.8	147.7	147.7
Costs										
Investment costs	CFAF, millions	(20,776)								
Operating costs	CFAF, millions		(208)	(208)	(208)	(208)	(208)	(208)	(208)	(208)
Financing costs	CFAF, millions		(623)	(623)	(623)	(623)	(623)	(623)	(623)	(623)
Economic Benefits										
Value of avoided LOLL	CFAF, millions		664	664	664	664	664	664	664	664
Value of loss reduction	CFAF, millions		1,653	1,641	1,568	1,494	1,421	1,257	1,265	1,233
Value of additional electricity transited	CFAF, millions		474	576	721	889	1,789	11,120	24,403	25,687
Net benefits	CFAF, millions	(20,776)	2,582	2,674	2,745	2,839	3,667	12,832	26,124	27,376
Financial Benefits										
Value of avoided LOLL	CFAF, millions		122	116	119	117	116	121	129	129
Value of loss reduction	CFAF, millions		1,732	1,637	1,683	1,658	1,636	1,711	1,821	1,821
Value of additional electricity transited	CFAF, millions		40	49	58	68	131	740	1,631	1,686
Net benefits	CFAF, millions	(20,776)	1,064	970	1,029	1,013	1,052	1,740	2,750	2,805

	EIRR	FIRR
Internal Rate of Return (%)	27	8
NPV (US$, millions)	US$175.342	US$7.650

Table 3.5. Key assumptions

Items	Unit		Sources
Activity 1: Solar PV plants			
PV plant			
Maximum capacity (Kaya)	MWp	10	SONABEL prefeasibility
Maximum capacity (Koudougou)	MWp	20	SONABEL prefeasibility
Lifetime	years	25	
Performance losses	% per year	1	
Generation at maximum capacity (equivalent)	hours per annum	1,620	SONABEL prefeasibility
Load factor	%	18	
Electricity generated (year 1)	GWh	49	
Construction costs per unit	EUR, millions/MWp	1.06	Zagtouli PV plant
Compensations (provision for)	CFAF, millions		
Construction costs	CFAF, millions	20,859	
Supervision costs	% of investment	2	
Connection costs (Kaya)	CFAF, millions	354	SONABEL prefeasibility
Connection costs (Koudougou)	CFAF, millions	354	SONABEL prefeasibility
Operating costs	% of inv. per year	2	
Thermal plant (HFO)			
Density	g/l	850	
Heat rate	g/kWh	215	
Fuel price, excluding subsidies (year 1)	CFAF/l	225	ARSE
Fuel price increase	% per annum	2.5	
Other variable O&M	CFAF/kWh	13	
GHG			
Emission with HFO groups	tCO_2/GWh	677	WBG, GHG accounting guidelines
Social value of carbon	US$/$tCO_2$	See table 3.3	WBG Group, Social Value of Carbon in project appraisal, 2014
Activity 2: Network strengthening			
Investment costs	CFAF, millions	20,776	SONABEL prefeasibility
O&M costs	% of inv.	1	SONABEL prefeasibility
Amortization period	years	30	
Avoided LOLL	MWh	871	SONABEL prefeasibility
Loss reduction	MWh	12,329	SONABEL prefeasibility
Additional electricity	MWh	See table 3.4	SONABEL prefeasibility
Cost of unserved energy[a]	CFAF/kWh	762	EDF generation master plan, 2014
Average cost of supply (economic)	CFAF/kWh	See table 3.4	World Bank, Roadmap for Burkina Faso mix diversification, team calculation
Cost of thermal supply	CFAF/kWh	See table 3.4	World Bank, Roadmap for Burkina Faso mix diversification
LTMC	CFAF/kWh	112	World Bank, Roadmap for Burkina Faso mix diversification
Average tariff	CFAF/kWh	122	SONABEL Annual Report 2015
Consumer's willingness to pay	US$/kWh	0.4	
Others			
X-rate	US$/CFAF	619	
X-rate	EUR/CFAF	656	
Discount rate	%	6	
Weighted Average Cost of Capital	%	3	

Note: a. Based on captive generation method.