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Report No: 149467-ZM

IMPLEMENTATION COMPLETION AND RESULTS REPORT

(G-2470, G-2550)

ON

IDA PARTIAL RISK GUARANTEES

IN THE AMOUNT OF SDR 4.18 MILLION

(US$5.7 MILLION EQUIVALENT)

TO THE

REPUBLIC OF ZAMBIA

FOR THE

ZAMBIA SCALING SOLAR ENERGY PROJECT (P157943)

AND

SECOND SCALING SOLAR GUARANTEE (P163958)

September 30, 2020

Southern Africa Energy Unit
Eastern and Southern Africa Region

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CURRENCY EQUIVALENTS

(Exchange Rate Effective May 6, 2020)

Currency Unit =	Zambia Kwacha (ZMW)
ZMW 17.98 =	US$1
US$1.361590 =	SDR 1

FISCAL YEAR

July 1 - June 30

ABBREVIATIONS AND ACRONYMS

AC	Alternating Current
AfDB	African Development Bank
AMR	Annual Monitoring Report
COD	Commercial Operation Date
CPF	Country Partnership Framework
DC	Direct Current
DFI	Development Finance Institution
DPO	Development Policy Operation
E&S	Environmental and Social
EGP	Enel Green Power
EIB	European Investment Bank
EIRR	Economic Internal Rate of Return
ERB	Energy Regulation Board
ESAP	Environmental and Social Action Plan
GHG	Greenhouse Gas
GRZ	Government of the Republic of Zambia
GSA	Government Support Agreement
GWh	Gigawatt-hour
ICR	Implementation Completion and Results Report
IDA	International Development Association
IDC	Industrial Development Corporation
IFC	International Finance Corporation
IMF	International Monetary Fund
IPP	Independent Power Producer
ISR	Implementation Status and Results Report
kWh	Kilowatt-hour
LC	Letter of Credit
M&E	Monitoring and Evaluation
MIGA	Multilateral Investment Guarantee Agency
MoE	Ministry of Energy
MoF	Ministry of Finance
NPV	Net Present Value

O&M	Operation and Maintenance
OPIC	US Overseas Private Investment Corporation (now part of the US International Development Finance Corporation)
PAD	Project Appraisal Document
PCG	Partial Credit Guarantee
PDO	Project Development Objective
PPA	Power Purchase Agreement
PS	Performance Standards
RF	Results Framework
PV	Photovoltaic
RfP	Request for Proposal
SPV	Special Purpose Vehicle
tCO_2	Tons of Carbon Dioxide
TOC	Theory of Change
WTP	Willingness to Pay
ZESCO	Zambia Electricity Supply Corporation Limited

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DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P157943, P163958	Zambia Scaling Solar Energy Project
Country	**Financing Instrument**
Republic of Zambia	IDA Guarantee
Original EA Category	**Revised EA Category**
B - Partial Assessment	B – Partial Assessment

Organizations

Borrower	Implementing Agency
Republic of Zambia	Bangweulu Power Company Limited Ngonye Power Company Limited

Project Development Objective (PDO)

Original PDO

The project development objective is to increase solar electricity generation capacity and diversify electricity generation resources in Zambia.

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FINANCING

	Original Amount (million US$)	Revised Amount (million US$)	Actual Disbursed (million US$)
World Bank Financing			
IDA guarantee	3.5	5.7	0
Total	**3.5**	**5.7**	**0**
Non-World Bank Financing			
Multilateral and Bilateral Financing	45	81	81
Private capital financing	15	24.5	24.5
Total	**60**	**105.5**	**105.5**
Total Project Cost	**63.5**	**111.2**	**105.5**

KEY DATES

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
February 16, 2017	November 30, 2017		December 31, 2019	December 31, 2019

ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US$M)	Key Revisions
December 19, 2017		Additional financing for the second solar IPP (P163958)

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Satisfactory	Satisfactory	Substantial

RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US$M)
01	07/26/2017	Satisfactory	Satisfactory	
02	06/29/2018	Satisfactory	Satisfactory	
03	10/29/2019	Satisfactory	Satisfactory	
04	04/17/2019	Satisfactory	Satisfactory	

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SECTORS AND THEMES

Sectors

Major Sector/Sector	(%)
Energy and Extractives	**100**
Renewable Energy Solar	100
Guarantee	**100**

Themes

Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)
Private Sector Development	**100**
Business Enabling Environment	100
Investment and Business Climate	*100*
Finance	**100**
Finance for Development	100
Infrastructure Finance	*100*
Environment and Natural Resource Management	**100**
Climate change	100
Mitigation	*100*
Energy	100
Energy Policies & Reform	*100*

ADM STAFF

Role	At Approval	At ICR
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I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

A. CONTEXT AT APPRAISAL

Country Context

1. **Zambia is a resource-rich country with substantial mineral endowments (especially copper) and significant agricultural potential.** Although the country covers approximately 750,000 km^2, it is relatively sparsely populated. However, its population is growing rapidly (rising from about 10 million in 2000 to a little over 18 million in 2019). Zambia recorded impressive economic growth between 2004 and 2014 at an average of 7.3 percent. However, Zambia's economy remained undiversified and thus vulnerable to external and domestic shocks. Its dependency on copper—which accounted for three-quarters of total exports in 2014 and which has direct and indirect links with the performance of other key economic sectors—makes it vulnerable to external shocks. Most domestic shocks are related to climatic conditions, including and especially droughts. Such shocks have direct bearing on agriculture (which accounts for 10 percent of the economy and is a source of livelihood for half of the population, the majority of whom are poor) and electricity (95 percent of Zambia's electricity generation capacity is linked to hydropower), which is an input for all sectors of the Zambian economy.

2. **The end of the commodity super cycle in 2015 revealed Zambia's vulnerabilities.** As global demand for copper decreased, copper export earnings (in US dollars) contracted by 42 percent between 2011 and 2016, and the Zambian economy slowed down significantly in 2015. The impact of lower commodity prices was aggravated by El Niño-related droughts that decimated rain-fed agriculture and lowered hydroelectricity generation. Suboptimal fiscal policy in response to the emerging revenue realities exacerbated Zambia's experience of the copper and climate shocks. Furthermore, in light of an expansionary fiscal policy, monetary policy had to be tightened aggressively to bring inflation back to single digit levels and stabilize the kwacha. While successful in restoring a certain level of confidence in the macroeconomy, the tight liquidity further constrained the private sector.

3. **In 2017, at the time of appraisal, the economic situation of the country had slightly improved, though economic growth remained below the rates achieved before 2015.** Improvements in the economic situation were driven by recovering copper prices and a bumper 2016–17 harvest. However, these factors were insufficient to significantly reduce poverty. In addition, continued weak growth of the services sector contributed to overall weak economic growth. Growth increased to a modest 3.8 percent in 2017, up from 3.6 percent in 2016. Despite improved hydrology and the eased situation in agriculture and energy, significant fiscal and debt challenges remained as revenues fell short of targets, while domestically financed expenditures remained on course. Rapid public debt accumulation increased the country's risk of debt distress and remained a source of vulnerability over the medium term.

Sector Context

4. **At the time of appraisal, electricity was the second most important energy source in Zambia after wood fuel, providing 10 percent of the national energy supply.** The installed generation capacity was 2,683 megawatts (MW) and the main source of electricity generation was hydropower, representing

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approximately 90 percent of electricity production. Most of this was concentrated in one basin—that of the Zambezi river—making it particularly vulnerable to hydrology and climatic variations. Out of the total installed capacity, 14 percent was provided by independent power producers (IPPs). The overall national electricity access rate was low at 32 percent (47 percent of the population in urban and peri-urban areas and a mere 3 percent in rural areas). Poor reliability and quality of electricity supply combined with a lack of access to electricity services had an adverse impact on the economy.

5. **The Zambian electricity sector was overseen by the Ministry of Energy (MoE), which provided overall policy guidance.** Electricity supply was predominantly the preserve of ZESCO Limited, a vertically integrated, fully state-owned company involved in the generation, transmission, and distribution of electricity. ZESCO's shares were owned by the Industrial Development Corporation (IDC), which managed the assets of state-owned enterprises. This structure was designed to allow ministries to focus on policy while the IDC would operate the state-owned enterprises following commercial principles.

6. **Between 2004 and 2014, electricity demand in Zambia was growing at an average of 4 percent per year, triggered by average annual gross domestic product (GDP) growth of about 7.3 percent.** In 2015–16, the power sector experienced power supply shortages, with power generation not meeting total energy demand due to low rainfall and drought.

7. **The power shortage led to nationwide load shedding of up to eight hours per day on a rotational basis to manage an estimated annual deficit of 3,500 gigawatt-hours (GWh) in energy.** This had a significant adverse impact on economic growth, which was already slowing due to the external shock caused by a fall in copper prices. The 2015 energy shortages made a clear case for the need to diversify Zambia's electricity generation and to prepare for climate variability.

8. **In response to the power shortages, the Government of the Republic of Zambia (GRZ) requested that developers of IPP projects under construction accelerate their progress and that ZESCO start buying (expensive) emergency power.** The costly emergency power was imported at an average cost of US¢12.9 per kilowatt-hour (KWh), compared with the retail tariff of approximately US¢5.2 per KWh. Due to the significant tariff differential, the emergency power imports were contracted on the understanding that the GRZ would cover the price differential. The fiscal impact of the power shortages was significant. For the financial year ending December 2015, the cost of power imports was US$59 million compared with US$4 million in the previous year. In 2016, the cost of emergency power imports was about US$340 million, that is, 45 percent of ZESCO's fiscal year (FY) 2015 revenues.

9. **At the time the plants were tendered, settling emergency import and IPP invoices presented a severe strain on ZESCO's financial position.** The GRZ agreed to meet the difference between ZESCO's costs and revenues under these contracts. However, the GRZ did not fulfill its commitments in a timely manner, resulting in payment arrears, which put at risk further supplies from contracted IPPs and emergency power suppliers. While the GRZ took some actions toward addressing the financial state of the sector—including raising tariffs (partially reverted); launching a cost of service study; and engaging in active discussions with the International Monetary Fund (IMF), African Development Bank (AfDB), and the World Bank Group—ZESCO's financial standing remained uncertain.

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10. **Recognizing the country's great solar potential and its need to diversify the energy mix away from hydropower, Zambia became the first country to implement the Scaling Solar program of the World Bank Group.** The Scaling Solar program was designed to be a one-stop shop that brings together a suite of World Bank Group services and instruments under a single engagement aimed at creating viable markets for grid-connected solar photovoltaic (PV) power plants. It brings an open, competitive, and transparent approach that facilitates the rapid development of privately owned, utility-scale solar PV projects in Sub-Saharan Africa. The Scaling Solar program mitigates the risks of limited institutional capacity, lack of scale, lack of competition, high transaction costs, and high perceived risk by offering advice on technical aspects, simple and rapid tendering, and bankable project documents and by providing financing and risk mitigation instruments. As part of the Scaling Solar program's original design, the International Finance Corporation's Advisory Services ('IFC Advisory') supports governments in preparing a competitive and transparent solar auction based on template documents and processes. Based on the bid package, IFC Investment Services ('IFC Investment'), the World Bank, and the Multilateral Investment Guarantee Agency (MIGA) then provide term sheets for financing, guarantees, and political risk insurance, respectively. Bidders can decide to use none, some, or all of these World Bank Group instruments. Bidders that pass the technical and financial criteria are then ranked based on the offered tariff.

Box 1. Current Overview of the Scaling Solar Program

Zambia was the first country to implement a Scaling Solar auction. Senegal followed closely (60 MW awarded in 2018 to Engie-Meridiam at €0.038 per kWh for the Kahone plant and €0.04 per kWh for the Touba plant). Construction is ongoing for what will be Senegal's cheapest utility energy source.

Several other Scaling Solar mandates are ongoing in Sub-Saharan Africa in Madagascar (request for proposal [RfP] under preparation), Côte d'Ivoire (early stage), and Togo (early stage) and outside of the continent in Uzbekistan (100 MW awarded in 2019 to Masdar at just US¢2.7 per kWh, financial close ongoing) and Afghanistan (RfP under preparation). The demonstration effect of well-prepared competitive auctions and price signal benefited other countries where governments decided to launch similar type of auctions.

11. **During the World Bank Group's initial engagements with the GRZ on implementing the Scaling Solar program, the IDC championed the idea as well suited to its mandate of improving efficiencies in ZESCO.** These discussions resulted in an in-principle agreement to develop the Scaling Solar program in Zambia for up to 600 MW of solar generation capacity in two subsequent phases (or 'rounds'). On August 13, 2015, the IDC and IFC Advisory signed a Financial Advisory Services Agreement to develop two solar PV plants with a total capacity of up to 100 MW using the Scaling Solar initiative ('Round 1'). The IDC, supported by IFC Advisory, further carried out the prefeasibility work on these two plants and tendered them out to select private sector developers using the Scaling Solar program's open and competitive procurement process. A total of 48 companies submitted a request for qualification, including many internationally reputable firms, of which 11 were prequalified.

12. This Implementation Completion and Results Report (ICR) covers the Zambia Scaling Solar Energy Project (P157943, G-2470, approved by the Board on February 16, 2017) and Second Scaling Solar Guarantee (P163958, G-2550, processed as an additional financing and approved by the Board on December 20, 2017), hereafter referred to as the Zambia Scaling Solar Project or the Project.

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The Project

13. In May 2016, only nine months after the start of the World Bank Group engagement, the IDC awarded the first two contracts under Zambia's Scaling Solar Round 1 tender, for a combined generation capacity of 75.7 MW. The two winning bidders, both offering flat tariffs for 25 years, were (a) a consortium of Neoen SAS of France ('Neoen')/First Solar of the United States ('First Solar') with a US¢6.015 per kWh tariff, the lowest for solar energy in Sub-Saharan Africa at that time (the 'Bangweulu project') and (b) Enel Green Power (EGP) with a US¢7.839 per kWh tariff (the 'Ngonye project'). Both projects had requested in their bids an IDA guarantee (that was offered as part of the IDC's bidding package). It was the GRZ/IDC's decision to award two separate projects to two different bidders rather than a single lowest bidder to (a) crowd in more potential investors, (b) maximize the demonstration effect, and (c) diversify, and therefore mitigate, execution risks. The Ngonye project's tariff, being the second lowest, although higher than that of the Bangweulu project, was still highly competitive as an IPP in the Zambian and Sub-Saharan Africa context. In Round 1, both were planned to be presented as a single package for Board approval. However, while the Bangweulu project was ready for submission to the Board, the Ngonye project was not, mainly due to the delay of environmental and social (E&S) disclosures required before submission. To not delay a potential financial close for the Bangweulu project, the joint IDA and IFC team decided to go ahead and present the Bangweulu project to the Board in February 2017. Subsequently, the Ngonye project was presented to the Board in December 2017, processed as an additional financing.

14. The Bangweulu project's solar PV plant, with installed capacity of 47.5 MW alternating current (AC) (approximately 55 megawatt peak [MWp]), is located in the Lusaka South Multi-Facility Economic Zone, 20 km south of Lusaka, Zambia. It will generate around 100 GWh per year, sold to ZESCO under a 25-year power purchase agreement (PPA). The Bangweulu Power Company Limited is a special purpose vehicle (SPV), established according to the shareholder agreement on November 4, 2016, and co-owned by Neoen, First Solar, and the IDC of Zambia with 55 percent, 25 percent, and 20 percent shareholding, respectively.

15. The Ngonye project's solar PV plant with the capacity of 28.2 MW AC (approximately 34 MWp) is also located in the Lusaka South Multi-Facility Economic Zone, next to the Bangweulu project. It will generate around 61 GWh per year, sold to ZESCO under a 25-year PPA. The Ngonye project is led by the EGP. Its parent company—Enel S.p.A. (Enel) —was Italy's largest power company and Europe's second largest utility with an installed capacity of 90 GW. The EGP and the IDC signed their shareholder agreement on November 11, 2016. On April 3, 2017, the Ngonye Power Company Limited (the project company), signed a PPA with ZESCO and a Government Support Agreement (GSA) with the GRZ. The project company is co-owned by the EGP (80 percent) and the IDC (20 percent).

16. Both projects were supported by several World Bank Group instruments. These included IDA payment guarantees of up to US$3.5 million for the Bangweulu project and up to US$2.8 million for the Ngonye project; IFC A-Loans and Blended Finance Loans both of up to US$15 million; and one or more interest rate swaps (in US dollars) covering a notional amount representing up to 100 percent of the total debt to the project company. IFC signed a mandate with Neoen and Enel, the lead sponsors, to act as the Mandated Lead Arranger for the projects' financing. MIGA political risk insurance and IDA loan guarantees were not requested.

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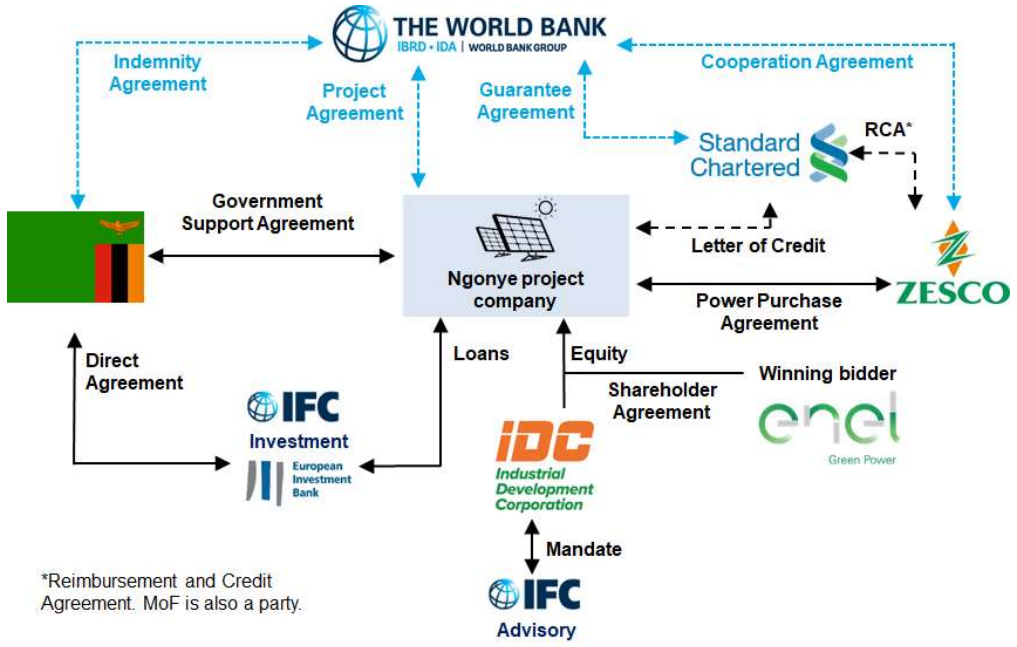
17. **The IDA payment guarantee** supported certain responsibilities by ZESCO under the PPA. ZESCO is required to provide payment security of an amount equivalent to six months of the IPPs' revenues. The security could be either via an escrow account or via a letter of credit (LC). The GRZ expressed preference for the LC option given its lower commitment of capital and lower costs. To help ZESCO provide such security, the GRZ requested the IDA to offer payment guarantees. Without IDA guarantees, ZESCO would not be able to find long-term LCs and many sponsors and lenders, both development finance institutions (DFIs) and commercial banks, would not be willing to participate. The IDA guarantee also reduced the cost to ZESCO of procuring these LCs and avoided the requirement for ZESCO to post a cash collateral. All the bidders, who submitted an offer in Round 1, requested an IDA payment guarantee. Figure 1 presents the Project's contractual structure in detail.

Figure 1. Project Contractual Structure (example of Ngonye)



Note: IBRD = International Bank for Reconstruction and Development; IDA = International Development Association; MoF = Ministry of Finance.

Theory of Change (Results Chain)

18. As theories of change (TOCs) were not required for World Bank operations at the time of the preparation of the Zambia Scaling Solar Project, the TOC presented in the ICR is based on the results chain and the critical assumptions at the time of the preparation of the Project. The IDA guarantees, as part of the suite of World Bank Group instruments, facilitated the development, financing, and delivery of the solar plants. More specifically, the role of the IDA guarantees was to mitigate ZESCO's payment risk, and as such they are directly linked to the TOC outputs in terms of the construction and operation and maintenance (O&M) of the two solar power plants by the private sector. Together with the other inputs under the overall Scaling Solar initiative—solid technical, legal, and financial preparation of the tender and bidding documents; on-the-job training for the IDC to carry out an open and competitive tender; IFC-

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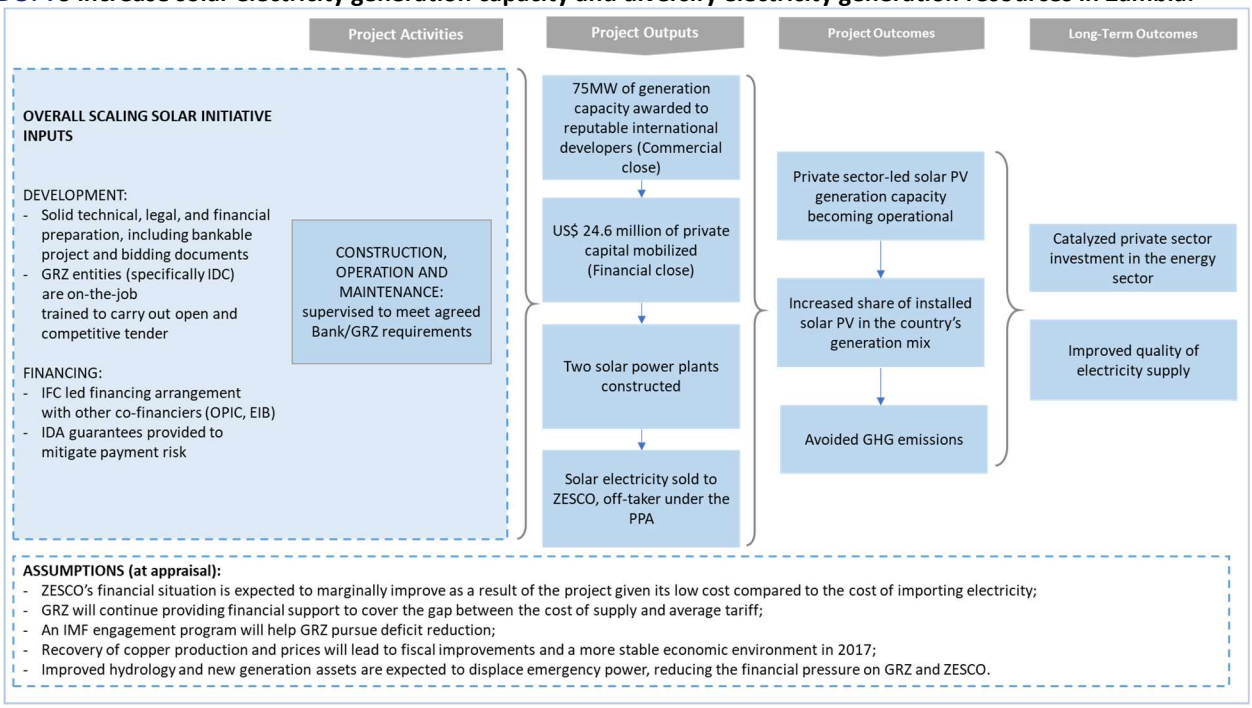
led financial arrangements—the IDA guarantees contributed to the intended Project objectives of increased solar generation capacity and diversification of electricity generation.

Figure 2. Theory of Change

PDO: To increase solar electricity generation capacity and diversify electricity generation resources in Zambia.



Note: EIB = European Investment Bank; GHG = Greenhouse gas; IDA = International Development Association; OPIC = Overseas Private Investment Corporation.

Project Development Objectives (PDO)

19. The PDO was **to increase solar electricity generation capacity and diversify electricity generation resources in Zambia.**

20. The direct Project beneficiaries include (a) ZESCO, as the Project aimed to contribute to reducing costly emergency imports with competitively priced electricity from the solar PV power plants and optimize hydropower use and (b) the IPPs, which benefited from the IFC financing and the IDA payment guarantees. The ultimate beneficiaries are electricity consumers in Zambia, as the new power plants contributed to reducing the load shedding. The Project also supported the GRZ in attracting private capital to increase Zambia's electricity generation capacity and diversify the generation mix. This in turn provides a hedge against the risks of climatic and hydrological variability, thus increasing the reliability and security of electricity supply. Finally, the Project introduced practical application of a structured framework for transparent and competitive procurement of new generation with improved cost and technology benefits.

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Key Expected Outcomes and Outcome Indicators

21. The following key indicators were used to measure progress toward the achievement of the PDO:

(a) Generation capacity of energy constructed (MW) - Core

(b) Solar PV plants constructed (number)

(c) Reduction of GHG emissions (tons of carbon dioxide, tCO_2)

(d) Share of installed solar PV generation capacity (%)

(e) Private capital mobilized (US$ million) - Core.

22. In addition, the Project's Results Framework included the following intermediate-level indicators:

(a) Solar energy generation capacity awarded (MW)

(b) Renewable energy generation capacity constructed - Solar (MW AC)

(c) Renewable energy generated annually (GWh)

(d) Physical implementation progress (%)

(e) Commissioning test completed (Y/N).

Components

23. The Project consisted of (a) the development, financing, construction, operation, and maintenance of a new 47.5 MW AC (approximately 55 MWp) solar PV plant by the Bangweulu Power Company Limited and of a new 28.2 MW AC (approximately 34 MWp) solar PV plant by the Ngonye Power Company Limited, both located in the Lusaka South Multi-Facility Economic Zone, 20 km south of Lusaka, Zambia and (b) the sale of the electricity generated from such plant to ZESCO.

24. The IDA support consisted of an IDA payment guarantee of up to US$3.5 million for the Bangweulu project and an IDA payment guarantee of up to US$2.8 million for the Ngonye project, backstopping as a security mechanism enabling the Bangweulu and Ngonye power companies to receive timely payments.

B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)

25. As referred earlier, both Round 1 projects—Bangweulu and Ngonye—were planned to be presented as a single package for Board approval. However, due to differing progress toward financial close, the West Lunga Bangweulu Scaling Solar Project (P157943, G-2470) was submitted for the Board approval first and approved on February 16, 2017. The Ngonye Scaling Solar Project (P163958, G-2550) was processed as an additional financing and approved by the Board on December 20, 2017.

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Revised PDO and Outcome Targets

26. There was no change to the PDO during implementation. The overall outcome targets and PDO and intermediate indicators were revised upward upon approval of the additional financing (P163958) (table 1).

Revised Components

27. The components were not revised.

Other Changes

28. There were no other changes to the Project.

Rationale for Changes and Their Implications for the Original Theory of Change

29. The original Project targets and indicators accounted for the Bangweulu project. The additional financing resulted in an increase in the outcome targets for the Zambia Scaling Solar Project to account for targets and indicators specific to the Ngonye project. Therefore, the achievement of the Project is assessed against the combined targets for both the Bangweulu and Ngonye projects.

II. OUTCOME

A. RELEVANCE OF PDO

Assessment of Relevance of PDO and Rating

Rating of Relevance: High

30. The PDO was highly relevant at the time of project appraisal and it remains critically relevant for the country. The FY13–16 Country Partnership Strategy for Zambia identified critical infrastructure gaps as a constraint to the competitiveness of the private sector. Zambia's Revised 6th National Development Plan 2013–2016[1] recognized that secure and reliable supply of electricity is essential for accelerating and diversifying growth, as well as enhancing economic development in the country.

31. The FY19–23 Country Partnership Framework (CPF) Objective 1.3—*Access to and quality of resilient infrastructure services (initial services on electricity and roads) increased in selected rural areas and small towns*—is measured, among others, by Progress Indicator 3 - *Variable renewable energy capacity added to the grid*, with the target of 450 MW by 2021.

32. The Zambia Scaling Solar Project contributes to approximately 17 percent of the CPF target (or 75.7 MW), making it highly relevant to the overall objective of improving infrastructure services in the country. Although Objective 1.3 and Progress Indicator 3 of the CPF did not specifically identify the sources

[1] https://www.ilo.org/wcmsp5/groups/public/---africa/---ro-abidjan/---ilo-lusaka/documents/publication/wcms_465092.pdf

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of variable renewable energy, the CPF Overview explains that hydropower, which represents 85 percent[2] of the existing generation capacity, is prone to climatic effects, exacerbating the financial ability of ZESCO to mitigate the effects of the potential climate crisis, which calls for the diversification of electricity generation sources. Moreover, the increase in generation capacity through the Zambia Scaling Solar Project is relevant to the objective of increased access to electricity, given the additional and cheaper capacity of the two solar plants.

33. The PDO is also highly relevant to Zambia's national policy targets. Zambia's National Energy Policy 2019[3] includes *Objective 5: To increase exploitation of renewable energy in order to diversify the energy mix* and *Objective 6: To increase access to electricity in order to improve the livelihoods of citizens*, which further stipulates that the expansion in energy generation is necessary to achieve increased access. Moreover, Zambia's 7th National Development Plan 2017–21[4] confirms that reliance on hydropower creates a generation deficit and estimates that growth in demand will increase by 150–200 MW per annum. The Project's target to increase installed generation capacity by 75.7 MW contributes to closing approximately half of the expected annual gap.

34. The IDA guarantees were critically relevant as part of the Scaling Solar program, as they provided the project financiers with mitigation measures for payment risks and unlocked the necessary private investment for solar PV generation capacity and diversification of the energy generation mix.

B. ACHIEVEMENT OF PDO (EFFICACY)

Assessment of Achievement of Each Objective/Outcome

Assessment of the PDO (efficacy)

Rating of Efficacy: High

35. The Project featured a PDO consisting of two objectives: (a) to increase solar electricity generation capacity and (b) to diversify electricity generation sources in Zambia. Achievement of the first objective is measured by the installed capacity becoming operational, while the second is measured by the share of the installed solar PV in the country's generation mix. By the closing date (December 31, 2019), the Project had substantially achieved both objectives. Minor quantitative shortcomings in renewable energy generation (GWh) and GHG emissions targets are driven by the timing of plant commissioning. Extrapolating the average monthly generation data from both plants to a full year, the power plants are on track to achieve the annual targets. This is also confirmed by actual data available by closing. Interviews with Project stakeholders validate that the IDA guarantees played a critical role in the achievement of these results: the guarantee was key for de-risking the transaction and ensuring the bankability of the Project to mobilize private financing and ultimately achieve the PDO targets.

[2] The percentage at the appraisal stage was 90 percent, which subsequently changed given the addition of 150 MW installed capacity from the Maamba coal thermal plant and the Project.
[3] Ministry of Energy shared the National Energy Policy of 2019 with the World Bank team
[4] https://www.sdgphilanthropy.org/system/files/2019-02/7th-National-Development-Plan-Zambia.pdf

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36. The World Bank support through IDA guarantees played a key role in mobilizing private sector financing in the form of equity (US$24.5 million) and senior debt (US$81 million) for the construction of the two solar plants. Since the IDA guarantees reduced the most immediate risk for investors and lenders—the nonpayment of electricity bills—they directly contributed to achieving financial close and commercial operation and obtaining the record low tariffs.

37. The Project's Results Framework presented a valid set of indicators, sufficient to measure the progress toward achieving the PDO. Table 1 summarizes the Project's Results Framework alongside targets and actual results.

Table 1. Summary of the Project's Results Framework Indicators with Targets and Results

Project Outcome Indicator	Status	Baseline (2016)	End Target (2019)	Actual Result (December 31, 2019)
Indicator 1 - Corporate result indicator Generation capacity of energy constructed (MW)	**Revised**	0	**75.7**	**75.7**
- **Bangweulu**	Unchanged		47.5	47.5
- **Ngonye**	New		28.2	28.2
Indicator 2 Number of solar PV plants constructed	**Revised**	0	**2**	**2**
- **Bangweulu**	Unchanged		1	1
- **Ngonye**	New		1	1
Indicator 3 Reduction of GHG emissions (tCO_2)	**Revised**	0	**148,500**	**101,920**
- **Bangweulu**	Unchanged		97,000	69,874
- **Ngonye**	New		51,500	32,046
Indicator 4 Share of installed solar PV generation capacity (%)	**Revised**	0%	**2.7%**	**2.9%**
- **Bangweulu**	Unchanged		1.7%	1.8%
- **Ngonye**	New		1%	1.1%
Indicator 5 Private capital mobilized (US$ million)	**Revised**	0	**24.6**	**24.6**
- **Bangweulu**	Unchanged		15	15
- **Ngonye**	New		9.6	9.6
Intermediate Outcome Indicators				
Solar energy generation capacity awarded (MW AC)	**Revised**	0	**75.7**	**75.7**
- **Bangweulu**	Unchanged		47.5	47.5
- **Ngonye**	New		28.2	28.2
Renewable energy generation capacity constructed – Solar (MW AC)	**Revised**	0	**75.7**	**75.7**
- **Bangweulu**	Unchanged		47.5	47.5

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Project Outcome Indicator	Status	Baseline (2016)	End Target (2019)	Actual Result (December 31, 2019)
- **Ngonye**	New		28.2	28.2
Renewable energy generated annually (GWh)	**Revised**	0	**161**	**104**
- **Bangweulu**	Unchanged		100	71.3 (April–December 2019)
- **Ngonye**	New		61	32.7 (June–December 2019)
Physical implementation progress (%)	**Revised**	0	**100%**	**100%**
- **Bangweulu**	Unchanged		100%	100%
- **Ngonye**	New		100%	100%
Commissioning test completed (Y/N)	**Revised**	N	**Y**	**Y**
- **Bangweulu**	Unchanged		Y	Y
- **Ngonye**	New		Y	Y

To Increase Solar Electricity Generation Capacity

38. The achievement of this objective was substantial. As of October 11, 2019, both solar plants were constructed, with a combined operational generation capacity of 75.7 MW. However, at the Project closing, the indicator on renewable energy generated annually was not fully met, driven by the actual timeline of the financial close and the power plants becoming operational. The main reasons for delays in reaching financial close are explained in section III.B.

39. The financial close for the Bangweulu project was achieved in March 2018, mobilizing US$15 million of private equity investment out of a total project cost of US$38.6 million. The power plant was constructed with a generation capacity of 47.5 MW, and President Lungu officially commissioned the plant on March 11, 2019. Supervision, including project quarterly operating reports, demonstrates that it has been successfully operational since the commissioning.

40. The financial close for the Ngonye project was achieved in May 2019, mobilizing US$9.6 million of private equity investment. Owing to the availability of the private equity financing, its construction started earlier and was completed by June 2019, with 28.2 MW generation capacity operational. During construction, physical implementation progress was monitored through project supervision missions and reported in Implementation Status and Results Reports (ISRs); the commissioning tests were completed as planned.

41. According to the project operating reports, as of December 2019, ZESCO had purchased 71.3 GWh electricity from the Bangweulu plant. The average monthly generation between May and December 2019, when the plant was functioning at full capacity, was 8.4 GWh. Moreover, the operating data for the first four months of 2020 suggest that, on an annual basis, the generation from the Bangweulu plant stood at 101.4 GWh, exceeding the annual target.

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Table 2. Monthly Generation at the Bangweulu Plant, 2019

2019	April	May	June	July	August	September	October	November	December
Monthly generation (MWh)	4,008	8,357	7,530	8,016	8,939	9,249	9,179	8,144	7,884

Source: Adapted from project operations report.

Table 3. Monthly Generation at the Bangweulu Plant, 2020

2020	January	February	March	April
Monthly generation (MWh)	7,313	6,526	8,055	8,190

Source: Bangweulu project company.

42. For Ngonye, according to its operating reports, as of December 2019, ZESCO had purchased 32.7 GWh electricity from the plant. The average monthly generation between June and December 2019, when the plant was functioning at full capacity, was 4.7 GWh. Moreover, the operating data for the first four months of 2020 suggest that, on an annual basis, the generation from the Ngonye plant stood at 51 GWh, slightly below the annual target.

Table 4. Monthly Generation at the Ngonye Plant, 2019

2019	June	July	August	September	October	November	December
Monthly generation (MWh)	4,629	5,311	4,499	4,479	4,709	4,159	4,954

Source: Adapted from project operations report.

Table 5. Monthly Generation at the Ngonye Plant, 2020

2020	January	February	March	April
Monthly generation (MWh)	4,116	3,828	5,062	5,273

Source: Ngonye project company.

To Diversify Electricity Generation Sources in Zambia

43. The achievement of this objective, measured primarily by the share of installed solar capacity, was high. The same set of outputs made a logical sequential contribution to the attainment of the second objective. Even though the IDA guarantees had a direct enabling impact on the generation of solar energy, the share of installed solar PV in the country's generation capacity due to the Project is modest (2.9 percent of the country's total generation capacity at the time of appraisal). Nevertheless, it represents 17 percent of the FY19–23 CPF target for Zambia, thus making an essential contribution to the achievement of the country's development objectives.

44. Finally, the Project's Results Framework included an indicator on reduced GHG emissions to demonstrate the additional benefit of diversifying generation sources. As this indicator is a derivative of the generated energy, the timing of the Project closing did not allow the full year to be taken into account and, hence, the target for GHG emissions reduction was not fully achieved at the Project closing. With approximately 70 percent of the target achieved in 7 to 10 months (101,920 tCO_2 GHG emissions avoided

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at the time of Project closing), in annual terms the achieved result stood at 148,372 tCO_2 GHG emissions avoided, slightly below the Results Framework target of 148,500 tCO_2.

Justification of Overall Efficacy Rating

45. Overall, the Project met the PDO. The first objective—to increase solar electricity generation capacity—is achieved, with the number of plants constructed and the installed capacity of 75.7 MW fully commissioned and operational. The second objective—to diversify electricity generation sources in Zambia—is exceeded: the share of the installed solar PV in the country's generation mix in the country is 2.9 percent, which is higher than the outcome target of 2.7 percent. The targets for renewable energy generated annually (104 GWh achieved at project closing versus the target of 161 GWh) and GHG emissions avoided (101,920 tCO_2 achieved at project closing versus the target of 148,500 tCO_2) were not fully achieved due to the timing of the projects' financial close and the plants' commissioning. Nevertheless, the project operating data from both plants for January to April 2020 suggest that on an annual basis, at the time of the ICR writing, the targets were almost fully achieved. Therefore, the efficacy of the PDO is rated *High*.

C. EFFICIENCY

Assessment of Efficiency and Rating

Rating of efficiency: Substantial

46. The economic analysis at closing was undertaken using the same methodology used at project preparation as detailed in the Project Appraisal Document for the Bangweulu project and the Project Paper for additional financing of the Ngonye project. The analysis identified that the main benefits of the Project (both the Bangweulu and Ngonye power plants) are the same and are aligned with the benefits at appraisal: (a) reduced load shedding, (b) improved availability of electricity, and (c) reduced GHG emissions from solar PV investments. The main costs of the Project included (a) capital costs of US$98.6 million to construct the solar power plants and (b) O&M costs for 25 years (life of the PPA).

Table 6. Costs and Benefits at Project Close

	Bangweulu	Ngonye
Costs		
Capital cost	US$60.2 million	US$38.4 million
O&M cost	US$0.49 million/year (and a total US$2.1 million of finance cost equally spread across 25 years)	US$0.21 million/year
Benefits		
PV capacity	47.5 MW AC (55 MWp DC)	28.2 MW AC (34 MWp DC)
Generation	71.3 GWh from April to December 2019, 94.0 GWh/year going forward	32.7 GWh from June to December for 2019, 64.9 GWh/year going forward
GHG emissions factor	0.98 tCO_2/MWh	0.98 tCO_2/MWh
Social cost of carbon	US$30/$tCO_2$	US$34/$tCO_2$ in 2019 US$39/$tCO_2$ in 2024

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Note: DC = Direct current.

47. The estimates at completion show that the Bangweulu project achieved 20.4 percent of the economic internal rate of return (EIRR) with a net present value (NPV) of US$43.9 million, and the Ngonye project achieved an EIRR of 18.2 percent and an NPV of US$41.2 million. The Ngonye project has exceeded the expectations at appraisal because the project's O&M cost was only 20 percent of what was estimated (US$0.21 versus US$1.18 per year at appraisal). The cost is lower than expected because the economic analysis used a conservative estimate for the O&M cost. Conversely, the EIRR and NPV of the Bangweulu project are slightly lower than expected at appraisal, and it is mainly due to delayed financial close, which caused a one-year delay in commercial operations (commercial operation date, COD).

Table 7. Economic Analysis at Project Close

		EIRR (%)	NPV (US$, millions)
Bangweulu	Appraisal	22.3	49.6
	Completion	20.4	43.9
Ngonye	Appraisal	18.1	37.3
	Completion	18.2	41.2

48. Without the Project, ZESCO would have procured an equivalent amount of power through emergency imports, mainly from Mozambique (Electricidade de Moçambique- EDM) and South Africa (ESKOM). The average cost of emergency power then was US¢12.9 per KWh. In comparison, the cost of supply from the Bangweulu and Ngonye plants was around half of that cost.

Implementation Efficiency

49. Implementation efficiency assesses the following aspects of the Project implementation: (a) successfully reaching financial close with highly competitive PPA tariffs and (b) mobilizing private sector financing for the construction and commissioning of the power plants.

50. First, both the Bangweulu and Ngonye projects went through a transparent and competitive procurement process, which attracted reputable sponsors and resulted in the lowest tariffs (US¢6 per kWh and US¢7.8 per kWh non-indexed, respectively) in the Sub-Saharan African region at the time (see figure 3). Even though the financial close took longer than expected at project appraisal, the construction, commissioning, and start of operations were implemented smoothly (in about a year's time). The implementation experience is a clear example of the benefits of a properly prepared, competitively tendered approach to procuring IPPs and has strengthened the data set demonstrating solar as a truly competitive form of power generation.

51. Although reaching financial close took longer than expected at project appraisal, both the Bangweulu and Ngonye projects were among the fastest implemented and the cheapest priced in Sub-Saharan Africa. This is particularly true in comparison to unsolicited projects that usually take much longer (contrary to their usual claim to governments that they can deliver fast) and result in higher prices.

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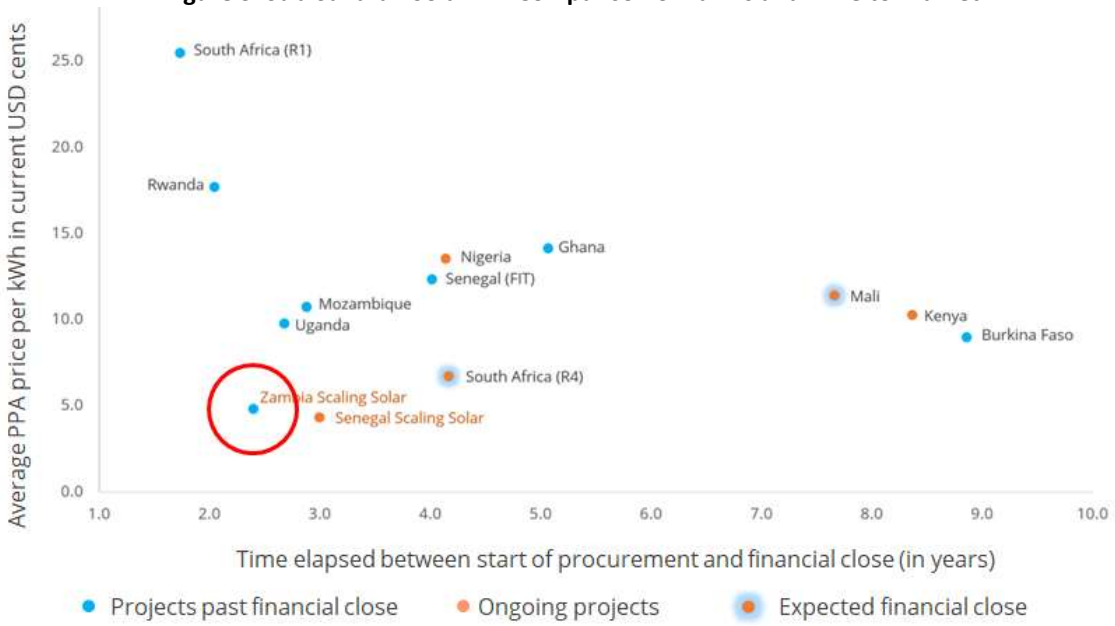
Figure 3. Sub-Saharan Solar PV: Comparison of Tariffs and Time to Market



Note: As of Zambia Scaling Solar Project financial close.

52. Second, the two IDA guarantees, totaling US$5.7 million, have successfully mobilized US$105.5 million of financing, including US$24.5 million of private capital. This financing supported the construction and commissioning of the two power plants, which were implemented by the project companies. Both power plants reached COD in April and June 2019, respectively.

53. Thus, the Project's efficiency rating at Project close is Substantial.

D. JUSTIFICATION OF OVERALL OUTCOME RATING

Overall rating: Satisfactory

54. The overall outcome is rated Satisfactory. Even though the *High* relevance, *High* efficacy, and *Substantial* efficiency ratings warrant the Project's overall rating to be Highly Satisfactory, the Satisfactory rating reflects the high risks related to the Project's sustainable operation given the lack of earlier expected reforms in the sector and deteriorating financing situation of ZESCO.

E. OTHER OUTCOMES AND IMPACTS (IF ANY)

Institutional Strengthening

55. The Project contributed to the strengthening of the IDC's institutional capacity through the broader Scaling Solar program framework. The appointment of IFC Advisory as transaction adviser to prepare and execute the tender, including the bidding documents, provided an on-the-job learning experience for the IDC in competitively procuring solar IPPs (some of this experience was unfortunately lost by the replacement of part of IDC's management during implementation, but experienced technical

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staff remain). The IDC's institutional capacity to manage public-private partnership-type contracts is also currently enhanced by its experience of overseeing the O&M of the two power plants as well as its role as a shareholder in the project companies. In addition, other key stakeholders—ZESCO and MoE—acquired understanding of the competitive procurement processes and how to use this method to achieve low-cost and efficient implementation.

56. Accumulating such experience is particularly important in a context where the GRZ had previously entered into several memorandums of understanding for unsolicited proposals to construct solar PV power plants. Following the successful outcome of the first auction, the MoE issued, in 2016, a circular on its 'Medium term policy direction for developing on-grid solar projects'. This circular identified a total amount for on-grid solar energy and invited potential investors to either participate in the then planned next round of Scaling Solar (up to 300 MW) and or in the GET FiT (Global Energy Transfer Feed-in Tariff) Program (up to 120 MW). The GRZ's decision at the time to provide clarity, prevent unsolicited bids, and solely use competitive auctions, was a positive step forward.

57. Finally, the experience of the Project's preparation and implementation has led to key stakeholders appreciating better the need for system plans—and later amendments incorporated in the country's grid code—to include technical specifications for the integration of large-scale renewable energy plants.

Mobilizing Private Sector Financing

58. The Project has had positive impacts in Zambia in terms of showing the benefits and value of a clear and transparent tendering process. Successful unsolicited bids became less common after the Scaling Solar auction. The ability of the key stakeholders—the IDC and ZESCO—to conduct the transactions created confidence that the national counterparts have the experience and skills required to conduct competitive, transparent, and well-structured procurement of large infrastructure projects. Subsequently, the GET FiT program led by the MoE in partnership with the German Development Bank, *Kreditanstalt für Wiederaufbau* (KfW), applied a similar approach (including stapled financing and payment risk mitigation from the African Trade Insurance agency). In April 2019, the GET FiT awarded six solar PV IPP projects, totaling 120 MW AC, at an impressively low average price of US¢4.41 per kWh. However, these projects have not yet reached financial close. The Project could have had significantly greater impact in catalyzing additional private sector investments and commercial financing. However, the continued deterioration of the macroeconomic and sector situation prevented significant further investment.

Poverty Reduction and Shared Prosperity

59. The Project had an indirect impact on poverty reduction and shared prosperity. The tariffs achieved were significantly lower than expected by the World Bank Group teams for a solar IPP in Sub-Saharan Africa, having a positive impact on the average cost of supply of electricity. This contributes toward the sustainable expansion of electricity access in the long term.

Other Unintended Outcomes and Impacts

60. There were no other unintended outcomes and impacts.

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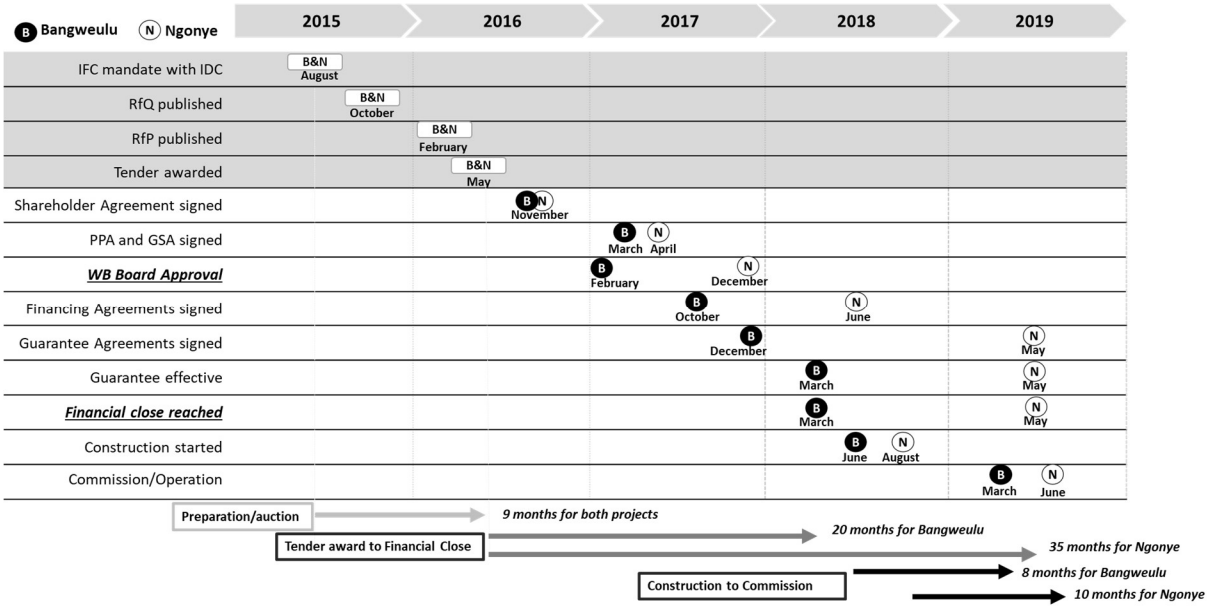
III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOMES

61. The Project closed on December 31, 2019, delivering the results as planned. Figure 4 shows the timeline of milestones across Project preparation and implementation.

Figure 4. Project Preparation and Implementation Timeline[5]



Note: Time between signature and financial close/guarantee effective is due to the parties meeting several conditions precedent, of which the guarantee was one. RfQ = Request for quotation; WB = World Bank.

A. KEY FACTORS DURING PREPARATION

62. While Zambia showed strong political commitment at the highest levels to developing on-grid solar power projects, at the working level, support of the Project was initially muted. In 2015, the GRZ announced its interest in developing on-grid solar power projects and set the target of achieving 600 MW of solar generation. It further requested ZESCO to carry out a study of its transmission system to determine how much solar energy can be injected without compromising system integrity. However, at the lower levels, there was no available supporting system to facilitate a transparent and competitive bidding process. ZESCO and the MoE received many unsolicited bids for solar PV IPPs, which created challenges, posing risks of the provision of poor value for money. Following up on this political commitment and responding to the challenges faced by the sector, the World Bank Group engaged with the GRZ to initiate the Scaling Solar auction. The IDC led that engagement from the GRZ's side while ZESCO and the MoE were initially less involved. They progressively realized the benefits of a competitive bidding process and became more supportive.

[5] The timeline shows the project development time from the initiation of the competitive bidding process to the commissioning of the power plants.

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63. In such an environment, with no clear initial championing counterparts at the working level, the support to the GRZ from IFC Advisory during the auction preparation process was important. Close coordination among IFC, the World Bank, and MIGA team ensured no gaps in advice to and communication with the GRZ. The prefeasibility work on the first two plants informed the design of the competitive procurement process carried out by the IDC. The Project was well prepared before Board approval, as the IDC had awarded the two subprojects, the SPV for Bangweulu Solar Plant was established, the IDA payment guarantees and IFC investments were under advanced preparation (including development of a joint sector financial model), and the Environmental and Social Action Plan (ESAP) was developed based on joint IFC/World Bank E&S performance standards. Both project companies also signed contracts with reputable companies for engineering, procurement, and construction and O&M.

64. The Project also conducted proper analysis of the key risks, developed relevant mitigation measures, and implemented some measures during Project design through its transaction adviser - IFC Advisory. At the stakeholder level, the Project identified that the IDC was a new institution with an evolving relationship with ZESCO, and the overall institutional capacity of the client was low. To support institutional capacity, during Project preparation, IFC Advisory provided the IDC and other key government stakeholders with on-the-job training in carrying out open and competitive tenders. It helped the IDC and the GRZ prepare for Project implementation. The IDC led a transparent procurement and contract award process with guidance from IFC Advisory. This led to low tariffs and a high quality of sponsors for both solar IPPs.

65. However, there were some challenges: (a) the IDA E&S team had limited experience with the E&S performance standards that were applied for the investment, and this led to initial misunderstandings of requirements for the E&S work; (b) the site due diligence had to be comprehensive requiring more than initially expected resources to ensure that there were no surprises during the Project implementation; and (c) the document processing and approval timelines were overambitious, given the complex nature of Project financing and the processes within and across all counterparts involved in this transaction (World Bank Group, lenders, sponsors, LC bank, and so on). Better measures could have been developed to mitigate the risks for such a complicated coordination.

66. Overall, the Project was well prepared. The Project's design was characterized by clear operational logic, which allowed the Project to be implemented on time.

B. KEY FACTORS DURING IMPLEMENTATION

67. Project implementation covered a period of 35 months from Board approval in February 2017 to Project close in December 2019. Implementation involved reaching financial close and constructing, commissioning, and operating the two solar IPPs.

Factors Subject to Government and/or Implementation Entities' Control

68. **Timeline between award and financial close.** Although both the Bangweulu and Ngonye projects reached financial close relatively quickly compared with other similar projects in the region, the process still took longer than expected at project appraisal. Table 8 shows the expected and actual financial close and COD. Several factors explain the shift in the expected timeline for the financial close:

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(a) First, for the Ngonye project site, an earlier boundary coordinates error was discovered during the detailed technical design process. The correction of this required a coordinated effort from various GRZ agencies that took time to organize.

(b) Second, the grid code was not adapted to renewable energy projects, and the solar IPPs had to be granted exemptions to be connected to the grid.

(c) Third, the process of obtaining the generation license from the Energy Regulation Board (ERB) was difficult and time-consuming and took longer than initially envisaged, given a lack of experience in integrating large-scale solar IPPs. To address the obstacles, the ERB proactively established an interim solution for the plant to achieve COD, by issuing a provisional generation license.

(d) Finally, it took the parties longer to finalize and sign all the legal agreements due to the volume and complexity of the documentation required by project finance transactions, lack of experience with such processes in Zambia, and close scrutiny of key agreements, such as the Common Terms Agreement between lenders and the LC documents.

Table 8. Financial Close and Commercial Operations Dates at Appraisal Versus at Completion

	Bangweulu		Ngonye	
	At Appraisal	**At Completion**	**At Appraisal**	**At Completion**
Financial close	July 2017	March 2018	January 2018	May 2019
Commercial operations	May 2018	March 2019	November 2018	June 2019

69. **Coordination among government agencies was complicated**. The Project would have benefited from closer coordination among key stakeholders in Zambia, especially the MoE and the IDC. The MoE used to play a leading role in the energy sector and its key staff were still adjusting to the more limited role of a policy-setting institution, leaving the shareholding and implementation roles to other agencies. There was initial confusion as to the boundaries of the IDC's new roles as a ZESCO shareholder and an implementation entity for the Scaling Solar program. The lack of coordination, at times, led the MoE and the IDC to perceptions of partially overlapping mandates in developing renewable energy programs, resulting in limited collaboration and inefficiencies. The establishment of an inter-ministerial committee, chaired by the MoE Permanent Secretary, proved helpful in resolving inter-agency tensions and expediting implementation.

70. **Lack of sector reforms.** Although the IDA payment guarantee helped the private sector mitigate payment risk, the key sector issues (tariffs below cost recovery levels and high operational losses) needed to be addressed to improve the sector's financial health and reduce the need for government transfers. However, despite extensive discussions with IDA and other donors and tentative action plans, the GRZ did not launch any substantial sector reform. The AfDB-financed cost of supply study, which would serve as a basis for tariff reform and the medium-term tariff policy, suffered many delays. The AfDB was also preparing a Development Policy Operation (DPO) for the energy sector, which the World Bank was coordinating closely, but it did not proceed in the end.

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Factors Subject to World Bank Control

71. The World Bank's coordination with IFC Investment was excellent, in particular on due diligence, including sector financial evaluation and implementation supervision. The IFC and World Bank teams conducted joint missions in 2018 and 2019 to supervise the power plants' construction and operations. The respective teams also coordinated in monitoring ZESCO's payments to the two developers, promptly following up to mitigate the risks of potential payment delays.

Factors Outside the Control of Government and/or Implementation Agencies

72. **Macroeconomic environment.** The Scaling Solar program was implemented when Zambia's macroeconomic situation started to deteriorate due to lower-than-expected copper prices.

73. **Frequent drought and its impact on ZESCO's financial viability.** In 2015–16 and 2018–19, two droughts hit Zambia, deteriorating ZESCO's financial viability. ZESCO continued to make payments to the Scaling Solar IPPs, close to or on the due dates, but accumulated arrears toward other larger and more expensive IPPs. Due to the deteriorating financial viability, ZESCO has been making payments 'at the last minute', sometimes requiring World Bank Group engagement to ensure that the payments are made on time.

IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOMES

A. QUALITY OF MONITORING AND EVALUATION (M&E)

M&E Design

74. Overall, the Project presented a sound results chain, clearly linking the Project inputs, activities, and outputs to the intended objectives, specifying the role of the IDA guarantees within the framework of the Scaling Solar program, and providing a logical sequence of the outputs necessary to achieve the PDO. The intended results were generally well reflected in the Project's Results Framework, which presented a set of valid indicators to measure the attainment of the PDO. The indicators were specific, measurable, achievable, and time bound; however, there were minor shortcomings in the design of the indicators.

75. Some indicators that measured the same result were included at both outcome and intermediate outcome level. For example, there was an intermediate indicator on renewable energy generation capacity constructed and there was an indicator at the Project outcome level for number of power plants constructed. This was an unnecessary repetition and did not follow the sequence of results (outcome-level indicators measure the attainment of the PDO, while the number of power plants constructed is a target for an output).

76. The indicator used to measure one of the PDOs—to diversify electricity generation sources in Zambia—was a valid measure of the intended outcome: renewable energy generated annually (GWh). Even though this indicator was expected to measure the PDO, it was included as an intermediate indicator

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in the Results Framework. This is a minor flaw of the M&E design, as the level of the indicator contradicts the logical sequence of results in the TOC.

M&E Implementation

77. The M&E implementation quality was satisfactory. The progress on the Results Framework indicators was measured during the supervision missions and properly reported in the ISRs. The targets of all indicators were properly revised upon the addition of the second IDA guarantee for the Ngonye project.

78. The project operation reports served as the primary source of data for the indicators and provided reliable and good quality data to measure progress. Nevertheless, the quality and timeliness of information from the Ngonye project was lower than for Bangweulu. The IFC and World Bank teams are collaborating to ensure the Ngonye project improves its reporting post-closing.

M&E Utilization

79. One specific positive aspect of the M&E utilization is that the M&E data were used to collect evidence for the achievement of the Project outcomes, as opposed to only measuring the physical progress of power plant construction. Nevertheless, the timing of the financial close and the subsequent shift in the timeline for the power plants to become operational could have been used to revise the target of the renewable energy generated indicator from annual to monthly, as both power plants were constructed and became operational several months before Project completion.

Justification of Overall Rating of Quality of M&E

80. Overall, the design of the M&E system was sufficient to assess the achievement of the objectives and reflect the adequate links in the results chain. Therefore, the quality of M&E is rated Substantial.

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

81. **Environmental and social.** The Project was classified as environmental category B (Partial Assessment). Five of the eight Performance Standards for Private Sector Activities (OP/BP 4.03) were applied for the guarantee project, and due diligence work was led by IFC. Environmental and Social Action Plans (ESAP), which were required by the Financing Agreements for both solar IPPs, were finalized by the developers and are currently under implementation. During the implementation period, the Environmental Plan, resettlement, and overall safeguard rating was Satisfactory. The 2019 Annual Monitoring Reports (AMRs) indicated that the projects are in compliance with applicable E&S requirements and all actions have been undertaken pursuant to the ESAPs. In addition, E&S supervision, including site visits, has shown compliance with social safeguards requirements during Project implementation, and the overall health and safety standards have been good. Moreover, the community development plan has been developed, agreed, and implemented to help accelerate the economic development of the neighboring communities.

82. **Fiduciary.** The overall financial management performance was rated satisfactory throughout Project implementation. Given the nature of IDA guarantees, there were no disbursements. However,

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there are financial management arrangements for the payment guarantees and the project companies. ZESCO procured competitively, with IDA support, two LCs, one for each project, from Standard Chartered Bank. The payment guarantees cover the repayment by the GRZ and ZESCO to Standard Chartered Bank, in case of a draw on the LCs. The process has been successfully established. At the project company level, the SPVs install and maintain financial management systems and report financial performance in quarterly operations and AMRs.

C. BANK PERFORMANCE

Quality at Entry

83. The Project was well designed to ensure smooth implementation and to achieve its PDO. However, there were some minor gaps at entry that could have improved Project design, and therefore quality at entry is rated Satisfactory.

84. Positive attributes at entry are as follows:

- The Project concept was highly relevant to Zambia's CPF (increase access to electricity, catalyze private sector investment, and improve quality of electricity services). The choice of IDA guarantees responds to the need to mobilize private sector financing, which is appropriate. The IDA payment guarantees, along with DFI (IFC, OPIC, EIB) and private sector financing, helped Zambia increase solar generation and diversify its energy mix.

- The economic analysis considered various scenarios and confirmed the Project was robust under various conditions.

- The Project conducted detailed E&S due diligence, developed specific ESAPs, and ensured the enforcement of ESAPs by including its implementation in the Financing Agreements.

- The Project included clearly structured contractual arrangements, designed in close coordination between IFC and the World Bank. The Project design also indicated appropriate timing and sequencing of key tasks.

- The roles and responsibilities of the MoF, MoE, IDC, and ZESCO were clearly stated in project implementation documents, although practical coordination proved difficult.

- The M&E arrangement was clear and easy to follow.

- Most of the risks associated with the implementation of the Project were analyzed, and appropriate mitigation measures were identified in the appraisal document.

- The sector strategies and policies risk, namely ZESCO's deteriorating financial situation, was properly assessed and identified as high. To mitigate the risk, parallel activities were under preparation or initiated. In particular, the AfDB was financing a cost of supply study and was preparing a DPO for the energy sector, in cooperation with the World Bank.

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85. Gaps at entry include the following:

- In Zambia, the World Bank did not have engagements with other instruments, such as a DPO or a Program-for-Results, to maintain a strong sector dialogue and provide necessary support and incentives to improve the financial viability of the sector. An AfDB-led DPO was expected to proceed and would have had a positive impact on ZESCO's financial situation. However, after Board approval, the macroeconomic and sector situation continued to deteriorate (as noted in ISRs, for instance in June 2018) and the AfDB did not proceed with the DPO. IDA engaged with the GRZ to prepare a new operation to improve sector sustainability but there was not enough political willingness in the GRZ to pursue this.

Quality of Supervision

86. The World Bank's supervision and implementation support of the Project, in coordination with IFC, was satisfactory. The two solar IPPs were able to reach financial close in a short period and the Project achieved its PDO with limited delays. Therefore, it is rated Satisfactory.

87. Positive attributes of supervision are as follows:

- Regular supervision missions, with a focus on technical aspects and safeguards, were carried out by the World Bank and IFC teams, both jointly and individually.

- The operations reports were overall consistent with World Bank and IFC supervision findings (although the ones for the Bangweulu project were more detailed and on time than for the Ngonye project).

- Processing the Ngonye project by using the additional financing instrument rather than as a separate stand-alone project brought efficiencies to the overall Project preparation and in turn reduced transaction costs and processing times. However, in retrospect, it would have been possible to process both projects at the same time without delaying Bangweulu's financial close.

- The World Bank Group proactively monitored payments from ZESCO to the IPPs by, for example, sending payment reminders to ZESCO, the IDC, and the MoE during supervision missions. The World Bank Group also proactively reached out to both developers and sector officials and initiated a working group, chaired by the MoE Permanent Secretary, to meet regularly to monitor the Project's implementation progress and facilitate discussions to resolve pending issues. Moreover, as the Chair to the Cooperating Partner Group, the World Bank Group used the donors' coordination platform to develop consolidated positions on policy issues and to ensure other donors were aligned.

88. A gap during supervision was not adjusting the M&E framework: the timing of the financial close and the subsequent shift in the timeline for the power plants to become operational could have been used to revise the target of the renewable energy generated indicator from annual to monthly, as both power plants were constructed and became operational several months before Project completion.

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Justification of Overall Rating of Bank Performance

89. The Project was adequately designed to meet its objectives. The overall rating for the World Bank performance is Satisfactory.

D. RISK TO DEVELOPMENT OUTCOME

90. As of December 2019, ZESCO had accumulated arrears estimated at over US$1 billion, of which more than US$700 million were to IPPs. This accumulation was, in particular, triggered by the droughts and the related addition of several expensive IPP projects. Meanwhile, the country's macro-fiscal environment has continued deteriorating due to a combination of external shocks and sub-optimal fiscal policy, making the budgetary support of the GRZ less likely despite increasing need for it in the sector. Given that ZESCO is fully owned by the GRZ, its payment obligations to lenders and suppliers eventually have to be covered by the GRZ. However, the sovereign debt has soared to US$11.5 billion, putting the GRZ in debt distress at the time of writing this ICR. Zambia's credit ratings during preparation (B3 by Moody's, B by S&P, B by Fitch in 2016) has significantly deteriorated since (Ca by Moody's, CCC by S&P, and CC by Fitch, by May 2020) and the GRZ appointed Lazard to assist in debt restructuring in May 2020.

91. ZESCO's deteriorating financial situation and the lack of a parallel World Bank project to improve overall sector performance and financial viability increase the risk of ZESCO failing to make a payment under the PPAs. As evidenced from interviews with the project sponsors and their operations reports, ZESCO has been making payments 'at the last minute', sometimes requiring World Bank Group engagement to ensure that the payments are made on time.

92. The COVID-19 pandemic has also exacerbated the risk to the development outcome in the short term. Ensuring continued power supply is a key area of World Bank action to mitigate the negative impacts of the pandemic. Like many utilities, ZESCO faces lower demand given the economic slowdown caused by the pandemic and some of its largest mining consumers face declining commodity prices. While demand and revenues decrease, ZESCO's costs do not reduce accordingly. ZESCO's take-or-pay obligations in its IPP contracts, especially for the larger and more expensive IPPs, risk further straining ZESCO's financial situation.

V. LESSONS AND RECOMMENDATIONS

Lessons from the Scaling Solar Approach

- A small, transparent, and competitive tender process for IPPs can have a sizable regional impact, including lowering the benchmark on tariffs and bringing in strong developers into new markets. Such projects helped demonstrate, among other market signals, the value of competitive auctions for solar and brought practical experience to the region. However, a recent GRZ return to unsolicited and nontransparent projects shows that vested interests remain strong despite the clear benefits of transparent and competitive processes.

- Streamlining processes and documentation reduce transaction times and costs. The template documents, particularly the PPA and GSA, were attached to the RfP and clearly stated as non-

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negotiable documents. This saved some back and forth and expedited the transaction process, although they were still subject to some limited negotiations, especially regarding issues that appeared after the bid award.

Impact of IDA Guarantees

- The IDA guarantee is a powerful instrument to mobilize private financing and improve financing terms. It has demonstration effects in scaling up private sector investment in a country's power sector. It also signals to the market that the country is working toward guiding the sector in the right direction. However, the project's intended catalytic effect in scaling up the private sector in the country remains limited if there is a lack of government commitment to implement power sector reforms required to improve sector's financial sustainability.

- Guarantees alone are not well suited to be the sole instrument for sector reforms. Other suitable World Bank instruments, in coordination with the guarantees, need to be in place, or sufficiently advanced, at time of Board approval to support required reforms in the sector and to sustain the demonstration effect.

- At the project level, the guarantee exposure and the level of risk are lower if (a) the PPA tariff of the guaranteed project is lower than the average tariff and (b) the size of the off-taker's payment for the guaranteed project is relatively small, as is the case in Zambia.

Key Factor during Project Preparation

- The trade-off between the speed of preparation of the auction and the thoroughness of the requisite studies should be considered. The pre-tender due diligence, especially regarding land ownership, land rental agreements, and geotechnical studies, should be sufficiently thorough to inform the project design, create assurance for the developers during the bidding process, and avoid surprises to developers and their lenders after award. In this case, further technical studies may have prevented certain issues. However, some issues are also hard or impossible to anticipate, and stakeholders need to be prepared to work cooperatively to overcome them.

- Teams should discuss local participation with the Government early on. Governments have high expectations for local participation, and misunderstandings are common. It is in the best interest of the country to use the best firms globally to obtain a low tariff for all users and ensure that the selected firm can mobilize the financing and get the project done. Whether the lead sponsor is local or international, the share of costs and work from the country or from outside will be roughly the same (for instance, panels will come from outside while many construction jobs will be local). Governments should communicate that the project will generate local jobs and opportunities, regardless of the firm which wins it. Governments can also create more opportunities via smaller projects. In Zambia, the GRZ decided to use the Scaling Solar program to attract global developers while originally designing GET FiT for smaller projects.

- Conducting a political economy assessment is critical at the early stages, and strong political commitments need to be quickly transformed into specific practical actions. In addition, to avoid

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project implementation delays, there needs to be clarity regarding roles and responsibilities among key stakeholders early on.

World Bank Group Joint Project Supervision

- IFC and the World Bank coordination can bring together their respective strengths to deliver results in difficult environments. For projects where IFC and the World Bank need to coordinate their E&S due diligence, an early engagement with more systematic mechanisms to track progress can help speed the process. While IFC E&S teams are well placed to lead, IDA E&S teams have to quickly step up their knowledge of performance standards and remain involved throughout.

- The IDA team needs adequate resource for supervision and monitoring until the guarantee expires. Risks can become more prominent after the project closing date, as is the case in Zambia.

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ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: The project development objective is to increase solar electricity generation capacity and diversify electricity generation resources in Zambia.

Indicator Name	Unit of measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Generation capacity of energy constructed	MW	0 16-Feb-2017	47.5 15-Oct-2018	75.7 31-Dec-2019	75.7 31-Dec-2019

Comments (achievements against targets):

Indicator Name	Unit of measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of solar PV plants constructed	Number	0 16-Feb-2017	1 15-Oct-2018	2 31-Dec-2019	2 31-Dec-2019

Comments (achievements against targets):

Indicator Name	Unit of measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Reduction of GHG emissions	tCO2	0 16-Feb-2017	97,000 15-Oct-2018	148,500 31-Dec-2019	101,920 31-Dec-2019

Comments (achievements against targets): The target was for GHG emission reduction of one year. However, due to slightly delay of financial cl
Bangweulu started operational in April 2019 and Ngonye started operational in June 2019. The actual GHG reduction achieved is from less than o
year's of operation, and thus less than expected.

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Indicator Name	Unit of measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Share of installed solar PV generation capacity	%	0 16-Feb-2017	1.7% 15-Oct-2018	2.7% 31-Dec-2019	2.9% 31-Dec-2019

Comments (achievements against targets):

Indicator Name	Unit of measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Private capital mobilized	US$ million	0 16-Feb-2017	15 15-Oct-2018	24.6 31-Dec-2019	24.6 31-Dec-2019

Comments (achievements against targets):

A.2 Intermediate Results Indicators

Indicator Name	Unit of measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Solar energy generation capacity awarded	MW AC	0 16-Feb-2017	47.5 15-Oct-2018	75.7 31-Dec-2019	75.7 31-Dec-2019

Comments (achievements against targets):

Indicator Name	Unit of measure	Baseline	Original Target	Formally Revised Target	Actual Achieve Completion
Renewable energy generation capacity constructed – Solar	MW AC	0 16-Feb-2017	47.5 15-Oct-2018	75.7 31-Dec-2019	75.7 31-Dec-2019

Comments (achievements against targets):

Indicator Name	Unit of measure	Baseline	Original Target	Formally Revised Target	Actual Achieve Completion

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Renewable energy generated annually	GWh	0 16-Feb-2017	100 15-Oct-2018	161 31-Dec-2019	104 31-Dec-2019

Comments (achievements against targets): Due to slightly delay of financial close, Bangweulu started operational in April 2019 and Ngonye started operational in June 2019. Both projects has been operational for less than a year, the actual energy generation achieved is lower than the target. It is expected that the annual renewable energy generation will meet the target.

Indicator Name	Unit of measure	Baseline	Original Target	Formally Revised Target	Actual Achieve Completion
Physical implementation progress	%	0 16-Feb-2017	100 15-Oct-2018	100 31-Dec-2019	100 31-Dec-2019

Comments (achievements against targets):

Indicator Name	Unit of measure	Baseline	Original Target	Formally Revised Target	Actual Achieve Completion
Commissioning test completed	Y/N	N 16-Feb-2017	Y 15-Oct-2018	Y 31-Dec-2019	Y 31-Dec-2019

Comments (achievements against targets):

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B. KEY OUTPUTS BY COMPONENT

Objective/Outcome 1: Private sector-led solar PV generation capacity becoming operational	
Outcome Indicators	1. Generation capacity of energy constructed 2. Reduction of GHG emissions 3. Private capital mobilized
Intermediate Results Indicators	1. Renewable energy generated annually
Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)	1. 75.7 MW of generation capacity awarded to reputable international developers (commercial close) 2. US$24.6 million of private capital mobilized (financial close) 3. Two solar power plants constructed 4. Solar electricity sold to ZESCO, off-taker under the PPA
Objective/Outcome 2: Increased share of installed solar PV in the country's generation mix	
Outcome Indicators	1. Share of installed solar PV generation capacity 2. Number of solar PV plants constructed
Intermediate Results Indicators	1. Solar energy generation capacity awarded 2. Renewable energy generation capacity constructed - Solar 3. Physical implementation progress 4. Commissioning test completed
Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	1. 75.7 MW of generation capacity awarded to reputable international developers (commercial close) 2. US$24.6 million of private capital mobilized (financial close) 3. Two solar power plants constructed 4. Solar electricity sold to ZESCO, off-taker under the PPA

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ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION

A. TASK TEAM MEMBERS

Name	Role
Preparation	
Mirlan Aldayarov, Arnaud Braud	Task Team Leader(s)
Wedex Ilunga	Procurement Specialist
Lingson Chikoti	Financial Management Specialist
Joseph Mwelwa Kapika	Team Member
Jaeyoung Jin	Team Member
Anthony Molle	Legal (Guarantees)
Ximena Talero	Legal (Guarantees)
Monica Restrepo	Legal (Guarantees)
Kenta Usui	Team Member
Arsh Sharma	Team Member
Kabir Malik	Team Member
Sameer Shukla	Operations Adviser
Juliana Victor	Operations
Mwansa Lukwesa	Environmental Safeguards
Richard Everett	Social Safeguards
China Chhun	Operations
Supervision/ICR	
Mirlan Aldayarov, Arnaud Braud	Task Team Leader(s)
Wedex Ilunga	Procurement Specialist
Lingson Chikoti	Financial Management Specialist
Joseph Mwelwa Kapika	Team Member
Jaeyoung Jin	Team Member
Samuel Kwesi Ewuah Oguah	Team Member
Ximena Talero	Counsel

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Anthony Molle	Team Member
Yi Xu	Team Member
Njavwa Namposya Chilufya	Social Safeguards Specialist
Martin Stalman	Team Member
Anna Aghababyan	Team Member

B. STAFF TIME AND COST - (P157943)

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US$ (including travel and consultant costs)
Preparation		
FY16	26.19	112,328.10
FY17	38.09	193,418.27
Total	64.28	305,746.37
Supervision/ICR		
FY18	16.29	112,705.76
FY19	10.06	61,536.00
FY20	15.30	88,924.18
Total	41.65	263,165.94

A. STAFF TIME AND COST - (P163958)

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US$ (including travel and consultant costs)
Preparation		
FY17	3.88	14,680.00
FY18	15.22	82,687.37
Total	**19.10**	**97,367.37**
Supervision		
FY19	0.32	1,800.36

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FY20	0.69	3,794.62
FY21	0.52	2,908.28
Total	**1.53**	**8,503.26**

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ANNEX 3. PROJECT COST BY COMPONENT

Components	Amount at Approval (US$, millions)	Actual at Project Closing (US$, millions)	Percentage of Approval
IDA guarantee	5.7	0.0	100
Construction and operation of Bangweulu and Ngonye solar power plants	105.5	105.5	100
Total	111.2	105.5	100

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ANNEX 4. EFFICIENCY ANALYSIS

ECONOMIC ANALYSIS

At Appraisal

1. The economic analysis assessed the economic viability of the 47.5 MW solar PV power plant (Bangweulu) using a cost-benefit analysis. The benefits include (a) reduced ongoing load shedding, (b) improved availability of electricity, and (c) avoided GHG emissions from solar PV investment. The economic costs for the Project comprise the capital cost of the Project, estimated at US$59 million (or US$1.26 million per MW capacity) according to the winning bid, and O&M cost (US$1.05 million per year for 25 years). The cost of the incremental use of power transmission and distribution facilities was not considered as these facilities were already available at the project sites.

Additional Financing

2. The additional financing of the Project was to develop an additional 28.2 MW solar PV power plant (Ngonye) and the Project benefits included (a) consumers securing new power supply from the Project, and (b) GHG emissions reduction. The cost of the Project included capital investment in the PV plant (US$38.4 million) and the O&M cost (increasing from US$1.18 million in 2019 to US$1.32 million in 2043). The economic analysis projected that the generation would be 64.94~57.59 GWh per year.

At Completion

Project Benefits

3. At completion, the economic analysis identified that the main benefits of the Project were aligned with the benefits at appraisal: (a) reduced load shedding, (b) improved availability of electricity, and (c) avoided GHG emissions from solar PV investments.

4. Both power plants started operations in April and June 2019, respectively. Table 4.1 summarizes the monthly generation from the start of plant operations to the Project close. Due to the delay in financial close, both plants started operations late and thus the first year's generation amount (energy sent out) was lower than expected. However, starting in 2020, both plants will be able to produce the expected amount of power.

Table 4.1. Monthly Generation from Operational Start to Project Close (MWh)

	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
Bangweulu	4,008.2	8,357.0	7,530.0	8,016.4	8,939.3	9,248.6	9,179.1	8,143.7	7,884.3
Ngonye	—	—	4,628.99	5,310.8	4,498.9	4,479.3	4,709.3	4,159.2	4,954.1

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5. The power generated was valued as the consumer's willingness to pay (WTP) for electricity supply. The economic analysis uses estimates of average WTP for the Project at ZMW 2.1 per KWh[6] (which is approximately US$0.128 per kWh at the current exchange rate).

6. In addition, the Project also avoided GHG emissions associated with emergency power imports (such as from ESKOM) and from replacing diesel power generation. This avoidance started in 2019 and will continue for at least 6 years, or even longer, if the operations of Kafue Gorge Lower Hydroelectric plant are delayed due to ZESCO's vulnerable financial situation. The GHG emissions factor is 0.98 tCO_2 per kWh, which translates to at least 822,621.36 tCO_2 avoided from the Bangweulu and Ngonye power plants.

Project Cost

7. At completion, the total project cost for the Bangweulu and Ngonye plants, funded by debts from DFIs and equity from the developer, is US$98.56 million. This is in line with the expected capital costs at appraisal. The annual O&M cost for the first year was much lower than expected. Bangweulu's O&M cost was US$0.486 million and Ngonye's was US$0.21 million.

8. Table 4.2 provides a detailed comparison of project costs and benefits at appraisal and at project close (completion).

Table 4.2. Comparison of Cost and Benefit Estimates at Appraisal and at Completion

Bangweulu		
General	**At Appraisal**	**At Completion**
Project lifetime	25 years starting 2017	25 years starting 2019
Discount rate	6%	6%
Cost		
Capital cost	US$58.8 million	US$60.16 million
O&M cost	US$1.05 million per year for 25 years	US$0.486 million per year
Finance cost	US$2.1 million	US$2.1 million
Benefit		
WTP	US$0.129/kWh	US$0.128/kWh
PV capacity	47.5 MW AC (55 MWp DC)	47.5 MW AC (55 MWp DC)
Generation	94 GWh/year	71.3 GWh from April to December 2019, 94 GWh/year going forward
GHG emissions factor	0.98 tCO_2/MWh	0.98 tCO_2/MWh
Social cost of carbon	US$30/$tCO_2$	US$30/$tCO_2$
Ngonye		
General	**At Appraisal**	**At Completion**

[6] Following 'Power Sector Investment Projects: Guidelines for Economic Analysis' (World Bank, March 2016), the WTP is estimated conservatively as 50 percent of the cost of diesel generator, which costs around ZMW 4.2 per kWh to run in 2020. This estimate is benchmarked against the latest survey estimate in 2015 by Electricity Supply Board International Feasibility Study for the Project 'Supply Electricity Supply Southern Division', commissioned by the Government of Germany. The study estimated the WTP to be US$0.14 per kWh.

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Project lifetime	1 year construction and 25 years PPA terms	1 year construction and 25 years PPA terms
Discount rate	6.60%	6.60%
Cost		
Capital cost	US$38.4 million	US$38.4 million
O&M cost	From US$1.18 million in 2019 to US$1.32 million in 2043	US$0.2 million per year
Benefit		
WTP[7]	US$0.137/kWh	US$0.128/kWh
PV capacity	28.2 MW AC (34 MWp DC)	28.2 MW AC (34 MWp DC)
Generation	64.94~57.59 GWh/year	32.7 GWh from June to December for 2019, 64.94~57.59 GWh/year going forward
GHG emissions factor	0.98 tCO_2/MWh	0.98 tCO_2/MWh
Social cost of carbon	US$34/$tCO_2$ in 2019 US$39/$tCO_2$ in 2024	US$34/$tCO_2$ in 2019 US$39/$tCO_2$ in 2024
System loss	18%	18%

Results

9. The post-completion economic analysis demonstrates that the Project, including both the Bangweulu and Ngonye power plants, is economically viable. The Bangweulu power plant generates an EIRR of 20.4 percent with an NPV of US$43.9 million in 20 years. The Ngonye power plant generates an EIRR of 18.2 percent with an NPV of US$41.25 million.

Table 4.3. Summary of Economic Returns

		EIRR (%)	NPV (US$, millions)
Bangweulu	Appraisal	22.3	49.61
	Completion	20.4	43.90
Ngonye	Appraisal	18.1	37.34
	Completion	18.2	41.25

[7] https://www.energyeconomicgrowth.org/sites/eeg.opml.co.uk/files/2020-02/Imad%20Ahmed_presentation.pdf

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Table 4.4. Results of Economic Analysis at Completion for Bangweulu Solar Plant

		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2041	2042
Costs																		
Project cost	US$, million	60																
Year O&M contract	US$, million		0.49	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Finance cost	US$, million		0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Total cost	US$, million	60	0.57	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Benefit																		
Capacity	MW		55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
GWh sent	GWh		71	96	96	96	96	95	95	95	95	95	95	94	94	93	93	92
Benefit without carbon	US$, mill		9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Carbon avoidance	tCO_2		69,880	94,263	94,093	93,924	93,755	93,586										
Carbon benefit	US$, million		2.10	2.83	2.82	2.82	2.81	2.81										
Total benefit			11	15	15	15	15	15	12	12	12	12	12	12	12	12	12	12
Net benefit	**US$, million**	**–60**	**11**	**14**	**14**	**14**	**14**	**14**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**

Table 4.5. Results of Economic Analysis at Completion for Ngonye Solar Plant

		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2043
Costs																	
Project cost	US$, million	38.4															
O&M contract	US$, million		0.2	0.2	0.2	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.23	0.24	0.25

		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2035	2040	2043
Total cost	US$, million	38.4	0.2	0.2	0.2	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.23	0.24	0.25
Benefit																	
Energy sent out	GWh		32.7	64.3	64.3	64	63.7	63.3	63	62.7	62.4	62.1	61.8	61.5	59.9	58.5	57.6
Energy sent out to customer	GWh		26.9	52.7	52.7	52.5	52.2	51.9	51.7	51.4	51.2	50.9	50.6	50.4	49.2	47.9	47.2
Benefit without carbon	US$, mill		3.4	6.7	6.7	6.7	6.7	6.6	6.6	6.6	6.5	6.5	6.5	6.5	6.3	6.1	6.0
Carbon avoidance	tCO_2		26,310	51,668	51,672	51,413	51,156	50,901									
Benefit including carbon benefit	US$, mill		4.5	8.8	8.9	8.9	8.9	8.9	6.6	6.6	6.5	6.5	6.5	6.5	6.3	6.1	6.0
Net benefit	**US$**, mill	**−38.4**	**4.3**	**8.6**	**8.7**	**8.7**	**8.7**	**8.7**	**6.4**	**6.4**	**6.3**	**6.3**	**6.3**	**6.2**	**6.1**	**5.9**	**5.8**

FINANCIAL ANALYSIS

At Appraisal

10. The financial analysis at appraisal was a comparative analysis of the levelized cost of procuring power with and without the Project. With the Project, two PPAs were expected to be signed—the 47.5 MW Bangweulu plant with a 25-year PPA at US¢6.015 per kWh and the 28.2 MW Ngonye plant with a 25-year PPA at US¢7.893—kWh. Without the Project, ZESCO was expected to procure an equivalent amount of power through emergency imports or from other IPPs.

At Completion

11. The post-completion financial analysis of the Project was carried out using the same conceptual approach as during the appraisal. At completion, the financial benefits of the Project would be the cost of purchasing power from alternative IPPs that are not hydropower plants. This is because during 2018–19, Zambia experienced lower-than-expected rainfall, which resulted in low reserves in reservoirs and low energy production from hydropower plants. The cost of non-hydro IPPs contracted by ZESCO (see table 4.6) is around US¢ 13.9 per kWh.

Table 4.6. Local IPPs/Suppliers

Company	Ownership	Installed Capacity (MW)	COD	Fuel Type	Power Purchase Price (US$/kWh)
IPTC	50:50 JV ZESCO/Tata (India)	120		Hydro	0.093
KGL	100% ZESCO subsidiary	750	07/2020	Hydro	0.138
KNBE	100% ZESCO subsidiary	360		Hydro	0.046
MCL	MCL owned by Nava Bharat Singapore (65%) and ZCCM-IH (35%)	300	2016	Coal	0.139
NECL	GL Africa Energy (UK)	105	2013 – 50 MW 2017 – 55 MW	HFO	0.140
Ngonye	EGP (80%) IDC (20%)	34	2019	Solar	0.079
Bangweulu	Neoen (80%) IDC (20%)	54	2019	Solar	0.060

Note: HFO = Heavy fuel oil; ITPC = Itezhi-Tezhi Power Corporation; KGL = Kafue Gorge Lower Power Development Corporation; KNBE = Kariba North Bank Power Extension Corporation; MCL = Maamba Collieries Limited; NECL = Ndola Energy Corporation Limited.

Assumptions Comparison

12. A comparison of the financial analysis assumptions at appraisal and completion is given in table 4.7.

Table 4.7. Assumption Comparison

Bangweulu	**Appraisal**	**Completion**
Generation	94 GWh/year	71.3 GWh from April to December 2019, 94 GWh/year going forward
Power purchase tariff	US¢6.015/kWh	US¢6.015/kWh
Cost of alternative power	US¢12.9/kWh	US¢13.9/kWh
Ngonye	**Appraisal**	**Completion**
Generation	64.94~57.59 GWh/year	32.7 GWh from June to December for 2019, 64.94~57.59 GWh/year going forward
Power purchase tariff	US¢7.893/kWh	US¢7.893/kWh
Cost of alternative power	US¢9.8 /kWh	US¢13.9/kWh

Results

13. The post-completion financial analysis of the Project confirmed that the Project is financially viable, with an NPV gain of US$35.8 million for the Bangweulu power plant and US$43.7 million for the Ngonye power plant. Compared with the appraisal stage NPV gain, both the Bangweulu and Ngonye plants had realized more NPV gains at completion.

ANNEX 5. COMMENTS FROM THE MINSTRY OF ENERGY

1. The report has been reviewed and the comments are as follows:

2. On page 2, the actual disbursement indicates zero, does this means the guarantee did not disburse any funds due to cover for default from ZESCO?

3. Page 15, 43 The achievement in diversification of the national energy mix and other objectives listed was high. The report however does not give reasons why its IDA partial risk guarantee was discontinued regardless of it achieving high and in view of the first comment.

4. On page 15: The GHG emission is properly written as CO2 eq (Carbon dioxide equivalent).

5. On page 17, while the project has been regarded as one of the fastest implemented projects in sub-Saharan Africa, it has been mentioned that there were delays in the project reaching financial close. Could this be because the targets and timelines of the project did not consider the expected project implementation timeline in the region? There need to clarify the basis on the delay so that future timelines are not over ambitious.

6. In addition, the scaling project was the second cheapest in Africa as stated. Other than the competitive tenders, are there reasons that could be attributed to this? There is needed to clearly state the incentives (Example land, substation, tax holiday if any) that were granted to the developers to reduce the project cost and hence the tariff. This is because the tariffs are being compared to other developers who may not have the same incentives as the developers under the scaling solar project resulting in higher tariffs.

7. The report accurately states the important role the Ministry of Energy played to fast track and unlock certain challenges that were delaying the progress of the project. This was in satisfaction of its role in guiding the energy sector in terms of policy.

8. On page 20, 63, the stated low involvement from the Ministry of Energy was initially due to less corroboration from IFC and the World Bank with the Ministry of Energy. As the two projects were under implemented under the IDC, The Ministry of Energy did not actively participate in the tender processes and was required to be involved at a later stage when there were bottlenecks in the progress of the project. There is need to have engagement of the beneficially at all levels to prevent the challenge being highlighted in this section. Kindly revise to give a true picture of the extent to which MOE was involved in the processes from the beginning of the project and as reason for its slow involvement.

9. Under lessons learnt and recommendations, the report accurately states the value there is in competitive tender processes and states that the GRZ return to unsolicited projects contradicts the clear benefits of the competitive process. The clarified position is that power projects in Zambia have always been procured under two processes of solicited and unsolicited projects. This is to give an opportunity for private sector to participate in power projects which do not necessarily have to be procured by government. The Government Public Procurement Guidelines prescribe competitive tender for the procurement of all government goods and services except is special circumstances which need to be approved by the Zambia Public Procurement Authority. In addition, with the new energy regulation and electricity acts, any supply of electricity can use the national grid to supply to any customer and pay willing charges to the grid operator. In that case, power projects cannot be restricted to a tender process.

10. Lastly, the task team members who worked on the project from the institutions from the Zambian side can be provided for inclusion in the report as has been done on page 34 of the report.

ANNEX 6. BORROWER'S IMPLEMENTATION COMPLETION AND RESULTS REPORT

IDC Scaling Solar Project Completion Report
August 28, 2020

STAGE	EXPERIENCES/CHALLENGES	LESSONS LEARNED
1) Early stage activities (project preparation)	a) Solar energy generation was a reform area and faced typical resistance from regulators resulting in lengthy negotiations	• Change management measures should be incorporated from the beginning to incorporate first-hand experiences from jurisdictions that have embraced the technology.
	b) Concerns on IFC's dual role as advisor and financier on the program. c) Even though Chinese Walls were assured, concerns regularly arose as to which side of IFC we were dealing with.	• Ensuring that IDC gets a good deal for its subsidiary ZESCO while operating as a developer. • Ensuring that other lenders' concerns and demands were accommodated.
	d) Alignment with stakeholders and buy-in (e.g. ZESCO, MoE, MoF): - Managing high political expectations in the face of an on-going power crisis - Giving government assurances that commercial and financial close were in sight and construction of at least one project was on schedule - Convincing Government to ignore unsolicited bids with shorter turn arounds in favour of scaling solar – Some bidders offered Government similar terms as the Scaling Solar results while asking Government to ignore Scaling Solar as a failed experiment.	• It is imperative to ensure timely updates to key ministries of energy and finance whose support was key. • Support from government highest decision makers allows for speed and credibility and overcoming bureaucratic hurdles. • Procurement process allows for price discovery, thereby avoiding lengthy price negotiations. • Procurement process attracts credible bidders.

	e) Policy makers demands/concerns over lack of local participation in solar projects.	• There is a need for deliberate measures to include citizens in projects: - The importance of a local equity partner for the winning bidders both at the project level and in the bidders' consortium - IDC as an equity partner in the projects has assisted winning bidders to navigate the Zambian bureaucratic system with ease and speed - Having a commercially inclined public co-investment partner helps to align private sector interests with national strategic objectives - Bidders must also include a local partner who understands the local institutional frameworks in their consortium to save on time and avoid cultural shocks
2) The financing aspect	a) Coping with unplanned/surprise elements: - Accommodating last minute demands from lenders on agreements such as land agreements and ownership b) Delayed approvals by lenders c) Different second lender to the project d) Renegotiations of terms by the developer with the lender	• Innovative DFIs are critical in de-risking infrastructure projects for private sector participation • Stapled finance to the procurement processes a positive - Solution + Financing model is effective for accelerating infrastructure development and making project financing (in energy projects and especially in a single off-taker country) a success
3) Key contracts and agreements	a) Salvaging missed deadlines for approvals of key documents such as PPAs, GSA, SHA, Request for pre-qualification/Proposal and other financing documents	• A well-managed and transparent procurement process is crucial in achieving cost effective and value for money investments Templated documents • Templated permitting documents are crucial in achieving a quick turnaround with reviews, approvals and finally, signatures

4) Operational management	a) Single off-taker status b) Sector Challenges c) Off-takers credibility	• Sector challenges, Single off-takers status and off-taker credibility imply onerous demands by lenders and developers for guarantees • Onerous agreements are needed to provide extra security cover. • Renegotiation of terms, further tax incentives, lease fees and other government levies/fees post award of tender in order to improve returns, had the potential to unsettle authorities.
5) Role of IDA guarantee	a) Achieving Bankability: PRG and letter of Credit: - Prolonged negotiations with both the lender and the LC Bank - Onerous documentation and agreements required b) Sustainability concerns – Can African renewable energy grow without PRG, GSA and DFI's concessional finance? Can private capital still be deployed to the energy sector?	• The PRG and the Letter of Credit as risk mitigation instruments are key for the bankability of the project • These instruments are key in achieving a favorable tariff as they reduced risks.

ANNEX 7. SUPPORTING DOCUMENTS

KEY REFERENCED REPORTS

Client documents

1. Zambia's National Energy Policy 2019[8]
2. Revised Zambia 6th National Development Plan 2013-2016[9]
3. Zambia's Seventh National Development Plan 2017–2021[10]
4. IDC's Project Implementation Completion Report (see Annex 6)

Project operations reports

1. Project quarterly operations reports filed by Enel
2. Project quarterly operations reports filed by Neoen
3. Annual Monitoring Report (AMR) of 2019 filed by Enel

World Bank reports

1. Project Appraisal Document (2017) - Report No: 110675-ZM
2. Project Additional Financing Paper (2017) - Report No: 121430-ZM
3. Project Implementation Status and Results Reports (ISR)
4. Aide Memoires for Project Supervision Missions
5. Country Partnership Strategy for the period of FY13–16 - Report No: 75089
6. Country Partnership Framework for the period of FY19–23 - Report No: 128467

[8] Ministry of Energy shared the National Energy Policy of 2019 with the World Bank team
[9] https://www.ilo.org/wcmsp5/groups/public/---africa/---ro-abidjan/---ilo-lusaka/documents/publication/wcms_465092.pdf
[10] https://www.sdgphilanthropy.org/system/files/2019-02/7th-National-Development-Plan-Zambia.pdf