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Report No: 143566-SB

IMPLEMENTATION COMPLETION AND RESULTS REPORT

IDA-H4150, IDA-H9130

ON

GRANTS

IN THE AMOUNT OF SDR 3.9 MILLION
(US$6.0 MILLION EQUIVALENT)

AND

IDA-53790

ON

A CREDIT

IN THE AMOUNT OF SDR 7.2 MILLION
(US$11.0 MILLION EQUIVALENT)

TO THE

SOLOMON ISLANDS

FOR THE

SOLOMON ISLANDS SUSTAINABLE ENERGY (P100311) PROJECT
November 11, 2019

Energy and Extractives Global Practice
East Asia And Pacific Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective May 31, 2019)

Currency Unit	=	Solomon Islands Dollars (SBD)
SBD 8.21	=	US$1
US$1.38	=	SDR 1

FISCAL YEAR
July 1 – June 30

ABBREVIATIONS AND ACRONYMS

AF	Additional Financing
ADB	Asian Development Bank
BP	Business Procedure
CAPEX	Capital Expenditure
CPF	Country Partnership Framework
CSO	Community Service Obligation
EIRR	Economic Internal Rate of Return
ESMAP	Energy Sector Management Assistance Program
FEA	Fiji Electric Authority
FIRR	Financial Internal Rate of Return
FM	Financial Management
FNPV	Financial Net Present Value
GDP	Gross Domestic Product
HIES	Household Income and Expenditure Survey
ICB	International Competitive Bidding
IFI	International Financial Institution
ISR	Implementation Status and Results Report
KPI	Key Performance Indicator
MTDP	Medium-Term Development Plan
MTR	Midterm Review
MTS	Medium-Term Strategy
M&E	Monitoring and Evaluation
NCB	National Competitive Bidding
NDS	National Development Strategy
NPV	Net Present Value
O&M	Operations and Maintenance
PAD	Project Appraisal Document
PDO	Project Development Objective
PV	Photovoltaic
RAMSI	Regional Assistance Mission to the Solomon Islands

SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCD	Systematic Country Diagnostic
SEFP	Sustainable Energy Financing Project
SIEA	Solomon Islands Electricity Authority
SIEAREEP	Solomon Islands Electricity Access and Renewable Energy Expansion
SIG	Solomon Islands Government
SISEP	Solomon Islands Sustainable Energy Project
SIWA	Solomon Islands Water Authority
SOE	State-owned Enterprise
TRHDP	Tina River Hydropower Development Project
TTL	Task Team Leader
WACC	Weighted Average Cost of Capital

Regional Vice President:	Victoria Kwakwa
Country Director:	Michel Kerf
Regional Practice Director:	Ranjit Lamech
Practice Manager:	Jie Tang
Task Team Leader(s):	Maria Isabel A. S. Neto
ICR Main Contributor:	Leena Chaukulkar

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BASIC INFORMATION

Product Information

Project ID	Project Name
P100311	Solomon Islands Sustainable Energy
Country	**Financing Instrument**
Solomon Islands	Investment Project Financing
Original EA Category	**Revised EA Category**
Not Required (C)	Partial Assessment (B)

Organizations

Borrower	Implementing Agency
Ministry of Finance and Treasury	Solomon Islands Electricity Authority

Project Development Objective (PDO)

Original PDO

The objective of the project is to improve operational efficiency, system reliability and financial sustainability of SIEA through: improved financial and operational management, reduction of losses, and increased revenue collection.

Revised PDO

The objective of the project is to improve operational efficiency, system reliability and financial sustainability of SIEA.

FINANCING

	Original Amount (US$)	Revised Amount (US$)	Actual Disbursed (US$)
World Bank Financing			
IDA-H4150	4,000,000	3,999,894	3,834,859
IDA-53790	11,000,000	6,741,699	5,925,941
IDA-H9130	2,000,000	1,994,522	1,948,784
Total	**17,000,000**	**12,736,115**	**11,709,584**
Non-World Bank Financing			
Borrower/Recipient	6,900,000	8,200,000	8,200,000
Total	**6,900,000**	**8,200,000**	**8,200,000**
Total Project Cost	**23,900,000**	**20,936,114**	**19,909,584**

KEY DATES

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
08-Jul-2008	25-Jun-2009		30-Dec-2012	31-Mar-2019

RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US$M)	Key Revisions
22-Mar-2012	2.06	Change in Results Framework Change in Components and Cost Change in Loan Closing Date(s) Change in Financing Plan Change in Implementation Schedule
13-Feb-2014	3.69	Additional Financing Change in Project Development Objectives Change in Results Framework Change in Components and Cost Change in Loan Closing Date(s) Change in Financing Plan
01-May-2017	5.15	Change in Results Framework Change in Components and Cost Change in Loan Closing Date(s) Change in Financing Plan Change in Implementation Schedule
10-Apr-2018	7.30	Change in Results Framework Change in Components and Cost Cancellation of Financing Reallocation between Disbursement Categories

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Satisfactory	Moderately Satisfactory	Modest

RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US$M)
01	23-Jun-2009	Moderately Unsatisfactory	Moderately Unsatisfactory	0
02	28-Nov-2009	Moderately Satisfactory	Moderately Satisfactory	.11
03	11-Dec-2010	Moderately Satisfactory	Moderately Satisfactory	1.09
04	01-Mar-2012	Moderately Unsatisfactory	Moderately Unsatisfactory	1.97

05	24-Nov-2012	Moderately Satisfactory	Moderately Satisfactory	2.47
06	01-Oct-2013	Moderately Satisfactory	Moderately Satisfactory	3.23
07	07-Jul-2014	Moderately Satisfactory	Moderately Satisfactory	3.83
08	20-Jan-2015	Moderately Satisfactory	Moderately Satisfactory	3.64
09	02-Oct-2015	Moderately Satisfactory	Moderately Unsatisfactory	3.81
10	02-Jun-2016	Moderately Satisfactory	Moderately Unsatisfactory	3.86
11	04-Dec-2016	Moderately Satisfactory	Moderately Satisfactory	4.62
12	17-May-2017	Moderately Satisfactory	Moderately Satisfactory	5.15
13	22-Nov-2017	Moderately Satisfactory	Moderately Satisfactory	6.54
14	16-May-2018	Moderately Satisfactory	Moderately Satisfactory	7.94
15	02-Nov-2018	Moderately Satisfactory	Moderately Satisfactory	9.34
16	02-Apr-2019	Moderately Satisfactory	Moderately Satisfactory	11.37

SECTORS AND THEMES

Sectors

Major Sector/Sector	(%)
Energy and Extractives	**100**
Other Energy and Extractives	100

Themes

Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)
Public Sector Management	**33**
Public Administration	33
Transparency, Accountability and Good Governance	33
Urban and Rural Development	**67**
Urban Development	67
Services and Housing for the Poor	67

ADM STAFF		
Role	**At Approval**	**At ICR**
Regional Vice President:	James W. Adams	Victoria Kwakwa
Country Director:	Nigel Charles Emil Roberts	Michel Kerf
Director:	Christian Delvoie	Ranjit J. Lamech
Practice Manager:	Junhui Wu	Jie Tang
Task Team Leader(s):	Antonie De Wilde	Maria Isabel A. S. Neto
ICR Contributing Author:		Leena Chaukulkar

I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

A. CONTEXT AT APPRAISAL

Context

1. **The Solomon Islands, at the time of appraisal in 2008, had emerged from a period of political turmoil and civil unrest.** Over the period from 1998 to 2002, real gross domestic product (GDP) had fallen around 24 percent, exports had declined drastically, and external debt levels had soared. After ethnic tension ended in 2003, the economy started a strong recovery and recorded growth rates ranging from 8 percent in 2004 to 10 percent in 2007. The recovery was attributed to the return of business investment and an increase in export receipts and was supported by the arrival of a Regional Assistance Mission to the Solomon Islands (RAMSI). Budget surpluses were consistently observed from 2003 to 2007 due to higher government revenues and better expenditure management.

2. **However, the economy of the Solomon Islands faced a number of challenges**. Less than a quarter of the population was involved in any paid work and the majority was involved in subsistence or cash crop agriculture. Exports were commodity based and included timber, cocoa, and copra. Economic growth in recent years was deemed to be unsustainable as it was based on post conflict recovery and unsustainable growth of the logging sector. A reliable and cost-efficient power supply, a key ingredient for private sector growth, needed to be built.

3. **High costs and poor electricity system reliability were significant issues in the energy sector**. The high cost of power could be attributed to two main factors:

(a) High cost of petroleum which was due to rising international oil prices and the costly logistics of supplying it to the Solomon Islands. Diesel-fueled power generation accounted for 98 percent of the total. Electricity tariffs which incorporated automatic fuel price adjustments rose to a point where electricity became too costly for an average family using 250 W for 8 hours a day. This usage translated to a need to pay US$1 per day, which was unsustainable in a country where total GDP per capita amounted to US$690 per year.

(b) Power network losses with ad hoc maintenance and unsystematic operational practices added to unsustainably high costs. At appraisal, power network losses had reached 21 percent. During the period of ethnic tension, power generating capacity in Honiara declined as generator maintenance programs were neglected. Overdue maintenance needs on the distribution network were causing outages of approximately 72 hours per week.

4. **Access to electricity was low.** Less than 10 percent of the population had access to electricity. The Solomon Islands Electricity Authority (SIEA), a government-owned statutory body responsible for power supply and distribution, was unable to connect new customers and customers were unable to pay the high costs of electricity. The number of disconnections was increasing. The rural population, existing primarily on subsistence agriculture and fishing, relied on kerosene for home lighting and wood for cooking.

5. **SIEA was in financial distress**. Operating losses had increased from SBD 12 million in 2005 to approximately SBD 45 million in 2007, equivalent to about 30 percent of total operating revenue. More than 70 percent of the operating loss was interest due on past debt. A crucial factor in the remaining operating losses was the rising price of oil. Only 95 percent of the oil price increases were allowed to be recovered through electricity price increases. Further worsening SIEA's financial health was a decline in its bill collection efficiency which had declined to 72 percent in 2007. A significant factor was unpaid electricity bills by other state-owned enterprises (SOEs). Total SOE arrears were SBD 27 million at the end of 2007.

6. **Two main issues in the energy sector that needed to be addressed were reducing electricity costs and improving reliability and increasing access in rural areas and outer islands**. If both issues needed to be addressed satisfactorily, a prerequisite condition was a strengthened SIEA in terms of both financial health and operational capacity.

(a) **Reducing electricity costs and improving reliability.** In the near term, relatively simple measures to reduce costs such as reducing technical losses, improving maintenance and repairs, and improving operational practices were feasible. However, over the medium term, the development of a far lower-cost renewable power generation was considered critical to mitigate the impact of rising oil prices. In this context, opportunities for the development of hydropower generation were identified with a potential 22 MW run-of-the-river hydropower project at Ngalimbiu related to the development of the Gold Ridge mine. After meeting the demand of the Gold Ridge mine, the balance of power from the proposed hydropower project would be sufficient to meet load in Honiara with a potentially dramatic drop in overall electricity supply cost. International financial institutions (IFIs) such as the European Investment Bank expressed an interest in participating in the project. However, this meant that SIEA, which would play a critical role in this project, needed to be strengthened. In particular, issues that needed to be strengthened were the development of power purchase agreements, meeting compliance with safeguards such as compensation for land users and landowners, and regulatory issues.

(b) **Increasing access in rural areas and outer islands.** At the time of appraisal in 2008, the Global Environment Facility-supported Sustainable Energy Financing Project (SEFP) was under implementation. The SEFP was designed to make the purchase of basic solar photovoltaic (PV) energy affordable and accessible with low interest loans to purchase, install, and maintain solar PV kits. The SEFP also supported the purchase of small generators running on coconut oil. However, a long-term effort was needed to scale up rural electrification work. At a minimum, this included the completion of a Rural Electrification Master Plan to identify best options for rural villages, putting in place a transparent legal and regulatory framework for small-scale independent power production and determining associated pricing and possible capital subsidies.

7. **SIEA was central to achieving improvements in the energy sector**. It was critical that SIEA perform as a strong and capable institution to address the abovementioned energy sector issues. The objective was that SIEA be strengthened and in a position to lead the sector from a high-cost, oil-based system primarily centering only on Honiara to a more balanced, less-costly, and stable sector providing energy services throughout the Solomon Islands.

8. **The project was aligned with the World Bank's strategy for the Solomon Islands as stated in the Regional Engagement Framework FY2006–2009 for Pacific Islands**.[1] The project directly contributed to the two broad areas identified as areas of engagement. In the first area, the engagement strategy specified that the World Bank would assist the Government and other donors on public expenditure management issues to improve the delivery of basic services to communities and provide broader sector policy advice. In the second area, the World Bank would target specific initiatives to improve the climate for the private sector such as reforms to the energy sector, telecommunications, financial sector management, and foreign investment legislation. In addition, the World Bank was to contribute to long-term capacity building and make contributions to the productive sectors, recognizing that rural communities needed to benefit directly. The project contributed directly to two strategic pillars and focus areas: Improving the public expenditure management of infrastructure assets and Reducing the costs of doing business.

9. **The project responded to a recommendation from an Operations Evaluation Department** (now the Independent Evaluation Group) evaluation[2] that found that the World Bank had not been able to make a satisfactory contribution toward fueling economic growth in the region. The evaluation's recommendations included improving expenditure management and removing bottlenecks to private activity.

10. **The project directly responded to a request from the Solomon Islands Government** (SIG). In the Pacific Forum of the Finance Ministers of the Pacific Islands held in Washington, DC in 2005, several Pacific Island countries requested urgent World Bank support to expand sustainable energy use and energy efficiency to offset the increased price of oil. The SIG requested financing for additional investments including restoration of networks, expansion of electricity access, and development of new renewable energy-based electricity generation capacity. However, under the Honiara Club agreements that were then under effect, the SIG could not borrow for these investments. The SIG realized that before these investments could be made, SIEA needed to be strengthened. The commercialization and strengthening of SIEA therefore became the highest priority.

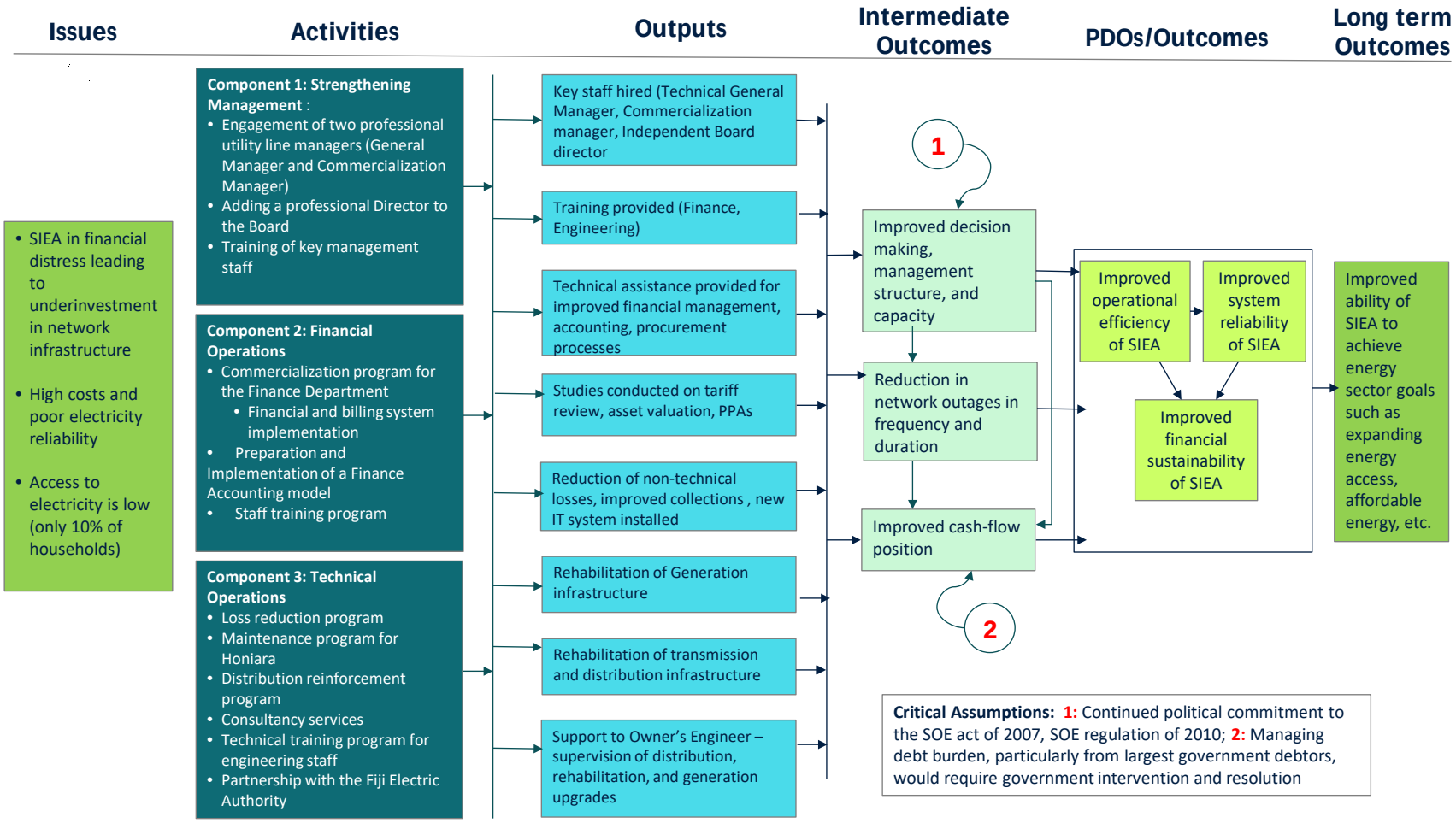
Theory of Change (Results Chain)

11. **Solomon Islands Sustainable Energy Project (SISEP) was designed to be the vehicle that would lay the foundation for future efforts to develop the energy sector**. Any effort to steady the sector, enable more reliable energy to be provided to customers at lower cost, expand access to rural areas, and partner with private entities and IFIs to develop the sector required building capacity in management, financial, and operational areas. Building this capacity is reflected in SISEP's development objectives of improving operational efficiency, system reliability, and financial sustainability. SISEP's three components, namely, strengthening management, financial operations, and technical operations, each supported all three aspects of the development objective. Strengthening management, for example, would be instrumental in improving operational efficiency, system reliability, and financial sustainability, as would technical and financial operations.

[1] Regional Engagement Strategy FY2006–2009 for Pacific Islands, Report No: 32261-EAP.
[2] Evaluation of World Bank Assistance to Pacific Member Countries, 1992–2002, Operations Evaluation Department, Report No: 31940.

12. Figure 1 shows the Theory of Change, including a link to longer-term outcomes that SISEP would contribute to beyond its closing date. Project activities were designed with the assumption that there would continue to be political commitment to the SOE Act; that government intervention would be required in resolving SIEA's debt, in particular from its largest government debtors; and that SIEA would be compensated for its community service obligations.

Figure 1. SISEP Theory of Change Diagram



Note: PPA = Power Purchase Agreement.

Project Development Objectives (PDOs)

13. The PDO, as stated in the Project Appraisal Document (PAD) and in the Financing Agreement of SISEP (or 'the project'), was to improve operational efficiency, system reliability and financial sustainability of SIEA through: improved financial and operational management, reduction of losses, improved generator and distribution system reliability and increased revenue collection.

Key Expected Outcomes and Outcome Indicators

14. **The project was intended to be the foundational investment for an ambitious program of support for the energy sector in the Solomon Islands.** As the first in a series of necessary steps to achieve a sustainable and affordable energy supply for the Solomon Islands, the planned project outcome was to restore SIEA to financial and operational health and build capacity so that it could play a central role in meeting energy sector goals. A strong and capable SIEA was a precondition for the SIG to undertake concerted action on a variety of fronts including developing new generation sources, working in partnership with IFIs to implement projects to further energy sector goals, and providing a reliable and stable foundation in energy access necessary for economic growth.

15. **Assessment of the outcomes is organized in terms of the three outcomes of the PDO.** They were (a) Outcome I: To improve the operational efficiency of SIEA, (b) Outcome II: To improve system reliability of SIEA, and (c) Outcome III: To improve financial sustainability of SIEA. While each of the outcomes contributed to improving SIEA, the PAD's arrangements for results monitoring lists one project outcome indicator, namely, that SIEA will operate profitably. This is consistent with the overarching goal of improving SIEA's capacity to meet energy sector goals. Each outcome and associated intermediate outcomes contribute to other outcomes supported by the project, with SIEA being able to operate profitably being an overarching goal for SISEP.

16. **The Results Framework in the Implementation Status and Results Reports (ISRs) is used to evaluate SISEP's outcomes.** SISEP's PAD listed four key indicators against which project achievements were to be assessed. The indicators in the PAD were largely reflected in ISRs but insufficient to measure all three parts of the PDO. On the other hand, the ISR's Results Framework included additional indicators which were relevant to measuring project outcomes and were necessary and sufficient in measuring achievements of the three components of the PDO. The PDO indicators in ISRs and those in the PAD were largely aligned, had no material discrepancy, and partially overlapped. Eight of nine PDO-level indicators in the ISR are used to evaluate achievement of outcomes. One indicator, the collection ratio, was found to have significant methodological errors which disqualified it from being an appropriate indicator and was not used in this assessment. Further information is available in the Monitoring and Evaluation section. In addition, one intermediate outcome indicator was used as an outcome indicator as it was more reflective of a PDO outcome.

17. **For the Implementation Completion and Results Report (ICR), the Results Framework was revisited to best reflect achievement of outcomes.** As mentioned, the ISR's Results Framework was used in evaluating achievement of outcomes. However, to align indicators with objectives, a reorganization of indicators and mapping to the three subobjectives of the PDO was necessary. Success in achieving Outcome I, namely, improving operational efficiency of SIEA, is assessed in part by evaluating SIEA's success in implementing a commercialization program. While ISRs did not mention the commercialization

program, three indicators present in ISRs were appropriate measures to assess the commercialization program's achievements. The list of the indicators used to assess outcomes is shown in table 1.

Table 1. Outcome Indicators Mapped to Relevant Project Objectives

Outcome	Relevant Outcome Indicators from the Results Framework[a]
Improved operational efficiency of SIEA	I.A. System Losses (Baseline: 27 percent; Target: 18 percent)
	I.B. Average number of debtor days to collect billed revenue (Baseline: 360 days; Target: 35 days)
	I.C. Number of days between due date of tariff and if not paid notice of arrears (Baseline: 360 days; Target: 15 days)
	I.D. Quarterly financial management reports and rolling projections for SIEA performance within 14 days at the end of each quarter (Baseline: No Reports produced; Target: Reports produced)
Improved system reliability of SIEA	II.A. System Average Interruption Duration Index (SAIDI) (Baseline: 51840; Target: 2000)
	II.B. System Average Interruption Frequency Index (SAIFI) (Baseline: 816; Target: 85)
Improved financial sustainability of SIEA	III.A. Revenue per kWh generated (Baseline: SBD 1.39/kWh; Target: SBD 4.5/kWh)
	III.B SIEA profitability (Baseline: Loss SBD 44 million; Target: Profit SBD 98 million)

Note: a. Targets after last restructuring expected at the end of project life.

Components

18. The project had three components:

(a) **Strengthening Management (IDA: US$4.0 million, US$3.69 disbursed; SIG:[3] US$5.4 million).** Engagement of two professional utility line managers (a general manager with a technical background and a commercialization manager) and a professional director to the Board, and training of key management staff

(b) **Financial Operations (IDA: US$0.7 million, US$0.64 disbursed; SIG: US$0.8 million).** Implementation of a commercialization program for the Finance Department, including new financial management (FM) and billing systems and preparation and implementation of a new Finance Accounting Manual with a staff training program.

(c) **Technical Operations (IDA: US$8.0 million, US$7.37 disbursed; SIG: US$2.0 million).** Implementation of a loss reduction program, a planned maintenance program for Honiara, and a distribution reinforcement program to increase the availability of existing generation and improve system reliability. Technical project implementation support to SIEA was also to be provided with consultancy services, a technical training program for engineering staff, and establishment of a partnership with the Fiji Electricity Authority (FEA).

[3] SIG contribution and estimation of project components costs are equal to actual component costs.

B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)

Revised PDOs and Outcome Targets

19. **The PDO remained essentially unchanged during project implementation**. The original PDO was to improve operational efficiency, system reliability and financial sustainability of SIEA through: improved financial and operational management, reduction of losses, improved generator and distribution system reliability and increased revenue collection. A minor change to the PDO was the deletion of the part of the PDO that described project activities, leaving the core PDO unchanged. The revised PDO of the project was to improve operational efficiency, system reliability and financial sustainability of SIEA. It remained in effect until the project closed in March 2019.

20. **SISEP's outcome indicator targets were revised several times during project implementation**. The purpose of revising targets was primarily to make them consistent with the objectives of restructuring or to make adjustments consistent with increased ambition such as with the additional financing (AF) approved in 2014. SISEP was restructured four times during implementation. With each restructuring, the project attempted to either increase the ambition of outcomes to be consistent with increased financing or to adjust to be more realistic in setting appropriate goals in achieving project outcomes without compromising the objective. Outcome targets that were revised are noted below along with a brief explanation of the reason for revision:

(a) **SAIDI and SAIFI indicators.** The target value was adjusted downwards at the time of approval of the AF to account for outcomes expected to accrue from activities that were financed. This included capital investments to strengthen the largest power grid (Honiara) and improve the efficiency and reliability of power supplies, a desirable outcome that would be measurable through SAIDI and SAIFI indicators.

(b) **System losses.** The target for system losses was revised at three of the four restructurings of the project. At the first restructuring in FY2011, the target for system losses was made more stringent, going from 16 percent to 12 percent. In the next restructuring in 2017, the target was increased to 14 percent, and further increased to 18 percent. The final target of 18 percent was arrived at by considering a realistic reach, that is, setting the target to one that is achievable due to project activities, but without compromising on the ambition of the outcome to be achieved.

(c) **Collection ratio.** The target for collection ratio was lowered from 90 percent to 70 percent in the final restructuring in 2018. This ICR finds that there were several issues with this indicator (discussed in the Monitoring and Evaluation section), one of which was that an unrealistic target was set at appraisal with the appropriate level of ambition being overstated.

(d) **Number of days between due date of tariff and, if not paid, notice of arrears and average number of debtor days to collect billed revenue.** The outcome targets for both indicators were made more stringent at the time of AF approval, as the team expected the increased investment to result in incremental improvements by the new closing date. However,

subsequent restructurings reverted the targets to ones that were more relevant and reflected appropriate goals.

21. As mentioned, SISEP was restructured four times during implementation. Table 2 summarizes key changes made to the project.

Table 2. Key Changes to SISEP during Implementation

Restructuring		Changes				
No.	**Date**	**PDO**	**PDO Indicators**	**PDO Targets**	**Closing Date**	**Other**
1	March 2012			Revised to reflect new closing date	Extended to June 2014	
2	February 2014 (including AF)	Revised to delete description of project activities	3 indicators dropped (revenue per kWh, prepaid meters installed, and SIEA profitability)	Revised to account for incremental improvement with increased AF investments	Extended to June 30, 2017	Capital investments in the Honiara power grid and strengthening of project management
3	April 2017			Targets for 3 indicators revised to rectify overstated targets (system losses and number of debtor days to collect revenue, days between due date of tariff and notice of arrears)	Extended to March 31, 2019	• Change in components and cost • Change in loan Closing date(s) • Change in financing plan • Change in implementation schedule
4	April 2018		Dropped indicator related to generators	Collection ratio target lowered and number of debtor days to collect billed revenue increased. Both indicators were adjusted to reflect a feasible but sufficiently ambitious goal. Two indicators		Cancelled US$3.3 million because of project savings

Restructuring		Changes				
No.	Date	PDO	PDO Indicators	PDO Targets	Closing Date	Other
				were reinstated.		

Revised PDO Indicators

22. During project implementation, two PDO-level indicators were dropped. Separately, two other indicators were dropped and reinstated:

(a) **Number of prepaid meters installed.** This indicator was dropped when the AF was approved and SISEP was restructured. At the time, the installation of prepayment meters across all households in Honiara had been completed and SIEA had a policy in place requiring all new meters and meter replacements for household customers to be prepayment meters. This indicator does not qualify for assessing PDO-level objectives and would not have been used to assess outcomes.

(b) **Generator efficiency improved.** This indicator became obsolete and was dropped when the project was restructured in 2018. At appraisal, the plan was to track the efficiency of three specific generators. However, almost 10 years after project approval, two of the generators were old and new generators had been purchased by SIEA without the support of project funds to compensate for deficiency of the old generators. SIEA had measures in place to ensure that overall efficiency of generators was adequate. The overall efficiency exceeded 90 percent at the time of restructuring when the indicator was dropped (target for all three generators was 85 percent). Reliability could also be gauged by the System Losses indicator.

(c) The PDO indicator 'Revenue generated per kWh' was dropped in error after the 2014 restructuring as it was deemed that this was already captured through the collection ratio and loss reduction ratio and Component 2 had closed. The intermediate outcome indicator 'Net profit before tax' was also dropped because of the consideration that an absolute profit figure is not very meaningful. The indicators were reinstated to measure the financial sustainability of SIEA for evaluating the project at completion.

Revised Components

23. Revisions were made to Components 1 and 3 by the addition of the following activities financed by the AF approved in February 2014:

- **Component 1: Strengthening Management.** Technical assistance and training on dispatch and control, system planning, and integration of renewable and independent power producers; support to owner's engineer; funding for the Capital Projects Manager 2014–2017; finance and due diligence technical assistance (legal officer, finance officer, and procurement officer for PPAs); additional support for training in project management and technical assistance for strengthening project management; and preparation of feasibility engineering services and safeguard studies for renewable energy activities.

- **Component 3: Technical Operations.** Upgrade of transformer capacity with an additional 5 MVA 33 kV/11 kV transformer, addition of a second 33 kV switchboard, and a new system control room and dispatch at Ranadi; a 12.5 MVA transformer and upgrade of switching arrangements at Lungga Power Station; New Zone substation for transforming 33 kV/11 kV, with wa 7.5 MVA transformer at Kola'a Ridge; and relocation of the second power circuit to supply the residential area to the south of Honiara Airport (Feeder 12 area) by building a new overhead power line and an underground circuit around the airport that links to the East Honiara Substation to the Feeder 12 area.

Other Changes

24. **US$3.3 million was canceled from the IDA credit during the fourth restructuring in April 2018**. Cost savings were achieved under Components 1 and 3 mostly because several contracts were less than the original estimates. SIEA also decided to fund installation of the Lungga transformer from its own funds. These funds were reallocated to another project with SIEA which was approved in July 2018.[4]

25. **Change in project costs.** Table 3 shows changes in project costs (US$ million) as a result of the AF and cancellation.

Table 3. Project Costs at Approval and after Approval of AF and each Restructuring

	Project Costs									
	At approval		1st restructuring		2nd restructuring		3rd restructuring		4th restructuring	
Year	2009		2012		2014		2017		2018	
	SIG	IDA	SIG	IDA	SIG	IDA	SIG	IDA	SIG	IDA
Project Component										
1. Management Strengthening		1.6	0.503	1.8	2.0	4.5	3.8	4.3	5.4	4.0
2. Financial Sustainability	0.09	0.7	0.09	0.7	4.6	0.7	0.3	0.7	0.8	0.7
3. Technical Operations	0.41	1.4	0.41	1.5	4.4	11.8	4.1	10.1	2.0	8.0
Contingency		0.4								
Total	**0.5**	**4.0**	**1.0**	**4.0**	**11**	**17.0**	**8.2**	**15.1**	**8.2**	**12.7**

Rationale for Changes and Their Implication on the Original Theory of Change

26. **While SISEP was restructured four times, the most substantial change occurred when the AF along with restructuring was approved in 2014**. The original project had been successful in improving commercial sustainability. As a next step, SIEA needed to undertake long-overdue investments in the generation, transmission, and distribution infrastructure to improve service to customers. With its financial position being relatively secure, SIEA was in a position to invest in infrastructure rehabilitation and maintenance. US$13 million was approved in the AF, of which US$10.3 million was allocated to technical operations. These involved improving the reliability of electricity supplies in Honiara which is

[4] GEF Electricity Access and Renewable Energy Expansion Project (P162902).

both the political and commercial capital and where 90 percent of the electricity is generated and consumed. Not only was this critically important for economic growth, but the weight of Honiara in determining a national uniform tariff was expected to have a large impact on the affordability of power across the Solomon Islands.

27. **There was no impact on the original Theory of Change**. The PDO was essentially unchanged except for the deletion of the portion of the PDO that described how the objectives were to be achieved. Other changes included the addition of activities as a result of the AF being approved, which strengthened existing components (1 and 3) of the project but did not have an impact on the results chain. Finally, PDO indicators and targets were revised during implementation. Their revisions had a marginal impact on indicator targets and were not material in the measurement of PDO outcomes.

II. OUTCOME

A. RELEVANCE OF PDOs

Assessment of Relevance of PDOs and Rating

28. **SISEP's PDO remains highly relevant to the development needs of the Solomon Islands.** The Systematic Country Diagnostic (SCD) for the Solomon Islands,[5] the Country Partnership Framework (CPF) for the Solomon Islands FY2018–FY2023,[6] the SIG's own program (National Development Strategy [NDS] 2016–2035 and Medium-Term Development Plan 2016–2020), explicitly state the need to further progress on development objectives supported by this project.

29. **The current CPF 2018–2023 as well as the Engagement Framework[7] at the time of project approval identify building government capacity for service delivery as a priority.** SISEP's development objectives were to improve operational efficiency, system reliability, and financial sustainability of SIEA. The Country Engagement Framework at the time of project approval identified reducing the cost of doing business through utility regulation and reform and improving rural access to energy as objectives for the energy sector. The current CPF 2018–2023 states that the previous Country Partnership Strategy program faced implementation challenges in reaching some objectives in several areas, one of which is reducing energy losses. In addition, service delivery in remote rural areas and outer islands was stated to be challenging. The current CPF is organized among three focus areas: (a) strengthening the foundations of well-being, (b) promoting inclusive and sustainable growth, and (c) managing uneven development. The development objectives of SISEP support all three focus areas. Support to two of the three focus areas directly translate to energy-related CPF objectives, as shown in table 4.

[5] Solomon Islands Systematic Country Diagnostic, Priorities for Supporting Poverty Reduction and Promoting Shared Prosperity, Report No. 115425-SB, World Bank Group, June 2017.
[6] Country Partnership Framework for Solomon Islands for the Period FY2018–FY2023, Report No. 122600-SB, World Bank Group, June 2018.
[7] Regional Engagement Framework for the Pacific Islands FY2006–FY2009, Report No. 32261-EAP, World Bank, May 2005.

Table 4. Energy-related CPF Objectives in the Solomon Islands' Current CPF Program

CPF Focus Areas Relevant to SISEP Objectives	CPF Objectives
Strengthening the foundations of well-being	Improve renewable power generation and access to electricity
Managing uneven development	Improve connectivity
	Improve access to service delivery in underserved communities

30. It is evident that SISEP's objectives are highly relevant to the CPF objectives, as shown in table 4. The CPF further elaborates that limited access to affordable and reliable power supply in the Solomon Islands constrains economic growth in urban areas and contributes to poverty in rural areas. Improving access to affordable and reliable power was deemed an essential ingredient in not only helping ensure that future growth is sustained but also lasting peace and stability is secured. SISEP's objective of improving operational efficiency, financial sustainability, and system reliability of SIEA was a key step in the project improving access to electricity and to service delivery.

31. **The SCD identified access to energy as a Tier 3 priority.** Included in Tier 3 priorities were areas where the World Bank Group already had a successful engagement. The SCD noted that energy utilities, along with water, waste disposal, and sanitation, were largely absent beyond urban areas. It deemed connective infrastructure as critical to facilitate access to the state and its services. One priority identified was full coverage of essential services in Honiara which would support essential service provision in smaller centers and beyond by lowering the unit cost of these services. The functioning and connectivity of Honiara was considered critical to security because private sector activity in the urban service economy could be a key channel for the redistribution of natural resource rents in the broader economy. Access to electricity for lighting in Honiara was 72 percent and 42 percent in provinces not including Honiara. The total access rate of electricity for lighting in the Solomon Islands was 45 percent. SISEP's objectives of making SIEA a viable and healthy utility continue to be relevant in improving access to service delivery in rural and provincial communities.

32. **SISEP is well aligned with the Government's own NDS 2016–2035 and Medium-Term Development Plan (MTDP) 2016–2020.** The NDS goals are (a) sustained and inclusive economic growth; (b) poverty alleviated across the whole of the Solomon Islands, basic needs addressed, and food security improved, with the benefits of development more equitably distributed; (c) access for all Solomon Islanders to good-quality social services, including education and health; (d) resilient and environmentally sustainable development with effective disaster risk management; and (e) a unified nation with stable and effective governance and public order. The NDS stresses the importance of good governance and public sector reforms as fundamental conditions for private sector growth. The MTDP maps the NDS's long-term development objectives into 15 medium-term strategies (MTSs). Listed below are relevant MTSs that are supported by SISEP:

- MTS2: Improve the environment for private sector development and increase investment opportunities for all Solomon Islanders
- MTS3: Expand and upgrade weather-resilient infrastructure and utilities focused on access to productive resources and markets to essential services

- MTS5: Alleviate poverty, improve provision of basic needs, and increase food security

33. **Rating.** At the time of project completion, the PDO remained very relevant. As described, it is evident that SISEP's PDO was relevant to the World Bank Group's current country strategy, as well as the Government's own national development plans. The PDO is directly in line with the development needs of the Solomon Islands.

34. The relevance of the PDO is therefore rated as **High**.

B. ACHIEVEMENT OF PDOs (EFFICACY)

Assessment of Achievement of Each Objective/Outcome

35. **SISEP met or exceeded relevant and attributable indicators for all three outcomes associated with the PDO**. Outcomes are assessed for the entirety of the implementation period, rather than with split ratings for any restructuring for reasons described further in the following paragraphs. Achievement of the PDO, to improve operational efficiency, system reliability, and financial sustainability of SIEA, is evaluated by assessing each of the three components of the PDO. Since restructurings made adjustments to the Results Framework, a split rating by each restructuring period was considered and rejected for the following reasons: (a) there were no changes to the PDO's key expected outcomes; the change in PDO only removed reference to specific means for achieving the respective outcomes, and (b) the restructurings did not introduce substantial and/or material change to key outcome indicators, project scope, and the associated level of ambition.

36. Table 5 lists relevant indicators used in the outcome analysis where there was a change in targets, with comments showing why the level of ambition did not change materially, thereby disposing of the need for a split rating.

Table 5. Changes in Indicator Targets and Relevance for Split ratings

Indicator Name	Baseline	Change in indicator target	Comments
I.A System Losses	27 percent	Target changed from 12 to 14 in 2014 and subsequently to 18 in 2017	System losses are assessed as a combination of technical and non-technical losses. The portion of technical losses were constant at 11 percent. Therefore reducing non-technical losses to 1 percent and 3 percent as part of the 12 and 14 percent system loss targets respectively, was not reasonable. Target was corrected to be more appropriate.
I.B Average number of debtor days to collect billed revenue	360 days	Target changed from 15 to 30 in April 2017 and from 30 days to 35 days in 2018	Indicator targets moving from 15 to 30 and then 35 days did not represent a change in the level of ambition, difficulty or scope. Improving the number of debtor days to collect billed revenue to 30 days or 35 days from a baseline of 360 days implied an improvement in orders of magnitude. Making the change was essentially practical and not material in achieving the outcome.
I.C Number of days between due date of tariff and if not paid notice of arrears	365 days	Target changed from 10 days to 15 days at 3rd restructuring in 2017	Indicator target was changed to be more appropriate. In practice, the 10 day target was not practical. To meet the 10 day target, the notice of arrears would need to be sent in the middle of the billing period

37. An analysis of each element of the PDO is provided in the following paragraphs.

Outcome I: Improve Operational Efficiency

38. The improved operational efficiency aspect, including both technical and nontechnical components of operational efficiency, is measured by the following indicators:

- I.A: System losses
- I.B: Average number of debtor days to collect billed revenue
- I.C: Number of days between due date of tariff and, if not paid, notice of arrears
- I.D: Quarterly financial management reports and rolling projections for SIEA performance within 14 days at the end of each quarter

39. **At the end of project implementation, all four indicators had exceeded their targets with outcomes fully attributable to SISEP's interventions.** System losses were 17.3 percent at project close relative to 27 percent at the start of the project, surpassing the end-project target of 18 percent. The commercialization program had been implemented successfully. Several management procedures had been instituted by new board members who were hired and funded by SISEP. These included, for example, the preparation of detailed reports for management before regular board meetings which were important for improving transparency and decision making. SIEA had produced quarterly FM reports and rolling projections for SIEA performance within 14 days after the end of each quarter since 2012. The average number of debtor days to collect billed revenue was 33.61 days relative to the target of 35 days and a baseline of 360 days. Customers were provided with invoices that clearly showed the current month's charges as well as previous months' charges with the notification that previous months' balances were

due immediately. The invoice containing the due date of the tariff, notification of when the account would be in arrears (15 days after the due date of the tariff), and amounts in arrears was sent each month, thus meeting the indicator target of 15 days.

40. **Achieving the objective of operational efficiency can be substantially attributed to activities financed by a component of SISEP which financed strengthening management and building capacity of key staff.** The component financed key management positions: a technical general manager, a commercialization manager, and an external board director. Infusion of professional management staff who introduced new initiatives—corporate planning workshops, strengthened board meetings including relevant reports, key performance indicators (KPIs), and company rules—revitalized SIEA. The management launched customer surveys, reviewed debtor accounts, and made examples of intransigent customers (including government ministries) by cutting off service. Board directors were provided training and bonuses were linked to performance. SIEA was restructured organizationally after a human resources review. Management strengthening activities funded by SISEP had a direct bearing on the improvement in operational efficiency.

41. **Covenants included in SISEP were key in contributing to the success of the management strengthening component.** Management strengthening was considered a fundamental aspect in achieving SISEP's goal which was to ensure the viability of SIEA by improving operational efficiency, system reliability, and financial sustainability. At appraisal, the project team considered management strengthening critical to SIEA and included the following covenants to ensure SIEA health. The covenants directly corresponded to outcome indicators that measured operational efficiency.

- SIEA shall appoint a general manager and professional external board member each with qualifications and on terms acceptable to IDA.
- SIEA shall ensure that (a) its annual bill collection from SOEs and other government entities will be at least 75 percent of what is due and (b) arrears owed to it by SOEs and other government entities will not exceed more than 120 days.
- SIEA shall no later than November 30 of each year of project implementation prepare an annual rolling business plan with financial forecasts covering at least 7 years and have such plans discussed among the project implementing entity's Board, management, and IDA.

42. Covenants were fully or partially complied with throughout project implementation. Efficacy rating for improving SIEA's operational efficiency is rated as High.

Outcome II: Improve System Reliability

43. SISEP included substantial investments to improve system reliability. Two indicators measured the aspect of improving system reliability:

- II.A: System Average Interruption Duration Index (SAIDI)
- II.B: System Average Interruption Frequency Index (SAIFI)

44. **Targets were met and exceeded at project closing with SAIDI and SAIFI indicators showing dramatic improvements compared to the baseline.** SAIDI and SAIFI expected outcomes and targets as described in the PAD's arrangements for results monitoring were modified in the first ISR and measured accordingly throughout the project. The change was in the way that the outcomes were communicated and did not indicate a decrease in ambition. The methodology used to determine SAIDI and SAIFI outcomes was consistent from the start of the project to its end, providing a robust measure of system reliability.

45. SIEA's poor financial position had precluded it from making capital investments in generation, transmission, and distribution infrastructure and denied it access to commercial financing. With SISEP's support, SIEA had demonstrated early noticeable improvements to system reliability by 2014. The SAIDI had improved from 51,840 at approval to 4,767, and the SAIFI had improved from 816 to 46.2. However, increased demand and insufficient investment had made power supply unreliable.

46. The World Bank provided support by approving the AF of US$10.3 million from an IDA credit to directly address reliability and efficiency of electricity supplies to Honiara, the largest city in the Solomon Islands and its commercial center. At project closure, the SAIDI index was 1,757.6, exceeding the target of 2,000. The SAIFI index was 17.5 versus the target of 85. There is a direct line of sight between improvements in system reliability and the World Bank's support as the World Bank and SIEA were the only two entities active in this area. AF funds made it possible for SIEA to undertake long overdue investments to improve service to customers. Four network investment subprojects financed by the AF addressed critical weaknesses in the Honiara distribution network. In doing so, it improved the reliability of supply on the Guadalcanal grid. The improvement of reliability can also be attributed to the professional/competent technical management of the utility, which had benefited from SISEP's operational efficiency component. The efficacy rating for improving SIEA's system reliability is High.

Outcome III: Improve Financial Sustainability

47. The improved financial sustainability aspect of the PDO is measured by two indicators:

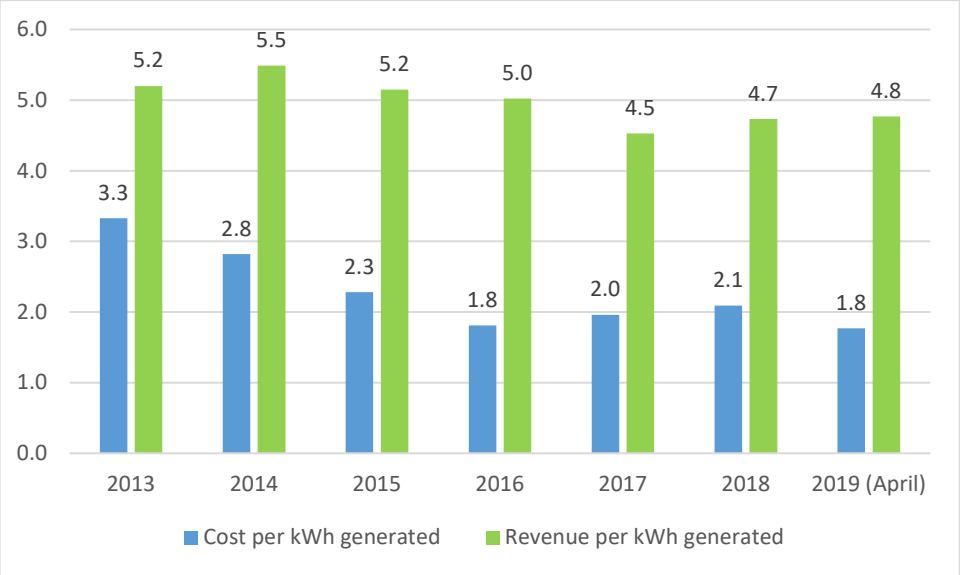
- III.A: Revenue per kWh generated
- III.B: SIEA profitability

48. Both indicators were mistakenly dropped from ISRs after the project was restructured in April 2014 (along with AF approval) even though annex 1 in the AF paper lists the indicator 'SIEA will operate profitably' as a PDO indicator and 'Revenue per kWh generated' as an intermediate outcome indicator. However, the indicators measuring revenue per kWh and SIEA profitability were reintroduced at the fourth restructuring to facilitate tracking of this outcome at closing.

49. **The achievement of both indicators is in the substantial to high range.** At project close, SIEA's profitability was SBD 80.1 million against a target of SBD 98.0 million, achieving 82 percent of the intended outcome. Revenue per kWh generated was SBD 4.64 per kWh versus a target of SBD 4.5 per kWh, achieving 103 percent of the intended outcome. When viewed in conjunction with revenue per kWh, costs per kWh generated is an additional metric to reflect SIEA's financial sustainability. Figure 2 shows costs

and revenues per kWh since 2013 (data are not available for previous years). From 2013 onward, revenues are substantially higher than costs, which bodes well for SIEA's financial sustainability.

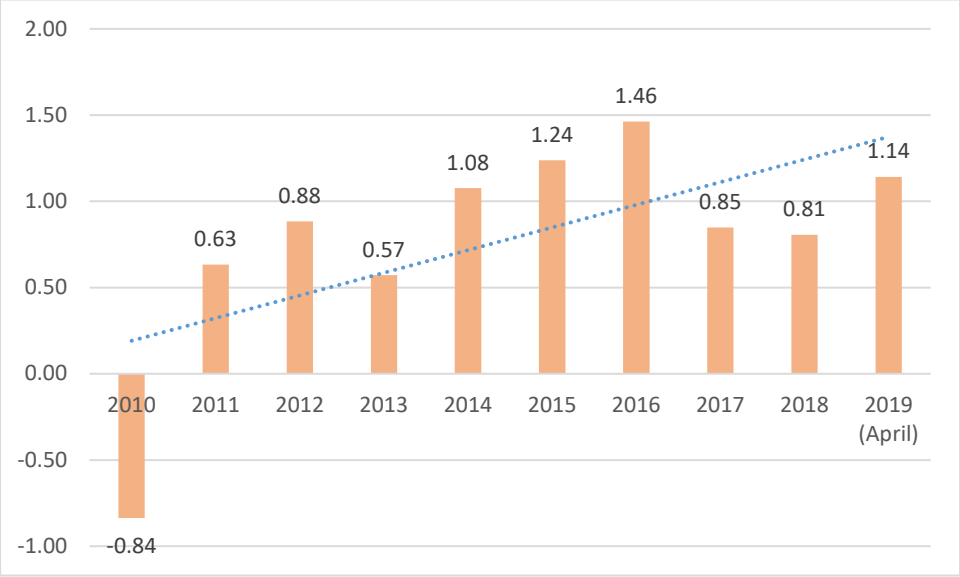
Figure 2. Cost and Revenues Per kWh Generated



Source: ICR team analysis of data provided by SIEA and from SIEA Annual Reports 2013-2018

50. In addition to the indicators mentioned, additional relevant data are available to demonstrate SISEP's success in putting SIEA on a sound financial footing. Profit per kWh can be considered an additional metric to confirm the success of this outcome. Having made a profit for the past eight years in a row (the previous operating loss was in 2010), SIEA's performance in profitability was strong. Figure 3 shows an increasing trend in profit per kWh for 2011–2018. While the overall trend is positive, the chart shows a smaller level of profitability in 2017 and 2018. This too, can be considered a success because it meant that SIEA had the resources to make investments in infrastructure from its own funds.

Figure 3. Profitability Per kWh Generated (SBD)



Source: ICR team analysis of data provided by SIEA and from SIEA Annual Reports 2010-2018

51. **SISEP had a direct role in improving financial sustainability through its support of the commercialization program.** The SIG agreement to resolve SIEA's debt was a condition of effectiveness for SISEP. In 2011, SIEA was in financial crisis and close to insolvency with severe cash flow problems and with poor and inconsistent information available to management. SIEA's fuel supplier issued a threat to restrict deliveries which created the risk of power rationing across the capital city and the entire country. However, by 2013, SIEA effected a dramatic turnaround in financial position and improved its cash flow position by concentrating on key aspects of the commercialization program that was supported by SISEP. The Ministry of Finance brokered an agreement between SIEA and the Solomon Islands Water Authority (SIWA), which was SIEA's largest customer and debtor. The agreement entailed having 100 percent of SIWA's debt to be paid. SIEA implemented improved financial controls and replaced the General Ledger System and addressed metering fraud at large commercial/industrial customers. A stronger financial performance also meant that SIEA was in a position to plan and seek capital investments. Commercial financiers began expressing interest in debt financing of SIEA's capital investments. SISEP had served its purpose of strengthening SIEA such that it could contribute to energy sector development. The efficacy rating for improving SIEA's financial sustainability is Substantial.

Justification of Overall Efficacy Rating

52. **The overall efficacy rating is High based on high efficacy in improving SIEA's operational efficiency, high efficacy in improving SIEA's system reliability, and substantial efficacy in improving SIEA's financial sustainability**.

53. Table 6 shows efficacy ratings for each aspect of the PDO based on the achievement ratio.

Table 6. Efficacy Ratings for Each Outcome of the PDO Based on Achievement Ratio

PDO Indicator	Baseline	End Target	Actual	Achievement ratio	Comment
Outcome I: To improve operational efficiency of SIEA					Efficacy rating: High
I.A System Losses	27 percent	18 percent	17.3 percent	104 percent	
I.B Average number of debtor days to collect billed revenue	360	35	33.61	104 percent	
I.C Number of days between due date of tariff and if not paid notice of arreaars	365	15	15	100 percent	
I.D Quarterly financial management reports and rolling projections for SIEA performance within 14 days at the end of each quarter	No	Yes	Yes	100 percent	
Outcome II: To improve system reliability of SIEA					Efficacy rating: High
II.A System Average Interruption Duration Index (SAIDI)	51,840	2,000	1,758	112 percent	
II.B System Average Interruption Frequency Index (SAIFI)	816	85	17.5	179 percent	
Outcome III: To improve financial sustainability of SIEA					Efficacy rating: Substantial
III.A Revenue per kWh generated	SBD1.39/kWh	SBD4.5/kWh	SBD4.64/kWh	103 percent	
III.B SIEA profitability	Loss SBD 44 million	Profit SBD 98 million	Profit SBD 80.1 million	82 percent	

C. EFFICIENCY

Assessment of Efficiency and Rating

Economic Analysis of SISEP

54. **The project has achieved the key outcomes with high efficiency based on an economic analysis as described herein, which is conservative and robust to sensitivity analysis**.

55. The economic analysis at completion was conducted at project level considering that major economic benefits are the joint result of implementing all three project components. The same cost-benefit approach was applied: economic benefits considered and quantified are avoided fuel cost and reduced outage cost while economic costs focused on capital investment and operations and maintenance (O&M) cost. In sum, at completion, the project has a net present value (NPV) of US$7.12 million (at a 10 percent discount rate) while the economic internal rate of return (EIRR) stands at 24.3 percent, which indicates good economic returns from the project. Considering environmental benefits, the NPV increased to US$13.31 million and the EIRR improved to 27.1 percent.

Table 7. Summary of Economic Benefits and Costs (US$)

ECONOMIC BENEFITS	
Avoided Fuel Cost	304,770
Reduced Outage Cost	13,063,619
ECONOMIC COSTS	
Capital Investment	5,879,352

O&M	366,066
NET ECONOMIC BENEFIT	**7,122,971**
EIRR	24.3%
Avoided Green Gas Emission	6,182,994
NET ECONOMIC BENEFIT (incl. environmental benefits)	**13,305,965**
EIRR (envir. benefit adjusted)	27.1%

56. Other economic benefits, such as customer saving through reduced requirement for auto-generation backup systems, reduced O&M costs, better voltage profile, better power harmonics, and more system stability, are evident but not included for the following two reasons: (a) to keep the same economic analysis framework used at appraisal and at AF appraisal and (b) to avoid a disproportional level of data collection and modeling efforts to quantify these benefits. For these reasons, the analysis is conservative in underestimating project benefits. Also, the conclusions are robust to sensitivity analysis if (a) O&M cost increases by 100 percent or 200 percent and (b) the discount rate was determined as about 7 percent using new 'Discounting Costs and Benefits in Economic Analysis of World Bank Projects (2016)'.

57. Harmonized[8] total ex ante NPV is roughly estimated at US$18.1 million. In comparison, ex post NPV is lower at US$7.12 million. Two driving factors are the lower-than-expected oil price and reduction of capital investment from US$17.0 million to US$11.7 million. Harmonized ex ante EIRR has not been calculated due to methodological constraints and lack of sufficient supporting data. However, the EIRR calculated at completion demonstrates comparable economic viability of the project broadly consistent with expectations at appraisal and at the stage of the AF.

Financial Analysis

58. The project is also financially viable and attractive thanks to its positive financial net present value (FNPV) as well as a financial internal rate of return (FIRR) of 21.8 percent, which far exceeds the weighted average cost of capital (WACC).

59. An ex post financial analysis of the project (not the Solomon Power as an SOE or sector) was also carried out using a 'cost-benefit analysis' with the same discount rate of 10 percent. In sum, at completion, the project has an FNPV of US$5.63 million while the FIRR stands at 21.8 percent, which far exceeds the estimated project (WACC) of 3.6 percent. A summary of the results, assumptions, and detailed analysis is presented in following sections.

Table 8. Summary of Financial Benefits and Costs (US$)

FINANCIAL BENEFITS	
Incremental revenue from reduction of loss	6,793,190
Incremental revenue from reduction of outage	12,520,779

[8] Economic analysis at appraisal only quantified the net economic benefit from avoided fuel cost while the economic analysis at AF appraisal focused on reduced outage cost. Therefore, to compare ex ante and ex post net economic return, the two ex ante analyses need to be harmonized to the same base year.

FINANCIAL COSTS	
Capital Investment	9,991,496
Incremental Fuel & Oil Consumption	3,072,026
O&M	622,100
NET FINANCIAL BENEFIT	**5,628,347**
FIRR	21.8%

60. The main financial benefits considered in this analysis are tariff revenue from incremental power consumptions by the customers due to reduction of energy losses and reduction of outage, which is in line with the two economic benefits examined in economic analysis. However, it is important to point out that financial benefit from reduction of nontechnical losses is included here because it is a transfer payment from the customers to SIEA.

61. On the other hand, three main financial costs contributed to achieve the abovementioned financial benefits: total project capital investment, fuel and oil cost for the incremental power consumption, and the O&M cost. Here the capital investment included the IDA grant, IDA credit, and the US$8.20 million equity invested by SIEA.

62. Sensitivity analysis has been performed against annual project O&M cost as well as the discount rate. In both cases, the FNPV is resilient to the changes.

Financial Sustainability Analysis of SIEA

63. Following SIEA's implementation of its capital expenditure (CAPEX) program, which included its equity investment of US$8.2 million in SISEP and a further SBD 350.0 million (US$47.6 million) entirely from its own equity for other priority projects (the construction of a new powerhouse at Lungga Power Station and installation of four 2.5 MW diesel generators), the projected financial performance of SIEA shows that the CAPEX program has had a positive impact on SIEA's performance. Throughout the future life of the program, total revenues, operating income, and net profit are projected to increase. Liquidity is expected to remain high with a current ratio well above 1 (lowest point is 8.5 in 2019). The debt-to-equity ratio is not expected to approach 30:70, given SIEA's aversion to debt, peaking at just 18:82 in 2018, before falling over the remainder of the program. The profitability of SIEA is projected to increase gradually over the life of the program, with net profit margins increasing from 17 percent in 2013 to 44.9 percent in 2033 and an average annual net profit of 37.0 percent over 20 years.

Implementation Efficiency

64. Overall, the project achieved a modest level of implementation efficiency due to implementation delays but significant cost savings.

65. The project closing date was extended from June 30, 2017, to March 31, 2019, due to a significant delay in the implementation of Procurement Plans and contracts. The main contributors were SIEA's inadequate capacity to conduct procurement in adherence to the World Bank's Procurement Guidelines, delayed recruitment to critical roles (such as procurement specialist and owner's engineer), and SIEA's inability to source qualified and skilled contractors to carry out the works. On the other hand, US$3.3

million saving in project cost was achieved. The saving mainly came from (a) savings in several capital work contracts and (b) SIEA's decision to install a transformer in Lungga by itself using its in-house capacity.

66. Efficiency ratings for the project are noted in the following paragraphs.

Overall Efficiency Rating: Substantial

67. The justification of overall efficiency rating is as follows:

- High economic efficiency demonstrated by a sound NPV of US$7.12 million and a positive EIRR of 24.3 percent
- High financial efficiency of the project with an attractive FIRR of 27.5 percent compared to WACC at 2.0 percent
- High financial sustainability of SIEA with average annual net profit of 37.0 percent over 20 years
- Modest implementation efficiency due to a 21-month closing date extension but significant saving of US$3.3 million

D. JUSTIFICATION OF OVERALL OUTCOME RATING

Overall Outcome Rating: Satisfactory based on High Relevance, High Efficacy, and Substantial Efficiency

68. SISEP was designed, appraised, and approved at a critical time for SIEA and for the Solomon Islands in the electricity sector. The Government faced a range of issues in the sector, including restoration of transmission and distribution networks which had been damaged in previous years' riots; expansion of electricity access: less than 16 percent of households had access to electricity at the time, with rural access at only 10 percent; and development of new renewable energy-based generation capacity. Prohibition of the SIG to borrow for these investments under the Honiara Club agreements meant that strengthening SIEA became not only a desired outcome but a core requirement, essentially a prerequisite, both for basic operations and for further sector development.

69. The following is a list of issues faced by SIEA at project start and their status today. SISEP's contribution in addressing these issues is also stated here:

(a) At the end of 2007, system reliability was poor. Customers had power interruptions at least twice a day and the power disruptions were endured for approximately 2.5 hours a day. At the end of SISEP's implementation, there was a dramatic improvement in system reliability. SIEA's 2018 annual report states that the SAIFI index (measuring the number of times a customer's service is interrupted in one year) showed that customers were interrupted 1.45 times a year in 2018. SISEP's investments in system reliability contributed to this improvement.

(b) SIEA had serious inefficiencies and was in crisis. In 2011, SIEA faced severe cash flow problems and was close to insolvency. However, at project close, SIEA's financial position is

sound. A 2016 Asian Development Bank (ADB) report[9] that benchmarked the performance of SOEs in Pacific Island countries noted that the Solomon Islands' SOE portfolio was the most profitable portfolio in the Pacific. The report further noted that SIEA represented 47 percent of the profit and 83 percent of the profit in the SOE portfolio and had contributed an average of 70 percent of the portfolio's net profit since 2010.

Table 8 is a snippet from the ADB report showing benchmarking of Pacific Island SOEs with the Solomon Islands at the top of the list.

Table 9. Benchmarking of Pacific Island SOEs

State-Owned Enterprise Portfolio Performance Indicators (%)

Country	Average Return on Assets FY2010–FY2014	Average Return on Equity FY2010–FY2014	Contribution to GDP 2014
Solomon Islands	6.7	10.0	3.6
Marshall Islands	(3.7)	(8.1)	5.3
Mauritius	3.4	7.4	1.9
Kiribati[a]	2.8	3.8	11.9
Tonga	2.5	3.9	7.1
Fiji	1.5	3.3	4.3
Papua New Guinea	1.3	2.4	1.8
Vanuatu (FY2010–FY2013)	0.8	3.7	1.8
Samoa	(0.3)	(0.6)	3.0
Jamaica	(2.3)	(15.1)	0.3
New Zealand	(0.4)	(1.3)	1.2
Singapore	5.1	10.4	3.9

( ) = negative, FY = fiscal year, GDP = gross domestic product.
[a] The financial results of the Kiribati state-owned enterprise portfolio must be treated with some caution, as few of the state-owned enterprises received unqualified audit reports.
Sources: World Bank. World Bank Development Indicators. http://databank.worldbank.org/data/home.aspx; accounts provided by countries and publicly available sources.

Source: ADB.

Improvements to SIEA's financial position are attributed to SISEP's successful implementation of the commercialization program along with other measures undertaken (e.g., restructuring of SIEA's debts). SIEA's financial position now allows it to pay dividends, which it has been paying since 2016. In 2018, SIEA invested SBD 30 million in SIG Domestic Development Bonds. In addition, SIEA also began a program of capital investment in generation, transmission, and distribution infrastructure, which was previously not possible because of its poor financial position.

(c) SIEA held a central role in advancing objectives in the energy sector but needed additional capacity and know-how. At SISEP's start, there were no other development partners participating in the energy sector. Their involvement required a strong and capable SIEA with capacity to partner with them in developing energy sector projects and implementing them. At SISEP's close, a substantial number of international partners are involved in the energy sector. SIEA's 2018 Annual Report[10] names the ADB, Japan International Cooperation Agency, the New Zealand Government, and the United Arab Emirates Government as partners in operations. SISEP's component which strengthened management played a

[9] ADB (Asian Development Bank). 2016. *Finding Balance 2016: Benchmarking the Performance of State-owned Enterprises in Island Countries*. https://www.adb.org/sites/default/files/publication/192946/finding-balance-2016-soe.pdf.
[10] http://solomonpower.com.sb/sites/default/files/Reports/Solomon%20Power%20Annual%20Report%202018.pdf.

significant role in building capacity. By 2014, newspaper articles were reporting on SIEA's turnaround, specifically citing World Bank's support in providing technical assistance and expertise.

70. **In summary, this ICR assesses that SISEP was highly successful in meeting its objectives.** SIEA is now in a strong position to implement each element of the Government's planned energy sector development program. Management has been strengthened, the commercialization program has become entrenched, and SIEA has invested to further improve system performance.

Table 10. SISEP Final Outcome Ratings

	Outcome Ratings
Relevance	**High**
Efficacy	
I. Operational Efficiency	High
II. System Reliability	High
III. Financial Sustainability	Substantial
Overall Efficacy	**High**
Efficiency	**Substantial**
Overall Outcome Rating	**Satisfactory**

71. The overall outcome rating is rated as **Satisfactory.**

E. OTHER OUTCOMES AND IMPACTS (IF ANY)

Gender

72. **Gender inequality is generally high in the Solomon Islands.** The country ranks 156th on the gender inequality index.[11] In the energy sector, gender inequality is noticeable. Most positions within the energy sector are technical roles, and traditionally, majority of women have not considered these types of roles as viable career paths nor have they been encouraged to pursue these roles by their employers. The Pacific Power Association benchmarking 2017 (2015 data) reports that 21.3 percent of the total workforce employed in Pacific power utilities are women, with 4 percent of female representation at technical levels. SIEA has 21 percent female employee base and 6 percent female employees at technical level. This places the organization at the top of Pacific regional statistics. However, SIEA is committed to improving gender equality within the power sector.

73. SISEP was prepared in 2008 when design and documentation of gender tag related aspects in projects was not required. However, at the time of AF approval, the project explicitly considered the relationship between improvements in access to reliable, efficient, and affordable electricity and the empowerment of women by reducing their time and labor burdens and providing opportunities for enterprise and capacity building. Consultations with the Solomon Islands Women in Business Association were carried out, which identified issues relating to the quality of power supply and the performance of SIEA. The design of the AF addressed these issues. The provision of reliable and more economical

[11] United Nations Development Programme, Human Development Report 2016.

electricity services through upgrades to the power network, as supported by the AF, was in several ways also gender neutral—because 'lights staying on' benefits all consumers.

74. **Strengthened management capacity has meant that SIEA is now committed to tackling gender inequality within its organizational structure.** The World Bank supports SIEA's commitment to improving gender equality through energy sector operations approved after SISEP. In particular, the Solomon Islands Electricity Access and Renewable Energy Expansion Project (SIEAREEP) supports the transformation of women's employment in three ways: (a) implementation of a program to employ rural women in maintaining solar panels and sites, (b) assessment of the main barriers for women to take technical and managerial roles and designing measures to address these, and (c) support to SIEA to implement gender-based violence policies and to develop respectful and supportive workplaces.

Institutional Strengthening

75. **SISEP was designed as a project to strengthen management, increase financial sustainability, and improve reliability, which was especially important in an environment of low capacity**. As such, the entire project was expected and proceeded to strengthen SIEA. SISEP financed several senior staff positions in SIEA, including expatriate specialists who infused their knowledge into SIEA operations. Some positions were required to have candidates with relevant experience—the commercialization manager, for example, was expected to be experienced in World Bank procedures. There were also many local staff with excellent and deep knowledge of their country and SIEA operations. The combination of local knowledge with international know-how greatly enhanced project operations. Project components also included training in technical and financial topics to increase capacity of staff where needed.

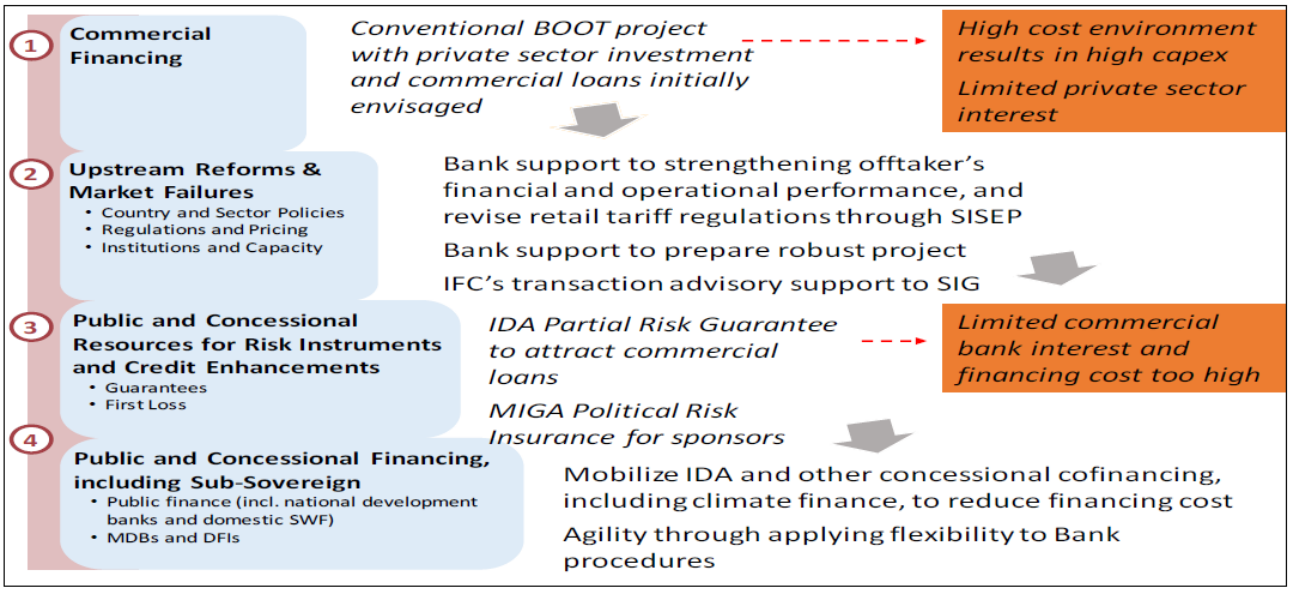
Mobilizing Private Sector Financing

76. As mentioned earlier, SISEP was approved in 2008 at a time when SIEA's financial position was precarious. This had led to chronic underinvestment in generation, transmission, and distribution infrastructure. Therefore, network reliability was inadequate and access to electricity among households was extremely low. Investment needs were high and private sector solutions needed to be catalyzed to bridge the investment gap. However, there was limited private sector interest. Private entities required a counterpart that could partner with them to design and implement energy sector projects, a role that SIEA found difficult to play at the time of approval.

77. SISEP was instrumental in improving the financial and operational performance of SIEA. Regulations and pricing were analyzed by a tariff review study supported by the project. Gains brought about by SISEP made partnering with private entities feasible. A case that demonstrates SIEA's success in partnering and implementing such projects is the Tina River Hydropower Development Project (TRHDP) which is expected to generate 15 MW of electricity and significantly reduce the country's dependency on diesel and improve the reliability of power supply. The TRHDP, cofinanced with Australia, the Republic of Korea's Economic Development Cooperation Fund, the Green Climate Fund, the Joint Abu Dhabi Fund for Development and International Renewable Energy Agency, and the ADB, is a good example of the maximizing finance for development (MFD) approach. The financing package was optimized with the private sector providing the majority of the equity and the SIG, multilateral development banks, and donors providing the rest of the equity and all the debt. This structure has helped achieve the lowest-possible electric tariff considering the high cost of the project. SISEP created the appropriate environment

for private sector involvement. Figure 4[12] shows the MFD approach for the TRHDP and SISEP's role in making it feasible.

Figure 4. SISEP and MFD Approach Used in the TIna River Hydro Development Project



Poverty Reduction and Shared Prosperity

78. **Poverty analysis.** The most recent poverty assessment[13] showed that based on the Household Income and Expenditure Survey, 12.7 percent of the population in the Solomon Islands lives below a Solomon Islands-specific poverty line and are classified as 'poor'. This poverty line is defined as the minimum expenditures needed to obtain basic food and non-food goods considering prevailing consumption patterns in the country. Honiara had the highest basic needs poverty line: meeting basic needs cost twice as much money in Honiara as in most other provinces due to the higher cost of both food and non-food goods.

79. A major obstacle in promoting economic development and expanding the use of electricity is the high average retail electricity tariff of approximately US$0.65 per kWh which is the highest in the Pacific region and among the highest in the world. The Solomon Islands is almost entirely dependent on imported refined petroleum fuels for national energy needs for electricity generation, transport, and lighting. Electricity is supplied to urban centers through diesel generators. In rural areas, the wide distribution of population and low densities make capital costs of connecting consumers very high relative to revenue generation. The problem had been further exacerbated by the distorted tariff methodology which did not benefit end-users appropriately when global oil prices were lower. At the end of 2016, SIEA revised the

[12] Source: Country Partnership Framework for Solomon Islands for FY2018–FY2023, Report No. 122600-SB, World Bank Group, 2018.
[13] Solomon Islands' poverty profile based on the 2012/13 HIES, World Bank, 2015; http://documents.worldbank.org/curated/en/922811528186449003/pdf/Solomon-Islands-Poverty-Assessment.pdf.

tariff methodology so that the benefit of lower generation cost will be adequately passed on to electricity users.

80. To reduce exposure to volatile global oil prices and to enhance energy security, the SIG aims to increase the share of renewable energy to 50 percent of total installed capacity by 2020. The SIEAREEP will facilitate access to additional people to electricity networks while improving sustainability and affordability through the replacement of diesel generation with more affordable sources of power. The SIEAREEP's economic analysis identified that the project will avoid over US$21.6 million in diesel-related costs which will facilitate tariff reduction by reducing the level of diesel dependency, generating clean and sustainable energy and subsidizing connections to over 1,500 low income families, schools and health centers.

81. The initial cost to connect to the power system in the Solomon Islands is extremely high. The World Bank approved the US$2.5 million Electricity Access Expansion Project supported by the Global Partnership for Output Based Aid in July 2016 to provide targeted subsidies to low-income households to help new customers pay the initial connection fee and basic in-house wiring for low-income households which is a major impediment to increasing the electrification rate. In 2017, SIEA advised the World Bank that the gazettal of the tariff regulation, which enacted a new retail tariff based on the cost of service study and tariff review, had occurred with new tariffs effective in January 2017. The tariff regulation resulted in a 20 percent decrease in tariff for large commercial customers and between a 4 percent and 10 percent decrease in tariff for residential customers. In addition, the tariff regulation benefited low-consumption users by introducing a low-consumption tariff (a baseline tariff) which was lower than the prevailing tariff rate.

Other Unintended Outcomes and Impacts

82. No unintended outcomes or impacts were recorded by SISEP.

III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

A. KEY FACTORS DURING PREPARATION

83. A primary objective of SISEP was the reform of SIEA, specifically strengthening of management as a prerequisite to achieving the SIG's energy sector goals. There were several options that could have supported the objective of strengthening management. They included (a) award of one or more electricity supply and/or distribution concessions to private companies, (b) award of a utility management contract to an outside firm for a specified period with specific performance requirements, or (c) engagement of external senior managers and/or expert staff to support utility management and operation for a specified period and help further train local utility managers and staff.

84. Each of the three options for improving management and operational efficiency in SIEA was considered. An initial concept was to make arrangements for the electricity and Honiara water utility (SIWA) together, especially because SIWA was the largest debtor to SIEA. However, SIWA did not participate, and the management contract concept was developed for SIEA alone. Over 30 potentially interested companies were surveyed regarding their interest in purchasing these franchises, but none

expressed interest in submitting bids. Five companies did express some potential interest in bidding on a management contract if suitable government guarantees were in place.

85. However, as time proceeded, the market for a potential electricity management contract tightened, with prices for these services increasing sharply, and guarantee requirements over and above what the Solomon Islands would be able to provide under the Honiara Club agreements. In the meantime, the experience of the FEA, which had opted to appoint five expatriate managers as part of its own reorganization in 2002, continued to show strong performance. In light of the emerging FEA experience and the increasingly less-favorable results with management contracts, the SIG and the World Bank designed a package of reforms which included the hiring of several senior staff in key positions. The proposal also included a twinning arrangement between SIEA and FEA.

86. **Partnership arrangements.** The World Bank worked in close collaboration with partners to provide support in improving the performance of SOEs in the Solomon Islands. While there was limited interest from commercial entities to participate in the energy sector, SIEA partnered with a few development partners to further energy sector goals. RAMSI/Australian Aid supported the electricity pricing and regulation study as well as the Rural Electrification Master Plan. A study to establish the legal framework for rural electrification was also planned. The World Bank and other partner agencies worked in a complementary fashion to further development.

B. KEY FACTORS DURING IMPLEMENTATION

87. SISEP's initial focus on strengthening management, that is, hiring of key senior staff, produced early gains which were key to achieving successful outcomes. These early gains are attributed to improved corporate governance, with appointments to the SIEA board being carried out under the SOE regulations of 2010 and improved FM and internal audit functions within SIEA. The success of the commercialization program was crucial in producing a virtuous cycle with regard to objectives—improved financial health allowed SIEA to invest in capital expenditure to improve service and increase revenue, which in turn led to a healthier balance sheet. During 2012 and 2013, the SIEA board approved a corporate restructuring that established an internal audit group focused on meter reading, billing reconciliation, and reducing theft/meter bypass and created a capital projects management team charged with the planning, oversight, and delivery of new projects.

88. SIEA's measures in implementing the commercialization program were necessary but not sufficient to put its finances on a sustainable trajectory. An important factor was the restructuring of SIEA's debt which was long-standing and needed government intervention without which it was unlikely that SIEA's financial recovery could be maintained. As mentioned earlier, SIWA was SIEA's largest debtor. The SIG had restructured SIWA's debt to SIEA in 2008 and it was a condition to IDA's financing of SISEP. However, this debt settlement agreement was not successful. SIWA continued to operate noncommercially, did not have the capacity to pay its power bills, and had accumulated the SBD 36.7 million debt to SIEA in the 50-month period between January 2008 and February 2012. It was only in early 2011 that the SIG committed to reforming SIWA, recognizing that without reform at SIWA, SIEA's largest customer, attempts to improve the financial sustainability of SIEA were unlikely to succeed. This had an impact on the development of the Tina River Hydropower Scheme which required SIEA as the power offtaker to be financially healthy.

89. In May 2012, a second SIWA-SIEA debt settlement agreement was signed between the SIG (Minister of Finance and Treasury and Minister of Mines, Energy, and Rural Electrification); SIEA; and SIWA. Full settlement of SIWA's SBD 36.7 million was structured in a way that combined SBD 20 million in government capital injection into SIWA for onward payment to SIEA, SIEA providing SBD 7.5 million interest-free loan to SIWA to be repaid over 8 years, and SIEA writing off SBD 9.2 million of SIWA's debt. Importantly, unlike the 2008 debt settlement, the one in 2012 worked because SIWA was financially restructured to operate on a commercial and sustainable basis. SIWA's tariffs were adjusted so that it could cover its costs, including for electricity. The agreement increased SIWA's tariffs over the next three years, established a mechanism for SIWA's tariffs to be adjusted quarterly in line with increases in SIEA's tariffs, and established a mechanism for SIWA's tariffs to be adjusted annually in line with the consumer price index.

90. As mentioned, SIEA was substantially dependent on imported refined petroleum fuels for national energy needs. An improved financial position meant that SIEA could initiate a fuel procurement tender in 2012. High fuel costs were a critical strategic issue for SIEA as fuel purchases accounted for around 60 percent of SIEA's operating expenditure. Past financial crises at SIEA had been related to cash flow issues relating to payment of fuel bills. A new fuel contract was negotiated for long-term supply, delivery, and management of SIEA's fuel stocks and maintenance and replacement of fuel storage tanks at SIEA power stations. The contract provided SIEA with a price that was a significant discount on regulated fuel price.

91. The fiscal position of SIEA continues to be strong. SIEA started declaring dividends to the SIG in 2016 and has done so each year thereafter. Dividends of approximately SBD 4 million are declared each year. In 2018, SIEA invested SBD 30 million in SIG domestic development bonds. SIEA's annual expenditure on infrastructure investments totaled SBD 140 million. The Solomon Islands' current electricity utility is a vastly different operation than the utility of 2008 when SISEP was approved.

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

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

M&E Design

92. **SISEP's objectives were clearly defined and directly responded to critical issues that SIEA was facing**. At approval, the PDO was complex in that it also described the activities to achieve the PDO in addition to the PDO itself. This was corrected during implementation. SISEP's Theory of Change was logical and could demonstrate the results chain that led from SISEP's activities leading to intermediate outcomes progressing on to PDO outcomes. SISEP's objectives responded directly to the issue identified which was that energy sector goals of increasing access and affordability could not be addressed until SIEA was a viable and financially healthy entity.

93. **At project design, there was inconsistency in describing PDO-level indicators and intermediate outcome indicators**. The inconsistency appeared in different sections of the PAD, leaving an impression that the Results Framework was not well thought through. As an example, the PDO-level indicators described in the project description section in the main body of the PAD were not consistent with the PDO-level indicators described in annex 3 or in the Results Framework. In addition, inconsistencies were

apparent between the PDO results indicators in annex 3 and the table describing arrangements for results monitoring which contained only one PDO indicator (SIEA will operate profitably and with PDO indicators listed as intermediate indicators).

94. **The PDO-level indicators were adequate to measure progress and achievement of the project's three-part development objective** of improving operational efficiency, financial sustainability, and system reliability of SIEA. The indicators were relevant and time bound. M&E arrangements were made for the project management team in SIEA to be responsible for M&E.

M&E Implementation

95. **There was considerable variability in the structure of the Results Framework throughout implementation.** The intermediate outcome indicators in the PAD's Annex 3: Arrangements for Results Monitoring were elevated to PDO-level indicators in the first ISR. However, four indicators were also retained as intermediate indicators leading to the same indicators being at the PDO level as well as the intermediate outcome indicator level: (a) SAIDI, (b) SAIFI, (c) revenue generated per kWh, and (d) net profit before tax. There was no indication that a formal restructuring was conducted to effect these changes in the ISR.

96. **The first ISR after AF approval reflected changes brought about by AF investments.** The Results Framework was amended to include new intermediate outcome indicators which corresponded to investments that were to be made for network improvements (for example, 'Commissioning of switchboard at Ranadi' and Kola'a ridge substation commissioned') and the indicators for revenue generated per kWh and net profit before tax were deleted at PDO and intermediate outcome levels However, SAIDI and SAIFI remained at both the PDO level and intermediate outcome level. The indicator 'Number of pre-paid meters installed' was dropped.

97. **The Results Framework was further refined during the third and fourth restructuring**. At the third restructuring, the Results Framework was amended and the duplication of SAIDI and SAIFI was removed. After the fourth restructuring, the Results Framework was amended once again with the 'Revenue generated per kWh' and 'Net profit before tax' indicators being reinstated, the latter as an intermediate outcome indicator. The indicator that measured generator efficiency was dropped.

98. **Targets for individual indicators also varied during implementation**. At times, targets were made more stringent with the desire to be accountable for increased investments. The more stringent targets made sense for some indicators, for example, SAIDI and SAIFI, where one could expect an improvement in these indexes if additional investments were being made to improve reliability. At other times, a more stringent target was not advisable such as the increase in ambition from 16 percent to 12 percent at the first restructuring. An Energy Sector Management Assistance Program study[14] suggests that system loss reductions measured as a combination of technical (for example, heat or copper losses, magnetic losses, and transformation losses) and nontechnical losses (for example, commercial losses, metering failures and theft) are difficult to separate. In SIEA's case, technical losses of approximately 11 percent have been assumed. A residual target of 1 percent for nontechnical losses was practically not feasible for SISEP. Some

[14] Tallapragada, P., M. Shkaratan, A. Izaguirre, J. Helleranta, S. Rahman, and S. Bergman. 2009. *Monitoring Performance of Electric Utilities: Indicators and Benchmarking in Sub-Saharan Africa.* , World Bank.

restructurings were conducted with short interval periods with indicator targets amended frequently. Considering that the change in targets was not material to the project's outcome, frequent changes in targets was inefficient.

99. **SISEP's data was collected and analyzed in a methodologically sound manner.** The methodology for most indicators was consistent from the first ISR to the end of the project. However, the methodology for the collection ratio indicator was not consistent from before project approval and continuing through project implementation. At the end of project implementation, the collection ratio was 60 percent, lower than the baseline figure of 72 percent at project approval. The ICR team could not verify that the collection ratio at the start of the project and at the end of the project was measuring what it purported to measure. There was substantial variation in collection ratio measurement leading to a situation which made comparisons at project start and end not possible, leading to the indicator being unusable. A possible explanation was that newer IT systems for billing installed as part of SISEP may have contributed to this mismatch. Systems that did the billing were not the same at project start and at project close. It would have been beneficial to revisit this target earlier in project implementation rather than at a later stage. The collection ratio was therefore not used in assessment of outcomes.

100. **There were instances where the project team took proactive action to correct the stated target** to one that is more appropriate and achievable due to project activities, but without compromising on the ambition of the outcome to be achieved. These actions are evident in the indicators 'Average number of debtor days to collect billed revenue' and 'Number of days between due date of tariff and, if not paid, notice of arrears'. These increases show that the project team was aware that there were shortcomings in the estimation of an appropriate target and level of ambition and took action to correct it.

101. **At first, the project team required assistance to conduct effective M&E implementation**. ISRs reported that an increase in the quality and detail of reporting on the progress toward the project's Results Framework indicators was required. This was to be expected with the World Bank and SIEA working together for the first time. By project close, however, M&E functions were being implemented in a sound manner and processes are likely to be sustained after project closing.

M&E Utilization

102. **The project management team at SIEA produced monthly reports which reported on progress toward indicators**. In addition, specific performance indicators were added to the contracts of the two professional utility managers. SIEA reported on their progress on a quarterly basis. An arrears report was mandated for each Board meeting to monitor non-paying SOEs and government entities. The general manager reported monthly to SIEA's board on the type of routine generation and network maintenance activities carried out, including system outages and analysis and estimated costs.

103. In addition to M&E conducted to inform its operations and report to its board, SIEA also gathered information from customers through a customer survey which allowed it to recalibrate its services based on consumer demand. Customer surveys are held regularly, with the most recent being held in 2018. One example of using consumer opinion to retool its services was provided to the ICR team by project counterparts. One request that came from customers was that more information on the mobile top up system was desirable. SIEA responded by conducting an information campaign. In addition to activities at its headquarters in Ranadi, areas with heavy foot traffic were targeted, for example, at Hyundai Mall.

Justification of Overall Rating of Quality of M&E

104. SISEP was successful in being able to monitor progress and providing evidence that development objectives as planned for at project start had been met. In addition to requirements for reporting to IDA, SIEA had instituted its own processes of reporting to its board, members of which were avid consumers of data provided. However, there were substantial shortcomings in the design of M&E before approval as described. Opportunities during implementation to re-examine the Results Framework were not used. The overall quality of M&E is rated as **Modest.**

B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

105. **Procurement.** At SISEP's approval in 2008, assessment of SIEA's capacity to implement procurement actions for the project rated the risk as High. SIEA's structure and capacity was deemed insufficient and expenditure control was taking place in a fragmented arrangement. The legal and regulatory framework lacked the operational detail necessary for efficient procurement implementation. There was an absence of procurement planning and procedural tools and the limited number of local contractors increased the possibility of saturation, collusion, and nepotism.

106. **Project design included a specific action to mitigate the above risks and support SIEA which until then had no experience with implementing World Bank procurement procedures.** The action plan included (a) appointment of a commercialization manager with World Bank procurement experience; (b) strengthening of the National Competitive Bidding (NCB) process with the first NCB packages; (c) implementation of a procurement planning cycle and the development and implementation of a procurement filing system; (d) finalization and implementation of audit procedures; and (e) training for SIEA staff on World Bank procurement procedures.

107. By 2014, at AF approval, several lessons were learned, particularly from past International Competitive Bidding (ICB) contracts, and were incorporated into the AF project design. Lessons included the following: (a) qualification requirements need to be appropriate to the size and complexity of the work; (b) suitable packaging of contracts into works of sufficient scale is required to attract more international bidders to a small, unfamiliar, and remote location like the Solomon Islands; and (c) cost estimates need to be more carefully prepared and procurement planning and execution needs to be carried out in a more timely manner.

108. **The World Bank conducted a post review of signed contracts in January 2019 (two months before project closure).** The review included contracts for the manager contracts, procurement specialist, and environment and social safeguards specialist. The review showed that the agreed procedures were followed, the relevant documents on the selection process were on file, and the selected consultants were all on the ground with services ongoing at the time of the review. It was recommended that SIEA should improve the filing system where procurement activities and documents are stored to make documents immediately available.

109. **FM.** The FM assessment at SISEP's approval in 2008 rated the risk as Moderate considering the total financial commitment to the program, the capacity of SIEA and the structure and complexity of the project. FM arrangements were assessed as adequate. The assessment flagged that government capacity was dependent on expatriate support but that the accountant general and auditor general were

increasingly effective. SIEA had no experience in the delivery of World Bank projects. To mitigate this risk, project design included funding for finance training. The SIG hired a professional accounting firm to assist SIEA to put in place all required financial reporting systems for this project.

110. During implementation, the FM assessment conducted at the time of AF approval noted that there had been significant improvements in SIEA's FM processes and systems which were reflected in (a) an unqualified entity audit in 2012, (b) the 2012 entity audit being completed within the statutory time period after the end of the fiscal year, and (c) SIEA implementing a new and more robust billing and ledger system, effective January 1, 2014.

111. An FM implementation review was conducted in March 2018. FM performance was then reassessed to Moderately Satisfactory because while accounts were well maintained, improvement was required in managing the commitments register on active projects. The commitments register is an important management tool to monitor all committed funds versus project-available funds and help identify project funds that remain uncommitted and is an effective way of monitoring contract payments. SIEA is tasked with updating the commitments register to monitor active projects. At project closing, no material issues are evident in the FM area.

112. One year before project closure, US$3.3 million was canceled as SIEA, now financially on its feet, decided to fund some of SISEP's activities from its own funds. At SISEP's closing, approximately US$0.9 million is expected to remain undisbursed. On one hand, this can be viewed as a positive development—SISEP had met its objectives to make SIEA financially sound and could now fund its own capital expenditures. On the other hand, project funds remaining undisbursed at the end of the project is likely due to inexact estimates of funds needed at the time of cancellation.

113. **Safeguards.** At SISEP's approval in 2008, the project's environmental category was rated as C, which reflected the fact that proposed investments were essentially replacement of distribution feeders, upgrading of other network distribution elements including transformers to reduce network losses, and replacement of existing meters with prepaid meters. Existing generation facilities were being provided with the necessary spare parts to improve the reliability and efficiency. SISEP's focus was on institutional strengthening, technical assistance, and commercialization through improved FM, improved accounting systems, and operational IT support. Hence, no environmental or safeguard policies were triggered by investments proposed in the loan approved in 2008.

114. The environment category for SISEP changed from Category C under the original project to Category B under the AF as new activities that were being financed triggered OP/BP 4.01 (Environmental Assessment). Activities financed by the AF took place within the confines of existing facilities on land leased by SIEA. There was no land acquisition or involuntary resettlement arising from AF activities. SISEP had an urban context and no indigenous peoples as defined under OP 4.10 (Indigenous Peoples) were located in the project's area of influence. The project's ESMF stated that the proposed new subprojects would cause no major social or environmental impacts and that minor impacts could be readily mitigated and resolved.

115. During implementation of AF activities, SIEA's contractor managed environment and social matters during construction of capital works with oversight by SIEA. As part of the capital works, SIEA managed the planned temporary closure of a Honiara road for approximately one week. The closure of

an approximate 60 m section of road (30 m on either side of the site of work) restricted the entrance to several houses and canteens. SIEA and the contractor notified residents and maintained pedestrian access during the majority of construction so as to minimize disruption. The details of any compensation of the businesses along the section of road were shared with the World Bank before construction.

C. BANK PERFORMANCE

Quality at Entry
Rating: **Satisfactory**

116. SISEP was conceptualized, designed, and approved at a time that was critical for SIEA. The agency was close to insolvency and had difficulty in obtaining fuel to maintain its operations. Strengthening SIEA in operational, financial, and quality of service areas was critically important for SIEA to perform basic functions of a power utility. SISEP was the first financial engagement undertaken by the World Bank in the energy sector in the Solomon Islands. Emerging from conflict, needs were huge, but no financiers would partner with SIEA as they needed a viable and healthy power utility to do business with. An IDA grant to restore the health of SIEA was the right choice. SISEP was therefore highly suited to support SIEA at that point in time.

117. While SISEP was the World Bank's first financing package in the Solomon Islands, support in the form of technical assistance and expertise had been ongoing since 2005. The initial World Bank engagement in 2005–2007 involved conducting diagnostics on both the power and water utilities and providing expertise on financial recovery plans for SIWA and SIEA. This made sense because the performance of both utilities had a substantial impact on each other. One proposed reform was a management contract/concession covering both SIWA and SIEA in 2007 which was not supported. A power management contract was tendered in 2007, but there was not enough interest. Regarding restructuring SIWA, there was no political or board or management support in 2007. Reform efforts then focused on SIEA and SISEP was approved with IDA financing in 2008.

118. SISEP was designed to place the energy sector of the Solomon Islands on a sustainable footing. Key operating aspects that helped neighboring Pacific Island states, for example, the FEA, achieve success were considered and largely incorporated in the design of SISEP. These included (a) the adoption of a strong FM system, with a focus on collection, with customers who are late in paying their tariffs receiving notices within 2 to 3 days after missed payments; (b) the introduction of prepaid meters, for which prepaid cards could be bought through local retail stores; (c) commitment from the Government to exercise due diligence in payment collections and, if necessary, cut off non-paying customers including SOEs; (d) outsourcing of maintenance and repair services while inspecting the level of services provided by their contractors; and (e) an active long-term human resource planning methodology, focusing on on-the-job training for both management and operators.

119. At approval, SISEP met readiness criteria for implementation. Procurement Plans had been formulated for the first 18 months and a General Procurement Notice was published. Advertisements and Expressions of Interest notices had been placed to procurement of the commercialization component. Procurement packages for IT systems had been defined and a Request for Expressions of Interest was ready to be published as soon as the project had been approved by the Board.

120. Project design acknowledged and mitigated for critical risks. Two substantial risks were identified. The first included a lack of capacity in the Government which was mitigated by making sure that the commercialization manager was appointed with qualifications acceptable to IDA. This was a condition of effectiveness. A second significant risk was a highly volatile political environment and the lack of commitment in commercializing SIEA. To mitigate this risk, the SIG agreed to restructure SIEA's debt before negotiations commenced for SISEP.

Quality of Supervision
Rating: **Moderately Satisfactory**

121. Project supervision was substantial after project effectiveness. Supervision missions were carried out regularly, averaging every four months, including field visits and physical checks of investments. The project's task team leaders were based in the Sydney office during the entire life of the project. This resulted in well-facilitated client engagement. The World Bank office in Honiara also provided support as needed. Critical issues were identified early and collaborative solutions were found with SIEA. The project record shows evidence of detailed ISRs and Aide Memoires.

122. Project teams were sensitive to needs that arose during implementation and accordingly restructured as needed. This ICR could not find evidence of a midterm review (MTR) though it is likely that frequent restructuring played the same role as would an MTR. The project was restructured four times, one of which also included the AF. The last two restructurings were at the tail end of the project—one and two years before closure. It could have been useful to consolidate these two restructurings. The project was extended thrice, which provided time needed for completion of activities without compromising the project's performance.

Justification of Overall Rating of Bank Performance
Overall Rating of Bank Performance: Moderately Satisfactory

123. The quality of entry and quality of supervision aspects have been assessed to be Satisfactory and Moderately Satisfactory, respectively. A few shortcomings as described above were not sufficiently severe to compromise the project. The World Bank team and government counterparts worked to keep the project on track and brought the project to a satisfactory closure.

D. RISK TO DEVELOPMENT OUTCOME

124. **The main risk to a sustainable development outcome is government commitment to the SOE Act of 2007 and regulation of 2010**. However, it is important to note that SIEA's performance in turning things around was strongly predicated on using provisions in the SOE Law. Improved corporate governance followed from appointments to the SIEA Board being carried out under the SOE Law. SIEA's road to financial sustainability was helped by the SOE Law which required SOEs to operate profitably. SIEA was able to disconnect non-paying consumers, including government agencies. Today government commitment to the SOE Act appears to be firm. If the government's commitment wavers, the risk of utilities falling back into insolvency is real.

125. **There is also a risk that affordability and access goals will remain a challenge**. The risk to their alleviation is mitigated by the fact that ongoing efforts by the SIG and other development partners are directly tackling these issues, including the World Bank through its SIEAREEP project. SISEP has achieved its objective in strengthening SIEA's position to contribute to holistic sector development. It is likely that financial sustainability will persist despite investments in improving access and affordability based on financial projections. SIEA is now in a better position to strike and maintain the right balance of the different sector objectives embodied in Sustainable Development Goal 7 (Ensure access to affordable, reliable, sustainable and modern energy for all).

V. LESSONS AND RECOMMENDATIONS

126. **A robust regulatory environment is vital to successful reform of SOEs.** The SOE Act of 2007 and 2010 SOE regulations provided a robust framework for SOE governance accountability and performance. The law required SIEA to operate profitably, a consequence of which is that SIEA operated as a private firm to the extent possible. The law set down corporate reporting requirements. The process to select and appoint directors needed to follow the law with members selected on the basis of technical and professional expertise rather than political appointments. The financing of community service obligations was required to be transparent following an equally open planning and costing process. The SOE law was the backbone of the effort to turn around SIEA, without which it is doubtful that the project could have succeeded.

127. **Political commitment is an essential ingredient to success in turning around SOEs.** The crisis at SIEA prompted sufficient government commitment to enable reforms to proceed. The Ministry of Finance had a large role to play in removing debt from SIEA's accounts. A deal was brokered to have SIWA's debts, which had accumulated from 2008, paid to SIEA. Electricity bills of other government entities were also paid on time with the Ministry of Finance and Treasury making them on behalf of other ministries. Reforms were implemented at SIWA and were instrumental in improving the situation at SIEA. The Government did not continue financing poorly performing SOEs but actively worked toward finding and implementing a sustainable solution. Without this intervention, infusion of financing either the government, IFIs, donors, and so on would not have been sufficient.

128. **Technical assistance and expertise are critical components to SOE reform.** SISEP provided both technical assistance/expertise as well as financing to SIEA. However, the technical assistance component played a crucial part in SISEP's success. The component that addressed management strengthening was key in providing a foundation for SIEA's success. Subsequent achievements in financial operations or technical improvements were dependent on having a strong and capable management structure. Building institutional capacity should be a required component of any financing that is provided to entities with low capacity as it is the only way to ensure the achievements are sustainable.

129. **Targeted assistance in low capacity environments can be essential to successful project implementation.** As noted, the project experienced delays in implementing its Procurement Plan notwithstanding the World Bank providing close supervision and support to procurement activities. Project or procurement officers with experience in implementing World Bank/donor projects would have been beneficial to SISEP. The lack of a project management team was remedied in the World Bank's follow-on SIEAREEP where key project management positions were identified—procurement officer,

gender specialist, solar engineer, manager construction, and manager projects. The project management team is expected to address capacity constraints. In terms of procurement, a positive impact on timely submission and quality of bidding documents for large works contracts is expected, thereby contributing to project success.

ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: A. To improve operational efficiency of SIEA

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
System losses	Percentage	27.00 31-Dec-2007	16.00 31-Dec-2011	18.00 31-Mar-2019	17.30 29-Jun-2018

Comments (achievements against targets):
Indicator achieved at 104 percent. System losses as measured by technical and non-technical losses demonstrated a steady decline through the project implementation period. Losses had declined by 6 percentage points at the time Additional Finance was approved (from 27 percent at project start to 21 percent in 2014), and 17.3 percent at project close. Project activities directly responded to the outcome of system loss reduction

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Average number of debtor	Days	360.00	30.00	35.00	33.61

days to collect billed revenue		31-Dec-2007	31-Dec-2011	31-Mar-2019	31-Mar-2019

Comments (achievements against targets):
Substantial improvement in average number of debtor days to collect billed revenue with an achievement ratio of 104 percent. Project interventions, especially in areas of management strengthening, are directly relevant in achievement of this outcome.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of days between due date of customer bill, and if not paid, notice of arrears	Days	365.00 31-Dec-2007	15.00 31-Dec-2011		15.00 31-Mar-2019

Comments (achievements against targets):
Indicator achieved with an achievement ratio of 100 percent. Customer is provided with a bill at the end of a billing period with a due date of 15 days after the billing period. Included in the bill is a table indicating that the bill will be in arrears (called aged debts) 30 days after the billing period, i.e., 15 days after the due date. When the bill is in arrears (15 days after the due date), the customer is put on the disconnection list. The bill indicates that no further notice is provided. Therefore, notice that the bill would be in arrears is provided at the end of the billing cycle (0 days) and the customer has been given 15 days between the bill due date and being in arrears.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Quarterly financial	Text	N	Y		Y

management reports, and rolling projections for SIEA performance within 14 days after end of each quarter		31-Dec-2007	29-Jun-2018		31-Mar-2019

Comments (achievements against targets):
Indicator was achieved at achievement ratio of 100 percent and can be directly attributed to project supported activities of strengthening management. New management instituted new procedures and company rules which had a direct bearing on the production of quarterly financial management reports and projections within 14 days after the end of each quarter.

Objective/Outcome: B. To improve system reliability of SIEA

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
System Average Interruption Duration Index (SAIDI)	Minutes	51840.00 31-Dec-2007	848.70 29-Jun-2018	2000.00 31-Mar-2019	1757.60 29-Jun-2018

Comments (achievements against targets):
Indicator was achieved with an achievement ratio of 112 percent. SISEP's financing of the system reliability component directly contributed towards achieving this indicator.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
System Average Interruption Frequency Index (SAIFI)	Minutes	816.00 31-Dec-2007	150.00 31-Dec-2011	85.00 31-Mar-2019	17.50 31-Mar-2019

Comments (achievements against targets):
Indicator achieved with an achievement ratio of 179 percent. SISEP's financing of the system reliability component directly contributed towards achieving this indicator.

Objective/Outcome: C. To improve financial sustainability of SIEA

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Collection ratio	Percentage	72.00 31-Dec-2007	90.00 31-Dec-2011	70.00 31-Mar-2019	60.00 29-Jun-2018

Comments (achievements against targets):
The collection ratio indicator was deemed to contain significant methodological errors which precluded it from being a viable measure of improved collections and was therefore not included in the ICR's analysis. However, SIEA's net profitability, an intermediate indicator in ISRs was deemed adequate to substantiate the PDO and was elevated to a PDO level indicator for purposes of this ICR's assessment.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Revenue per Kwh generated	Text	SB$ 1.39/KWh 30-Jun-2008	SB$ 3.00/KWh 31-Dec-2011	SB$ 4.5/KWH 31-Mar-2019	SB$ 4.64/KWh 29-Jun-2018

Comments (achievements against targets):
Indicator achieved with an achievement ratio of 103 percent. Achievement of this indicator can be directly attributed to SIEA's commercialization program supported by SISEP.

A.2 Intermediate Results Indicators

Component: Component 1 - Strengthening Management

Component: Component 2 - Financial Operations

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Net Profit before tax	Text	Loss SB$ 44M 30-Jun-2008	Profit SB$ 25M 31-Dec-2011	Profit SB$ 98M 31-Dec-2018	SB$ 80.1M 31-Dec-2018

Comments (achievements against targets):

Component: Component 3 - Technical Operations

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Commissioning of one 12MVA transformer at Lungga Power Station	Text	N 13-Feb-2014	Y 31-Mar-2019		N 15-Jan-2018

Comments (achievements against targets):
Works for commissioning of the 12MVA transformer at Lungga Power Station are complete. SIEA is awaiting completion of works (not included in SISEP) for commissioning the plant as it would be more cost-effective on a system-wide basis.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Commissioning of 5MVA 33kV/11kV transformer and a second 33 kV switchboard at Ranadi	Text	N 13-Feb-2014	Y 15-Jan-2018		N 15-Jan-2018

Comments (achievements against targets):
Works for commissioning of 5MVA 33kV/11kV transformer and a second 33 kV switchboard at Ranadi are complete. SIEA is awaiting completion of works (not included in SISEP) for commissioning the plant as it would be more cost-effective on a system-wide basis.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Kola'a Ridge 33/11kV substation commissioned with one 7.5MVA transformer	Text	N 13-Feb-2014	Y 31-Mar-2019		N 15-Jan-2018

Comments (achievements against targets):
Works for commissioning of the 33/11kV substation at Kola'a Ridge with one 7.5MVA are complete. SIEA is awaiting completion of works (not included in SISEP) for commissioning as it would be more cost-effective on a system-wide basis.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Feeder 12 load relocated from Lungga 11kV generation bus to East Honiara Substation	Text	N 13-Feb-2014	Y 31-Mar-2019		Y 31-Dec-2018

Comments (achievements against targets):

B. KEY OUTPUTS BY COMPONENT

Objective/Outcome I: To improve the operational efficiency of SIEA	
Outcome Indicators	I.A System Losses I.B Average number of debtor days to collect billed revenue I.C Number of days between due date of tariff and if not paid notice of arrears I.D Quarterly financial management reports and rolling projections of SIEA performance within 14 days at the end of each quarter
Intermediate Results Indicators	I.a Improved support for decision making – regular reports on key performance indicators used to make investment decisions I.b Improved capacity to manage SIEA operations – regular Board meetings and decisions made for SIEA strategy and operations
Key Outputs by Component (linked to the achievement of the Objective/Outcome I)	1. Key staff hired (Technical General Manager, Commercialization manager, Independent Board director) 2. Training provided (Finance, Engineering) 3. Studies conducted on tariff review, asset valuation, PPAs
Objective/Outcome II: To improve system reliability of SIEA	
Outcome Indicators	II.A System Average Interruption Duration Index (SAIDI) II.B System Average Interruption Frequency Index (SAIFI)
Intermediate Results Indicators	II.a Commissioning of one 12MVA transformer at Lungga Power Station

	II.b Commissioning of 5MVA 33kV/11kV transformer and a second 33kV switchboard at Ranadi II.c Kola'a Ridge 33/11kV substation commissioned with one 7.5MVA transformer II.d Feeder 12 load relocated from Lungga 11kV generation bus to East Honiara Substation
Key Outputs by Component (linked to the achievement of the Objective/Outcome II)	1. Rehabilitation of Generation infrastructure 2. Rehabilitation of transmission and distribution infrastructure 3. Support to Owner's Engineer – supervision of distribution, rehabilitation, and generation upgrades
Objective/Outcome III: To improve the financial sustainability of SIEA	
Outcome Indicators	III.A Revenue per kWh generated III.B SIEA profitability
Intermediate Results Indicators	III.a Improved cash flow position as evidenced through unqualified financial audits
Key Outputs by Component (linked to the achievement of the Objective/Outcome III)	1. Key staff hired (Technical General Manager, Commercialization manager, Independent Board director) 2. Training provided (Finance, Engineering) 3. Technical assistance provided for improved financial management, accounting, procurement processes 4. Reduction of non-technical losses, improved collections, new IT system installed

ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION

A. TASK TEAM MEMBERS

Name	Role
Preparation	
Supervision/ICR	
Maria Isabel A. S. Neto	Task Team Leader(s)
Zhentu Liu	Procurement Specialist(s)
Stephen Paul Hartung	Financial Management Specialist
Jennifer Appo	Team Member
Janet Funa	Team Member
Renee Berthome	Team Member
Kim Dagmar Baverstock	Team Member
Ross James Butler	Safeguards Advisor

B. STAFF TIME AND COST

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US$ (including travel and consultant costs)
Preparation		
FY06	1.650	41,970.77
FY07	8.965	133,501.71
FY08	25.629	727,988.01
FY09	0	84,703.30
FY10	0	12,168.30
FY16	0	4,892.24

Total	**36.24**	**1,005,224.33**
Supervision/ICR		
FY09	15.481	100,033.65
FY10	8.712	46,782.75
FY11	13.176	45,198.67
FY12	17.605	55,666.62
FY13	13.977	69,339.32
FY14	18.368	87,115.05
FY15	17.009	58,555.33
FY16	22.267	93,859.50
FY17	19.165	96,021.42
FY18	7.575	75,861.32
FY19	12.371	97,049.89
FY20	5.367	39,066.50
Total	**171.07**	**864,550.02**

ANNEX 3. PROJECT COST BY COMPONENT

Components	Amount at Approval[15] (US$M)	Actual at Project Closing (US$M)	Percentage of Approval (US$M)
Strengthening Management	4.00	3.69	92.3
Financial Operations	0.7	0.64	91.4
Technical Operations	8.0	7.37	92.1
Contingency	0	0	0
Total	**12.7**	**11.7**	**92.1**

[15] Amounts at Approval indicate amounts that were approved at project approval. It includes amounts added during approval of additional financing and accounts for exchange rate movements and amounts that were cancelled at project restructuring.

ANNEX 4. EFFICIENCY ANALYSIS

ECONOMIC AND FINANCIAL ANALYSIS OF SOLOMON ISLANDS SUSTAINABLE ENERGY PROJECT

1. **The project has achieved the key outcomes with high efficiency based on economic analysis and financial analysis (project level) as described herein, which is conservative and robust to sensitivity analysis.**

ECONOMIC ANALYSIS

2. The economic analysis at completion was conducted at project level considering that major economic benefits are the joint result of implementing all project components. In sum, at completion, the project has an NPV of US$7.12 million (at a 10 percent discount rate) while Economic Internal Rate of Return (EIRR) stands at 24.3 percent, which indicates great Value for Money from the project. Taking environmental benefits into consideration, the NPV increased to US$13.31 million and the EIRR improved to 27.1%. A summary of the results, assumptions and detailed analysis is presented in following sections.

Table A4.1. Summary of Economic Benefits and Costs (US$)

ECONOMIC BENEFITS	
Avoided Fuel Cost	304,770
Reduced Outage Cost	13,063,619
ECONOMIC COSTS	
Capital Investment	5,879,352
O&M	366,066
NET ECONOMIC BENEFIT	**7,122,971**
EIRR	24.3%
Avoided Green Gas Emission	6,182,994
NET ECONOMIC BENEFIT (incl. environmental benefits)	**13,305,965**
EIRR (envir. benefit adjusted)	27.1%

3. Two economic benefits considered and quantified in this ex-post economic analysis are *avoided fuel cost* and *reduced outage cost*. This is in line with the analytical framework established at project appraisal and additional financing appraisal. The first direct benefit of implementing this project is to reduce energy losses, which enables the delivery of same services from less fuel consumption. By comparing actual annual power generation to electricity sales in SIEA's audited annual report, it was evident that incremental reduction of energy losses is achieved with the project implementation. The other key benefit is increased system reliability, in the form of reduced outage and in customer saving through reduced requirement for auto-generation back-up systems. In this ex-post exercise, the reduced outage cost was estimated by using the actual

outage data as well as annual average retail tariff figures. However, no information is available on the reduced back-up generation systems due to better system reliability, hence the benefit is unable to be quantified. In addition, there are several secondary economic benefits from the implementation of the project, including reduced operation and maintenance (O&M) costs, better voltage profile, better power harmonics, and more system stability. They are nevertheless less significant compared to avoided fuel cost and reduction of outage. A disproportional level of data collection and modeling efforts are requested to quantify these benefits. For these reasons, the analysis is conservative in underestimating project benefits.

4. *Avoided Fuel Cost.* Economic Benefit from Avoided Fuel Cost is only US$0.3 million compared to projected US$9.0 million at appraisal. Two main reasons:
    - Much lower-than-expected crude oil price after 2008 financial crisis leads to less saving in fuel cost.
    - More importantly, our best educated estimation of non-technical losses is much higher than the baseline in the original economic analysis. Among total system losses, it was widely accepted that reduction of non-technical loss cannot be counted as economic benefit because they are mainly transfer of benefits between entities within an economy. And reduction of technical losses is the only source of avoided fuel cost in this project. However, as pointed out by Sinclair Knight Merz in its *"Solomon Islands Electricity Authority - Loss Reduction Study for the Honiara Network (2011)"*, in practice it is difficult to determine the balance between the technical and non-technical losses without precise measurement. Therefore, the key to calculate benefit here is to best estimate: 1*) actual technical losses during the period of project implementation*, and 2) the *baseline of technical losses at the start of the project*. Unfortunately, neither piece of information was clear.
    - The alternative approach is to determine 1) actual non-technical losses during the period of project implementation, and 2) the baseline of non-technical losses at the start of the project. Then the difference between total losses and non-technical losses is the technical losses.
    - *Actual non-technical losses during the period of project* implementation was able to be estimated based on datapoints provided in SIEA's report.
    - However, there were three different sources on *baseline of non-technical losses at the start of the project.* As shown in the scenario analysis below, economic NPV of avoided fuel cost is very sensitive to the baseline of non-technical losses at the start of the project. And it was clear that, if 6% as implied at appraisal is used, the NPV becomes significantly larger.

Table A4.2. NPV Scenario Analysis: Avoided Fuel Cost to Non-Technical Loss Baseline

Non-Technical Loss Rate Baseline in 2010		
Implied At Apraisal	6.0%	8,324,863.14
SIEA management estimate - Lower Range	10.0%	2,978,134.62
SIEA management estimate -Higher Range	12.0%	304,770.37
SKM estimate	15.0%	(3,705,276.02)

- After careful examination, 12% was selected as the best-estimated non-technical loss rate baseline in 2010 because all other options are not sensible. As per SIEA's annual report, the non-technical loss rate in 2012 is 12%, it's reasonable to argue that the non-technical loss rates in 2011 and 2010 are unlikely lower than 12%. Also, if 15% was adopted, it would leave the technical loss baseline at 6.92%, which is not practical considering the average technical loss during project implementation (2010-2018) is at a much higher level of 10.42%.
- In conclusion, with a baseline non-technical loss of 12%, NPV of avoided fuel cost was US$0.30 million.

5. *Reduced Outage Cost.* The estimated economic benefit from reduced outage cost is also lower than expected. It's worth pointing out that annual retail tariff (customer's willingness to pay, "WTP" hereinafter) is used to gauge the cost of outage since there is no known estimate of outage costs available for the Solomon Islands. Average annual retail tariff is US$0.76/kwh, which is lower than the assumption of US$1/kwh in the additional financing appraisal document. This can largely explain why estimated economic benefit of US$13.06 million from reduced outage cost is lower than the projected benefit of US$20.06 million at additional financing appraisal. In addition, during project implementation, SIEA installed several generators using its own capital and findings from ADB and other sources. However, it's hardly possible to distinguish what percentage of reduced outage results from our project or generator addition. Also, one important reason that SIEA was able to deploy its own funds and attract new external funding in growing its generation capacity is the implementation of this project, which put SIEA in sound financial footing and better operational efficiency.

Table A4.3. Customer's Willingness to Pay (WTP) Estimate

WTP Estimate	US$ / Kwh
2009	-
2010	0.515
2011	0.675
2012	0.807
2013	0.870
2014	0.927
2015	0.894
2016	0.786
2017	0.786
2018	0.747
2019	0.720
2020	0.703
2021	0.710
2022	0.717
2023	0.724

6. Data is based on actual IDA grant and credit disbursement as well as operating data reported by SIEA from 2010 to 2018. *Key assumptions* are listed below.

   - Total capital investment was US$11.72 million, 68.94% of planned original and additional financing.
   - 10% discount rate.
   - Operation and maintenance (O&M) costs are estimated at 1% of investment costs considering improvement of efficiency after project implementation.
   - Load factor at 62%.
   - Grid emission factor for the Solomon Islands is 0.31 tCO^2 per KWh per UNDP data.[16]
   - Price for Carbon at 30 USD/tCO2.

7. *Base case results.*
   - As detailed in the table below, SIEA experienced substantial growth of both power generation and sales. Thanks to the reduction of system losses, SIEA achieved high sales growth (19%) with lower generation growth (14%).

[16]https://www.undp.org/content/dam/philippines/docs/Operations/UNDP%20Environmental%20Performance%20Reporting%20tool_Philippine%20CO.xlsx?download

Table A4.4 System Generation, Losses, and Sales Comparison

Year	WITHOUT PROJECT				Year	WITH PROJECT			
	Generation	System Losses (incl. auxiliary use)		Total Sales		Generation	System Losses (incl. auxiliary use)		Total Sales
	kWh	kWh	%	kWh		kWh	kWh	%	kWh
2008					2008				
2009					2009	78,152,447			n.a.
2010	83,623,118	20,063,519	23.99%	63,559,599	2010	83,623,118	20,063,519.0	23.99%	63,559,599
2011	83,867,254	20,122,094	23.99%	63,745,160	2011	83,752,049	20,006,889.0	23.89%	63,745,160
2012	83,558,695	20,048,062	23.99%	63,510,633	2012	84,565,616	21,054,983.2	24.90%	63,510,633
2013	82,267,333	19,738,228	23.99%	62,529,105	2013	81,101,391	18,572,286.0	22.90%	62,529,105
2014	86,620,779	20,782,742	23.99%	65,838,038	2014	84,911,433	19,073,395.3	22.46%	65,838,038
2015	88,283,458	21,181,664	23.99%	67,101,793	2015	86,840,961	19,739,167.6	22.73%	67,101,793
2016	93,634,068	22,465,425	23.99%	71,168,643	2016	92,687,032	21,518,390.0	23.22%	71,168,643
2017	97,751,965	23,453,424	23.99%	74,298,541	2017	94,282,936	19,984,395.0	21.20%	74,298,541
2018	99,617,534	23,901,026	23.99%	75,716,508	2018	94,979,593	19,263,084.9	20.28%	75,716,508
2019	105,257,578	25,254,229	23.99%	80,003,348	2019	99,176,436	19,173,087.9	19.33%	80,003,348
2020	111,872,781	26,841,401	23.99%	85,031,380	2020	104,170,008	19,138,628.5	18.37%	85,031,380
2021	118,867,113	28,519,537	23.99%	90,347,577	2021	109,398,442	19,050,865.3	17.41%	90,347,577
2022	122,723,551	29,444,804	23.99%	93,278,747	2022	111,686,028	18,407,280.5	16.48%	93,278,747
2023	126,089,325	30,252,347	23.99%	95,836,978	2023	113,457,655	17,620,676.8	15.53%	95,836,978

- As discussed at project appraisal, the main economic benefit to be quantified is the fuel saving from reduction of system technical losses and increased reliability from reduction of outage. Below is a detailed table to shown economic benefits and costs year by year.

Table A4.5. Project Net Economic Benefit Evaluation

Year	INCREMENTAL		ECONOMIC BENEFITS			ECONOMIC COSTS			Net Economic Benfit
	Generation	Consumption	WTP	Fuel Savings	Total Benefit	Capital Investment	Non-Fuel O&M	Total Cost	
	KWh	*KWh*	*US$*	*US$*	*US$*	*US$*	*US$*	*US$*	*US$*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
2009	-	-	-	-	-	165,429	1,654	167,083	(167,083)
2010	-	-	-	-	-	992,093	11,575	1,003,668	(1,003,668)
2011	(677,377)	-	-	232,670	232,670	764,002	19,215	783,217	(550,547)
2012	369,290	-	-	(132,186)	(132,186)	543,934	24,655	568,588	(700,774)
2013	(1,104,409)	(11,114,013)	(9,674,206)	386,725	(9,287,481)	1,229,067	36,945	1,266,012	(10,553,493)
2014	(132,847)	4,644,712	4,307,657	45,227	4,352,884	(57,539)	36,370	(21,170)	4,374,053
2015	1,119,844	7,099,887	6,344,283	(249,319)	6,094,964	220,323	38,573	258,896	5,836,068
2016	2,312,335	3,749,470	2,948,506	(420,963)	2,527,543	762,836	46,201	809,037	1,718,505
2017	1,217,917	7,817,071	6,144,952	(221,641)	5,923,312	2,065,368	66,855	2,132,223	3,791,088
2018	1,283,483	7,059,596	5,274,538	(315,859)	4,958,679	3,482,464	101,680	3,584,144	1,374,536
2019	362,568	7,059,596	5,080,146	(82,604)	4,997,542	1,556,003	117,240	1,673,243	3,324,299
2020	(649,393)	7,059,596	4,960,296	143,477	5,103,773		117,240	117,240	4,986,534
2021	(1,762,897)	7,059,596	5,010,852	377,770	5,388,622		117,240	117,240	5,271,383
2022	(2,872,801)	7,059,596	5,059,408	614,209	5,673,617		117,240	117,240	5,556,377
2023	(4,028,822)	7,059,596	5,110,479	863,679	5,974,158		117,240	117,240	5,856,918
NPV @ 10%			13,063,619	304,770	13,368,389	5,879,352	366,066	6,245,418	7,122,971
Economic Rate of Return									**24.3%**

8. *Base Case with Environmental Benefit*. Below is the breakdown of costs and benefits with environmental benefits.

Table A4.6. Project Net Economic Benefit Evaluation (Including Environmental Benefit)

Year	INCREMENTAL		ECONOMIC BENEFITS				ECONOMIC COSTS			Net
	Generation KWh	Consumption KWh	WTP US$	Fuel Savings US$	Environmental Benefits US$	Total Benefit US$	Capital Investment US$	Non-Fuel O&M US$	Total Cost US$	Economic Benfit US$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2009	-	-	-	-	-	-	165,429	1,654	167,083	(167,083)
2010	-	-	-	-	-	-	992,093	11,575	1,003,668	(1,003,668)
2011	(677,377)	-	-	232,670	6,306,092	6,538,762	764,002	19,215	783,217	5,755,545
2012	369,290	-	-	(132,186)	(3,437,929)	(3,570,115)	543,934	24,655	568,588	(4,138,703)
2013	(1,104,409)	(11,114,013)	(9,674,206)	386,725	10,281,571	994,090	1,229,067	36,945	1,266,012	(271,922)
2014	(132,847)	4,644,712	4,307,657	45,227	1,236,749	5,589,632	(57,539)	36,370	(21,170)	5,610,802
2015	1,119,844	7,099,887	6,344,283	(249,319)	(10,425,267)	(4,330,303)	220,323	38,573	258,896	(4,589,199)
2016	2,312,335	3,749,470	2,948,506	(420,963)	(21,526,841)	(18,999,299)	762,836	46,201	809,037	(19,808,336)
2017	1,217,917	7,817,071	6,144,952	(221,641)	(11,338,280)	(5,414,969)	2,065,368	66,855	2,132,223	(7,547,192)
2018	1,283,483	7,059,596	5,274,538	(315,859)	(11,948,677)	(6,989,997)	3,482,464	101,680	3,584,144	(10,574,141)
2019	362,568	7,059,596	5,080,146	(82,604)	(3,375,352)	1,622,190	1,556,003	117,240	1,673,243	(51,053)
2020	(649,393)	7,059,596	4,960,296	143,477	6,045,566	11,149,340		117,240	117,240	11,032,100
2021	(1,762,897)	7,059,596	5,010,852	377,770	16,411,812	21,800,434		117,240	117,240	21,683,194
2022	(2,872,801)	7,059,596	5,059,408	614,209	26,744,543	32,418,160		117,240	117,240	32,300,920
2023	(4,028,822)	7,059,596	5,110,479	863,679	37,506,601	43,480,759		117,240	117,240	43,363,519
***NPV @* 10%**			13,063,619	304,770	6,182,994	19,551,383	5,879,352	366,066	6,245,418	13,305,965
Economic Rate of Return										**27.1%**

9. *Base case comparison*. It's very important to point out that the economic analysis at appraisal only quantified the net economic benefit from avoided fuel cost while the economic analysis at additional financing appraisal only focused on reduced outage cost. Therefore, in order to compare ex-ante and ex-post net economic analysis, the two ex-ante analyses need to be harmonized and consolidated. Harmonized total ex-ante NPV is roughly estimated at US$18.07 million. In comparison, ex-post NPV is lower at US$7.12 million. Two driving factors are the lower-than-expected oil price and reduction of capital investment from US$17.00 million to US$11.72 million. Harmonized ex-ante ERR has not been calculated due to methodological constraints and lack of sufficient supporting data. However, the EIRR calculated at completion nevertheless demonstrates comparable economic viability of the project broadly consistent with expectations at appraisal and at the stage of additional financing.

Table A4.7. Comparison of NPV and EIRR

	Appraisal	AF Appraisal	Harmonized Ex-ante Total	ICR
Excluding environmental benefits				
EIRR (%)	34.80%	17.60%	n/a	24.30%
NPV at 10% DR (US$M)	5.61	20.06	18.07	7.12
Including environmental benefits				
EIRR (%)				27.10%
NPV at 10% DR (US$M)				13.31

10. *Sensitivity analysis.*

- A sensitivity analysis has been performed on annual project O&M cost, in order to evaluate the impact of variation in O&M on economic viability of the project. The results are presented in the table below and it shows that the economic rate of return of the project is resilient to future changes in the generation facilities.

Table A4.8. Sensitivity Analysis

Scenario		NPV (US$M)	EIRR (%)
O&M Costs (as percent of capital cost)			
Base case	1%	7.12	24.3%
200% of base case	2%	6.76	23.6%
300% of base case	3%	6.39	22.9%

- Another sensitivity analysis has been performed on the discount rate. 10% was used according to the old guidance note on “Discounting Costs and Benefits in Economic Analysis of World Bank Projects”. However, according to the new guidance note (2016), a discount rate of 2 times the GDP growth rate is recommended. Therefore, the GDP growth rate of the Solomon Islands in 2018 and geometric mean of the past 10 years are used as the other cases. It also indicates that the economic rate of return of the project is resilient to the discount rate used.

Table A4.9. Sensitivity Analysis

Scenario		NPV (US$M)
Discount Rate		
2*GDP Growth Rate 2018	6.78%	11.38
2*GDP Growth Rate (Geo-mean 2009-2018)	7.43%	10.37
DR used originally	10.00%	7.12

FINANCIAL ANALYSIS

11. An ex-post financial analysis of the project (not the Solomon Power as an enterprise or a sector) was also carried out using the same method of evaluation “cost-benefit analysis” with the same discount rate of 10%. In sum, at completion, the project has a Financial NPV of US$5.63 million while Financial Internal Rate of Return (FIRR) stands at 21.8 percent, which far exceeds the estimated project Weighted Average Cost of Capital (WACC) of 3.6%. A summary of the results, assumptions and detailed analysis is presented in the following sections.

Table A4.10. Summary of Financial Benefits and Costs (US$)

FINANCIAL BENEFITS	
Incremental revenue from reduction of loss	6,793,190
Incremental revenue from reduction of outage	12,520,779
FINANCIAL COSTS	
Capital Investment	9,991,496

Incremental Fuel & Oil Consumption	3,072,026
O&M	622,100
NET FINANCIAL BENEFIT	**5,628,347**
FIRR	21.8%

12. The main financial benefits considered in this analysis are tariff revenue from incremental power consumptions by the customers due to reduction of energy losses and reduction of outage, which is in line with the two economic benefits examined in economic analysis. However, it's important to point out that financial benefit from reduction of non-technical losses is included here since it's the transfer payment from the customers to SIEA.

13. On the other hand, three main financial costs contributed to achieve the above-mentioned financial benefits: total project capital investment, fuel and oil cost for the incremental power consumption, and the extra O&M cost. Here the capital investment included the IDA grant, IDA credit, and the US$8.20 million equity invested by SIEA. Since the year-by-year breakdown of SIEA equity invested to different components of the project is not available, it was proportionally pegged to the actual disbursement by the World Bank. In addition, only incremental revenue from reduction of outage will result in incremental fuel & oil consumption.

14. *Key assumptions* are listed below.

- Total World Bank capital investment was US$11.72 million, 68.94% of planned original and additional financing.
- 10% discount rate.
- Operation and maintenance costs are estimated at 1% of investment costs considering improvement of efficiency after project implementation.
- Load factor at 62%.
- 0% corporate income tax per Electricity Act 1969.

15. Below please find the year-by-year breakdown of the financial analysis.

Table A4.11. Detailed Financial Benefits and Costs

Year	INCREMENTAL CUSTOMER CONSUMPTION		FINANCIAL BENEFITS			FINANCIAL COSTS				Net
	Energy Loss Reduction	Outage Reduction	Energy Loss Reduction	Outage Reduction	Total Benefit	Capital Investment	Incremental Fuel&Oil	Non-Fuel O&M	Total Cost	Financial Benfit
	KWh	*KWh*	*US$*	*US$*	*US$*	*US$*	*US$*	*US$*	*US$*	*US$*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
2009	-	-	-	-	-	281,134	-	2,811	283,945	(283,945)
2010	-	-	-	-	-	1,685,983	-	19,671	1,705,654	(1,705,654)
2011	784,834	-	530,072	-	530,072	1,298,361	-	32,655	1,331,015	(800,943)
2012	(443,692)	-	(358,217)	-	(358,217)	924,372	-	41,898	966,271	(1,324,488)
2013	2,640,224	(11,619,937)	2,298,186	(10,114,588)	(7,816,402)	2,088,702	(3,998,492)	62,786	(1,847,004)	(5,969,398)
2014	1,626,512	4,486,594	1,508,480	4,161,013	5,669,493	(97,784)	1,499,995	61,808	1,464,019	4,205,474
2015	847,908	6,939,924	757,670	6,201,344	6,959,014	374,421	1,562,977	65,552	2,002,950	4,956,064
2016	(411,889)	3,496,193	(323,901)	2,749,334	2,425,433	1,296,380	630,630	78,516	2,005,525	419,908
2017	1,299,818	8,097,635	1,021,779	6,365,502	7,387,281	3,509,931	1,472,008	113,615	5,095,554	2,291,728
2018	2,036,450	6,664,223	1,521,522	4,979,138	6,500,660	5,918,173	1,669,814	172,797	7,760,784	(1,260,124)
2019	2,280,349	7,059,596	1,640,959	5,080,146	6,721,105	2,644,304	1,669,222	199,240	4,512,766	2,208,339
2020	2,488,333	7,059,596	1,748,382	4,960,296	6,708,678		1,618,605	199,240	1,817,845	4,890,833
2021	2,758,330	7,059,596	1,957,844	5,010,852	6,968,696		1,569,761	199,240	1,769,001	5,199,695
2022	3,475,872	7,059,596	2,491,057	5,059,408	7,550,465		1,566,054	199,240	1,765,294	5,785,171
2023	4,317,098	7,059,596	3,125,170	5,110,479	8,235,649		1,570,120	199,240	1,769,360	6,466,289
FNPV @ 10%			6,793,190	12,520,779	19,313,969	9,991,496	3,072,026	622,100	13,685,622	**5,628,347**
Financial Rate of Return										**21.8%**

16. **Base case comparison.** It's clear that the project generated a positive FNPV of US$5.63 million, which indicates that the project is financially viable. Also, FIRR far exceeds the WACC of 3.6%.

17. In order to calculate WACC, the cost of IDA grant, credit and SIEA equity are all needed. However, cost of equity of SIEA is not available nor disclosed in SIEA's annual report. There are several ways to estimate such cost of equity. Since SIEA is a 100% SOE of SIG, 6.5%[17] interest rate of the $150 million Domestic Development Bonds issued by SIG to the Solomon Islands National Provident Fund Board (SINPFB) in 2017 could be used as a benchmark, resulting in a WACC of 3.6%. On the other hand, if we use the SIG long-term government bond yield of 3.24%[18], the WACC will further decrease to 2.3%. In either case, FIRR is far larger than the WACC, which made the project financially viable and attractive. Detailed calculation of WACC is illustrated in Table A4.11.

Table A4.11. SISEP - Weighted Average Cost of Capital (WACC)

[17] https://www.solomontimes.com/news/sig-sinpf-sign-domestic-development-bonds-agreement/8711
[18] https://www.economy.com/solomon-islands/average-long-term-government-bond

		Grant	Credit	SIEA Equity	Total
A.	Amount (USD million)	5.8	5.9	8.2	19.9
B.	Weighting (%)	29%	30%	41%	100%
C.	Nominal Cost (%)	0.0%	3.2%	6.5%	
D.	Tax rate	0.0%	0.0%	0.0%	
E.	Tax-adjusted nominal cost [C*(1-D)]	0.0%	3.2%	6.5%	
F.	Inflation Rate (%)	0.0%	0.0%	0.0%	
G.	Real Cost [(1+E)/(1+F)-1)]	0.0%	3.2%	6.5%	
H.	Weighted component of WACC	0.0%	0.9%	2.7%	
Weighted Average Cost fo Capital (Real)					**3.6%**

18. *Sensitivity analysis.*

- A sensitivity analysis has been performed on annual project O&M cost, in order to evaluate the impact of variation in O&M on financial viability of the project. The results are presented in the table below and it shows that the financial rate of return of the project is resilient to future changes in the O&M cost.

Table A4.12. Sensitivity Analysis against O&M Cost

Scenario		NPV (US$)	FIRR (%)
O&M Costs (as percent of capital cost)			
Base case	1.00%	5,628,346.58	21.8%
200% of base case	2.00%	5,006,246.21	20.5%
300% of base case	3.00%	4,384,145.83	19.3%

- Another sensitivity analysis has been performed on the discount rate. 10% was used according to the old guidance note on “Discounting Costs and Benefits in Economic Analysis of World Bank Projects”. However, according to the new guidance note (2016), a discount rate of 2 times the GDP growth rate is recommended. Therefore, the GDP growth rate of the Solomon Islands in 2018 and geometric mean of the past 10 years are used as the other cases. It also indicates that the financial rate of return of the project is resilient to the discount rate used.

Table A4.9. Sensitivity Analysis against Discount Rate

Scenario		NPV (US$)
Discount Rate		
2*GDP Growth Rate 2018	6.78%	9,335,677.98
2*GDP Growth Rate (Geo-mean 2009-2018)	7.43%	8,451,320.15
DR used originally	10.00%	5,628,346.58

Financial Sustainability Analysis of Solomon Islands Electricity Authority (SIEA)

Financial Performance and Sustainability

1. SIEA financial performance has considerably improved since 2006, becoming profitable in 2011. The SIEA incurred losses of SBD13 million and SBD37 million, in 2006 and 2007 respectively. In April 2008 when losses were SBD17 million, the Government agreed to a debt restructuring scheme through which approximately SBD200 million owed by the SIEA to the Government was written off. In return, the SIEA wrote off SBD32 million owed to SIEA by other government entities in 2009. This was the main contributor to the loss of SBD9 million that year. In 2010, losses were SBD70 million because the escalation of the outstanding receivables from government entities, mainly Solomon Islands Water Authority (SIWA), resulted in SIEA making a provision for bad debts of SBD57 million. In May 2012, a debt settlement agreement was signed between the two parties for SIEA to convert SBD7.5 million of outstanding dues into a loan to be repaid by SIWA over a period of eight years commencing 1 January 2013 at an interest rate of 0%. SIEA turned profitable in 2011 with a reported profit of SBD53 million. At the same time, the Solomon Islands Government (SIG) committed to reform and restructure SIWA, to place it on more commercial footing, and allow its water prices to be adjusted for changes in the electricity prices. This reform of SIWA, strongly supported by the SIG, the new SIWA Board and Management team – with financial support from Australia and Japan, is what was missing when the 2008 debt restructure was implemented. The reforms to SIWA have been crucial to the improved performance of SIEA since SIWA is SIEAs largest single customer. This was a condition precedent for the IDA Grant that established SISEP (P100311). This debt restructure followed years of payment difficulties between SOEs in the Solomon Islands, with several SOEs, particularly SIWA, owing considerable debts to SIEA. In 2012, the SIEA had an operating income of SBD414 million, net profit of SBD68 million, and had an asset base of SBD516 million.
2. By 2018, the SIEA had an operating income of SBD469 million, net profit of SBD80.1 million, and had an asset base of SBD1292 million.
3. The projected financial performance of the SIEA following the implementation of the SISEP (detailed in Table 1) shows that the project has a positive impact on SIEA's performance. Throughout the life of the project and beyond, total revenues, operating income and net profit are projected to increase. Liquidity remains high with a current ratio well above 1 (lowest point is 8.5 in 2019). The debt to equity ratio never approaches 30:70, given the SIEA's aversion to debt, peaking at just 18:82 in 2018, before falling over the remainder of the project. The profitability of the SIEA is projected to increase gradually over the life of the project, with net profit margins increasing from 17% in 2013 to 44.9% in 2033 and an average annual net profit of 37.0% over 20 years.

Conclusion

4. This analysis concludes that the SIEA is more than capable of servicing its current level of debt, which comprises just the US$6.0 million IDA Credit. Furthermore, the profitability of the SIEA is projected to increase significantly over the life of the program.

5. Based on the current financial projections, it appears that there is scope for SIEA to take on additional debt to finance its current capital expenditure program, including SISEP and other priority projects (the construction of a new powerhouse at Lungga Power Station and installation of four 2.5 MW diesel generators) worthy SBD350.0 million (US$47.6 million). There also appears to be scope for the SIEA to further extend the size of its capital expenditure program, and further expand access to electricity services across the Solomon Islands.

6. It is understood that a further tariff review is planned, which will take into account future investment requirements to increase access to electricity, improve reliability and quality of supply, and reduce operating costs by increasing the use of renewables in the power generation (i.e., solar, hydro) and reduce the heavy reliance on diesel-fired generation. That review should ensure the tariff methodology is set to more affordable levels over time.

Table 1 – Projected financial performance of the SIEA, including CAPEX projects to be funded through ID

	Audited								Projected									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2030	2035	2040	2045	2050	2053
A Average Retail Tariff																		
Residential (SBD per unit)	-	5.7	6.4	6.8	6.6	6.2	6.3	6.2	5.6	5.6	5.7	5.7	6.4	6.9	7.4	8.0	8.6	9.0
Industrial (SBD per unit)	-	6.2	6.4	6.8	6.6	6.2	6.3	6.2	5.6	5.6	5.7	5.7	6.4	6.9	7.4	8.0	8.6	9.0
Commercial (SBD per unit)	-	6.0	6.4	6.8	6.6	6.2	6.3	6.2	5.6	5.6	5.7	5.7	6.4	6.9	7.4	8.0	8.6	9.0
B Income Statements																		
Net Revenue	550,598	418,943	484,987	463,955	532,547	535,818	440,979	469,038	476,588	512,220	550,988	592,517	829,489	978,690	1,154,798	1,362,669	1,608,040	1,776,031
Operating Expenses	326,683	350,339	379,815	370,829	341,502	330,655	363,364	389,090	404,639	411,963	420,613	428,700	475,146	509,222	536,300	595,739	658,391	700,792
Interest Expense	-	-	-	1,097	-	-	389	30	373	381	388	396	1,761	1,394	1,027	660	293	73
Other Expenses	14	903	(5,236)	614	1,057	4,416	(424)	(162)	-	-	-	-	-	-	-	-	-	-
Net Profit	223,901	67,701	110,408	91,415	189,988	200,747	77,649	80,080	71,576	99,877	129,986	163,420	352,582	468,075	617,471	766,270	949,356	1,075,165
C Balance Sheets																		
Assets																		
Current Assets	97,320	191,136	212,612	254,520	279,051	361,406	341,445	401,498	511,041	661,576	843,914	1,060,788	3,659,130	5,918,589	8,772,940	12,351,479	16,797,374	19,953,611
Non-Current Assets	328,611	294,230	356,444	475,068	849,436	1,102,258	1,348,704	1,825,837	1,815,444	1,841,670	1,865,370	1,889,120	2,067,007	2,195,878	2,331,448	2,489,088	2,607,838	2,679,088
Total Assets	425,931	485,366	569,057	729,588	1,128,486	1,463,664	1,690,148	2,227,335	2,326,485	2,503,246	2,709,284	2,949,908	5,726,137	8,114,467	11,104,388	14,840,567	19,405,212	22,632,698
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liabilities and Equity																		
Liabilities	11,004	26,155	52,933	105,665	113,369	157,168	141,145	202,745	110,668	112,788	115,126	117,402	112,541	108,417	103,256	102,887	102,994	103,770
Equity	414,928	489,890	571,168	662,584	769,271	970,334	1,043,983	1,139,069	1,210,646	1,310,913	1,440,899	1,604,319	3,877,260	5,953,937	8,746,838	12,269,435	16,641,974	19,738,486
Total Liabilities and Equity	425,931	516,045	624,101	768,249	882,640	1,127,503	1,185,128	1,341,814	1,321,313	1,423,701	1,556,025	1,721,721	3,989,801	6,062,353	8,850,094	12,372,322	16,744,968	19,842,256
D Cash Flow Statements																		
Cash flows from:																		
Operating Activities	14,048	92,759	92,760	134,592	172,609	164,941	100,410	151,973	146,740	170,832	202,622	236,801	415,208	518,659	647,929	801,682	986,915	1,115,651
Investing Activities	(7,496)	(12,395)	(72,252)	(192,249)	(101,391)	(150,379)	(85,561)	(107,518)	(24,436)	(24,990)	(25,388)	(25,396)	(28,595)	(28,228)	(27,861)	(27,494)	(27,128)	(26,907)
Net Cash Flow	12,907	19,459	99,823	129,368	75,411	150,836	201,187	221,808	303,524	425,829	571,671	748,904	3,140,832	5,276,824	7,978,347	11,375,393	15,603,375	18,608,534
Cash Balance	19,459	99,823	129,368	75,411	150,836	201,187	221,808	303,524	425,829	571,671	748,904	960,309	3,527,445	5,767,256	8,598,416	12,149,581	16,563,163	19,697,278
E Key Financial Indicators																		
Net Profit Margin (%)	59%	16%	26%	20%	42%	45%	18%	17%	15%	19%	24%	28%	43%	48%	53%	56%	59%	61%
Return on Equity (%)	54%	14%	19%	14%	25%	21%	7%	7%	6%	8%	9%	10%	9%	8%	7%	6%	6%	5%
Current Ratio	9.2	7.3	7.9	9.0	7.7	6.8	8.2	7.0	8.5	10.8	13.5	16.7	52.0	78.5	110.5	140.0	172.3	192.3
F Covenant Compliance																		
Debt Service Coverage Ratio	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	190.9	261.4	333.7	411.3	97.6	144.6	215.5	306.9	446.1	563.6
Debt to Equity Ratio	3%	5%	9%	16%	15%	16%	14%	18%	9%	9%	8%	7%	3%	2%	1%	1%	1%	1%
G DMAC Assessment Requirements																		
Rate of Return on Net Fixed As	109.3	134.3	121.4	94.6	55.4	39.9	31.2	25.4	26.2	27.6	29.3	31.1	40.0	44.4	49.3	54.5	61.4	66.0
Operating Ratio	87.0	24.0	27.8	17.8	18.4	18.7	31.0	15.0	13.1	11.4	9.8	8.5	5.5	4.9	4.3	3.8	3.4	3.2
Self-financing Ratio	N/A	N/A	N/A	1.33	1.15	1.93	0.93	6.22	5.87	6.73	7.98	9.32	14.56	18.42	23.32	29.24	36.48	N/A
Quick Ratio	8.2	7.0	7.6	8.7	7.4	6.5	7.7	6.6	8.2	10.5	13.2	16.4	51.7	78.2	110.2	139.8	172.1	192.1

SOLOMON ISLANDS ELECTRICITY AUTHORITY (trading as Solomon Power)

SOLOMON ISLANDS SUSTAINABLE ENERGY PROJECT

IMPLEMENTATION COMPLETION REPORT

Prepared by: Pradip Verma, Chief Executive Officer

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1. Overview

SIEA was in financial crisis and close to insolvency with severe cash-flow problems in 2007-2009 due to the "tension", large outstanding receivables, non-revenue losses, rising oil prices, large debt levels, and a depreciating Solomon Islands Dollar (SBD). In 2009 the Solomon Islands Sustainable Energy Project (SISEP-P100311) commenced with support provided by the World Bank with the project development objective to improve operational efficiency, system reliability and financial sustainability of SIEA.

The total project cost was US$19.4 million (US$ 6.4 million- SIEA funding; US$13.0 million IDA grant and credits). The original IDA (US$4.0 million) became effective June 2009. Additional IDA Grant and Credit funds (US$ 13.0 million) became effective 26 June 2014. The Project Closed on 31 March 2019.
Together with support provided through SISEP, SIEA's financial performance has improved dramatically from making losses until 2010 to a net profit of SBD68 million, SBD110m, SBD91m, SBD107, SBD120m, SBD80m and SBD80m respectively in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively. Electricity sales revenues increased from SBD351.5 million in 2011 to SBD455 million in 2018. Additionally, the reliability indices SAIDI, SAIFI in Honiara have both shown significant improvement. Furthermore, the non-technical losses have shown a steady reduction from 16% in 2009 to 6% in 2018.

SIEA is well placed to invest significantly in capital projects. The organisation has successfully delivered capital projects over the financial years 2013-2018. SIEA has a strong cash position and is now planning a capital investment program of SBD1 billion in total over the period 2019-2022.

2. Project Stakeholders

The stakeholders are Solomon Islands Government (the recipient), Solomon Islands Electricity Authority (the implementing agency) and The International Development Association (IDA).
Broadly, the roles of the stakeholders were as follows:

2.1. SIEA (Implementing Agency):

SIEA was responsible for implementing the project including: (i) Carrying out, with the assistance of adequately qualified consultants, the technical aspects of the Project (ii) carrying out fiduciary aspects (procurement, financial management, disbursement and audit functions) of the Project (iii) preparing, and submitting to the Association, quarterly and annual progress reports; and (iv) carrying out monitoring and evaluation functions under the Project.

SIEA was also responsible to ensure that the Project is carried out in accordance with the provisions of the Anti-Corruption Guidelines.

2.2. SIG (Recipient)

To facilitate the carrying out of the Project the Recipient has made available the proceeds of the grant and credit/loan funds to the Implementation entity under subsidiary agreements between the Recipient and the Implementing Agency.
The Recipient also provided oversight of the Project by monitoring and evaluating the progress of the project.

The Recipient also ensured that the Project implementation agency maintained a Financial Management system in accordance with provisions of the General Conditions in the Project Agreement.
Additionally, the Recipient ensured that the Project Implementation Entity's financial statements are audited in accordance with the General Conditions of the Project Agreement and also ensured that the audited statements are forwarded to the Association within the stipulated period as per the general conditions of the Project Agreement.

3. Agreements

The Project Agreement between IDA and SIG

The Subsidiary agreements between IDA and SIEA

4. Project Development Objective and key indicators

The development objective is to improve operational efficiency, system reliability and financial sustainability of SIEA through improved financial and operational management, reduction of losses, improved generator and distribution system reliability and improved revenue collection.

Key indicators against which project progress has been monitored (see appendix 1 and 2 for details) include:

Reduction in the frequency and duration of outages

Increases in the collection of electricity bills

Improvement of SIEA's retained revenue for each generated kWh; and

An upturn in SIEA's profitability

5. Original grant

The funding under this grant was utilised to improve the governance, strengthen management capacity at the highest level, improve reliability of power supply, reduce losses and improve generation efficiency. The original grant commenced on 26th June 2009 and it closed on 30th June 2017 with a total disbursement of US$3.83 million.

Under the original grant, SISEP supported the funding of the following roles in SIEA:

External Director (David Laurie from April 2010 to September 2016)

General Manager (Norman Nichols from March 2010 to November 2014). His remuneration was paid under SISEP only up to November 2013.

Commercialisation Manager (Richard Scott from July 2009 to February 2011)

Chief Financial Officer (Mike Payne from February 2011 to November 2012)

Chief Financial Officer (Phill O'Reilly from March 2013 to July 2016). His remuneration was paid under SISEP only up to November 2013.

General Manager Capital Works (Mark Greenaway from December 2014 to July 2017)

General Manager Capital Works (Hemant Kumar from November 2017 until 31 March 2019)

The grant supported/funded the following activities:

- **Strengthening management and governance**
  - **Engagement of two line managers (General Manager and Commercialisation Manager)**
  - **Engagement of an overseas director to the Board**
  - **Training of key management staff**

- **Financial operations**
  - **Implementation of a commercialisation program for the Finance Department**
  - **New financial management and billing system**
  - **Staff training**
  - **New accounting manual**

- **Technical operations**
- **Implementation of a loss reduction program**
- **A planned maintenance program for generation facilities in Honiara**
- **A distribution reinforcement program**
- **Improvement in system reliability**
- **Technical project implementation support**
- **Technical training program for engineering staff**

Improving the cooling system of generators at Lungga.

Loss reduction studies

Replacement of the 11 kV switchboard at Honiara Power Station

Design, procurement, installation and commissioning of a new 33 kV, 3 core cable from Lungga to Ranadi Substation

Owner's Engineer

Strengthen management

6. Additional grant and credit funds

This component became effective 26th June 2014.

The funding under this grant and credit was utilised to fund support for strengthening of management,

Tina River Hydropower project, project management support, strengthening the distribution network,

The additional grant and credit supported/funded the following activities:

Component 1

- **Technical Assistance and Training on dispatch and control, system planning, integration of renewables and IPPs**
- **Tina River Hydropower project connection study**
- **Cost of service and tariff review**
- **SCADA design**
- **Owner's engineer**
- **General Manager Capital Works**
- **Financial modelling for Tina River Hydropower Project**

Component 3

- **Upgrade of transformer capacity and new 33 kV and 11 kV switchboards at Ranadi Substation**
- **12.5 MVA 11/33 kV transformer at Lungga Power Station**
- **New zone substation at Kola' Ridge with one 33kV/11 kV 12.5 MVA transformer**
- **Relocation of feeder 12 from Lungga Power Station to East Honiara Substation**
- **Stream Gauging for Tina River Hydropower Project**
- **Procurement of Ring Main Units**

7. Assessment of Outcomes:

7.1 Background

SIEA has made a remarkable turnaround from 2007 from being in a very poor financial situation, poor governance and lack of proper management to now in 2019 humming with activity, with strong financials, strong governance, excellent management and excellent growth. Much of this transformation is as a result of two key initiatives of the Solomon Islands Government, the Shareholders of SIEA. These are:

The SOEs reform. SIG partnered with ADB to put in place the SOE Act 2007 and SOE Regulations in 2010.

SIG and World Bank partnering in a project to revive SIEA, the SISEP

To the World Bank and ADB we are indeed indebted. We would also like to acknowledge and celebrate the support provided by our Shareholders, SIG.

7.2 Transitioning of SIEA

7.2.1 Governance:

The Board is responsible for charting the Company's strategic direction, for the setting of

objectives, policy guidelines, goals management, and for monitoring the achievement of these matters. The Board is also responsible for reviewing the Business Plan, Corporate Plan and Statement of Corporate Objectives, and approves the Operating and Capital Budgets each year. The Board also reviews matters of a major or unusual nature, which are not in the ordinary course of business.

The Board appointments were strengthened under the SOE Act and associated Regulations. An independent international expert was appointed to the Board in April 2010 under funding from SISEP. Further impetus to governance was provided by the appointed to the Board of a new Chairman with wide ranging experience in the private sector. Additionally, governance was further strengthened by the appointment of independent directors with expertise in financial management, risk management, technical skills, human resources and strategy setting.

These Directors brought in experience and expertise in strategy setting, finance, legal, governance, engineering and provided the necessary support and guidance to Management. The Independent international expert on the board provided mentoring to management on a regular basis throughout his term of six years. The cost of his services were all funded under SISEP.

The Board made a number of resolutions to improve procurement policy and procedures, HR policies, internal audit. In addition to this three board Sub-Committees (Audit and Finance, HR and Technical) were established with their charters and were made responsible for deliberating detailed issues and making suitable recommendations to the Board.

The Board also established an Internal Audit Department with Manager Internal Audit reporting directly to the Chairman of the Audit and Finance Sub-Committee of the Board. The department under guidance of the Sub-Committee carries out audits in accordance with an approved Annual Audit Plan. The outcomes of all audits were reported to the Audit and Finance Committee (now Audit, Finance, Risk and Governance) Sub-Committee. All actions were followed up and tracked until completion.

Since 2012 on an average the Board has had 9 board meetings annually. All these meetings are properly minuted in a timely manner and resolutions and actions tracked and reported by Management. Furthermore, the Board Sub-Committee also meet on an average at least three time annually providing the necessary support and guidance to Management and to the Board to make decisions.

All of the above would not be possible without the funding from SISEP. Furthermore, the missions from the World Bank during the term of the SISEP provided a monitoring, scrutiny and reporting role on the efficacy of the project and this further improved the focus of the Management and Board of SIEA.

7.2.2 Management

Under funding from SISEP, (mostly under the original IDA funding of USD4.0million) SIEA appointed a General Manager, a Commercialisation Manager, a Chief Financial Officer and a General Manager Capital Works. These appointments strengthened management.

The new management established a Procurement Policy and associated procedures, Human

Resources Policy and Procedures Manual. Both of these were approved by the Board.

SISEP contributed to improve SIEA's financial position during 2011-2014 which meant that the organisation could start funding some of these roles from end November 2014.

In November 2014, an expat was appointed as CEO and he replaced the outgoing General Manager. In addition, three expats were appointed in 2015 as Planning Engineer, Electrical Engineer and Manager Generation & Outstations. All these roles have been paid for by SIEA.

7.2.3 Financial/External Financial Annual Audits

SIEA has achieved financial stability. 2018 marks the 8th year in which the Authority has made a profit. Furthermore, the last 7 year's statutory accounts have been unqualified, and signed off by the Auditor General before the mandated date of 31st March each year.

7.2.4 Training

SISEP funded many training programmes during its term of over 10 years.
The following training courses have been conducted in SIEA, some of which were funded by SISEP:

- Lineman's training courses commenced in 2013 (for the first time since 2003)
- Power Station Operator Training for all Operators
- First Aid training
- Defensive Driving training
- Training in Cable Jointing
- Project Management Training
- Meter Technician training
- Training for accreditation of electricians
- Training in DigSilent
- Training in Homer
- Attendance at conferences/seminars
- University education in accounting, finance, engineering, commerce
- Apprenticeship programme
- Graduate programme
- Line Mechanic training programme
- Training in asset management system
- Training in contract management
- Leadership training

APTC training

7.2.5 Capital Infrastructure Development

SISEP contributed to improve SIEA's financial sustainability which meant that the company was able to conduct a program of investment on its own. Also improvements in SIEA's governance and operational efficiency meant other donor partners such as JICA, ADB, Abu Dhabi Government, MFAT (NZ Government) were ready and felt confident enough to develop additional projects- so it created a conducive environment and enabled further investments.

We provide below a commentary on the projects totally funded by SIEA, projects funded under SISEP and other projects funded by donors.

From 2013 to 2018 SIEA has utilised its own funds to carry out the following projects:

Design, procurement and installation of 4X2.5 MW diesel generators plus associated equipment, new building, new workshop, one new 11/33 kV 10/12.5 MVA power transformer at Lungga Power Station at a total cost of SBD130m.

New generators, associated buildings and switchgear at Outstations Auki, Gizo, Munda, Noro and Tulagi.

Hybrid (solar, battery storage and back-up diesel generators) generation systems and associated distribution networks at Seghe and Taro at a total cost of SBD33 million.
Design, procurement and installation of two new 33/11 kV 10/12.5 MVA transformers at Honiara Power Station.

Business as usual projects

SIEA's headquarters building at Ranadi refurbished and extended

Integrated Business Management System

Two 1.5 MW generators commissioned in Honiara Power Station in 2013 (the first investment in generation by SIEA since 1993)

Vehicle monitoring system installed on all vehicles to improve efficiencies

Network extension

Hybrid station at Taro (Choiseul Province)

New building housing the 4, 2.5 MW machines- in foreground- Lungga P.S.

Gizo power station with new generators

Under SISEP, SIEA completed the following projects during 2013-2018

New building and new 11 kV switchgear at Honiara Substation

Relocation of feeder 12 from Lungga Power Station to East Honiara Substation

Upgrade of Ranadi Substation

New 33/11 kV Substation at Kola'a Ridge

Improved cooling systems on the generators at Lungga Power Station

Design, procurement, installation and commissioning of a new 33 kV 3 core cable from Lungga to Ranadi Substation

Design, procurement, installation and commissioning of a new 33 kV, 3 core cable from Lungga to Ranadi Substation

Ranadi Substation before upgrade

Ranadi Substation after upgrade

Kola’a Ridge before upgrade

Kola’a Ridge Substation after upgrade

11 kV switchboard at Honiara Power Station


11 kV feeder 12

Other projects funded by donors (2014-2018)

Hybrid stations at Kirakira, Lata, Malu'u, Munda and Tulagi- in progress (Asian Development Bank)

1 MW Solar Farm at Henderson commissioned in May 2016 (UAE and NZ Governments)

Output based aid program- in progress (World Bank)

50 kW solar on Ranadi carport roof- commissioned August 2014 (JICA)

Staff training on the Electricity Tariff

7.2.6 Reduction of losses

The decline in SIEA's financial situation in the period 2003-2010 appeared to be strongly correlated to the increase in the SIEA's total losses. This was considered unacceptable for any power utility and the level of losses was one of the main factors in the SIEA being close to failing.

It was considered imperative in 2011 that urgent action is required by the Board, management and staff of SIEA to manage and reduce the losses.

SISEP funded a loss reduction study/program in the Honiara network.

The study determined that the non-technical losses of 16% are exceptionally high and are resulting in lost revenue that is leading to financial stress. The study found that there are two main causes of the non-technical losses:

The metering and billing system are far below an acceptable standard with a significant amount of energy delivered not billed.

At the line staff level, the losses are generally accepted as "business as usual" and there is no

focus on reducing the non-technical losses.

Under SISEP a program was put in place and implemented to improve the cooling system of the generators at Lungga Power Station which lead to improvement in their efficiencies and output.

SISEP also funded training and to increase focus of management to reduce losses.

The installation of more pre-payment (Cashpower meters), the replacement of current transformers and associated meters, testing the accuracy of meters utilising the state of art meter testing bench newly purchased from Itron, Spain; Inspection of all meters on an annual basis and ensuring all meters are properly registered in the billing system has led to a steady reduction of non-technical losses from 16% in 2008 to 6% in 2018.

7.2.7 Debtors

SISEP funded training initiatives which improved reporting at the Executive Management and the Board level. Special focus was put on reporting on debtors more than 30 days, more than 60 days and more than 90 days.

Billing and collection of debt functions were part of the Finance Division up to 2011. SISEP funding boosted and strengthened Management and increased Governance as a result of which the management with the support of the Board re-structured the organization to create a new Customer Services Division which assumed the responsibility for all customer issues, from community awareness through its Public Relations Section, to receiving, processing and registration of customer applications for new customer connections, customer enquiries, cashiering, administering billing and customer accounts, protection of revenue meters and revenue collection.

The Management with the support of the Board has carried out mass disconnections of some key customers for non-payment of bills.

The above concerted efforts have resulted in better debt collection.

8. SIEA today

The SISEP has made a remarkable impact on SIEA. SIEA is fundamentally different from what it was 10 years ago and has been for a number of years at the forefront of the commercialisation initiative of Solomon Islands Government (SIG).

SISEP contributed by financing the management and a director on the board that affected these changes, also through direct capital investment programs. As SIEA started improving its financial position and capacity and capability to deliver better outcomes other donors also stepped in to assist SIEA.

SIEA was rated as one of the best performing SOEs in a benchmarking study conducted by the Asian Development Bank in 2014 which included 8 Pacific participating countries, Mauritius and Jamaica.

Over 2012-2018 years a significant improvement in the commercial sustainability of SP has been

achieved. Prudent management has resulted in a situation where SP has been able to commit to a SBD 1 billion capital investment plan for the period 2019-2022.

The annual capital injection in financial years 2014- 2017 has been on an average SBD120 million. In addition to delivering the projects for the relocation of feeder 12 from Lungga Power Station to East Honiara Substation, Upgrade of Ranadi Substation and design, procurement and construction and commissioning of a new substation at Kola'a Ridge, SIEA has also replaced old generators and switchboards and distribution systems at 5 outstations, installed a commissioned 4 new 2.5 MW generators at Lungga Power Station, installed and commissioned 2 new outstations (Seghe and Taro) and other capital infrastructure projects.

The reliability indices SAIDI and SAIFI have shown remarkable improvement from 2007 to 2018 and also the system losses have steadily dropped from a figure of 27% in 2007 and now at the end of 2018 it was at 17%.

The Net Profit after tax has shown a remarkable improvement from a loss of SBD44m in 2007 to SBD80m profit in 2018.

The revenue per kWh generated has increased from SBD1.39 per kWh in 2007 to SBD4.70 per kWh in December 2018.

SIEA purchased and implemented an Integrated Business Management System and a new Billing system in 2013

The organisation also developed a suite of policies and procedures with input from staff and these have been successfully implemented with awareness training being provided.

Furthermore, the average number of debtor days to collect billed revenue has dropped from 360 days to 30 days in 2018, a remarkable achievement. SIEA's Customer Services has been very vigilant in follow up with Debtors especially the big debtors and therefore the recoveries have been very good. SIEA has developed policies and procedures to handle non-payment of dues.

SIEA opened in 2013 the first "drive thru" for Cashpower top ups with extended hours at its Headquarters. In the same year SIEA also started cashpower top ups through mobile phone banking.

The penetration of Cashpower pre-paid meters exceed more than 80% of its customer base and this has assisted in cash flows. The monthly pre-paid sale is now over SBD10m (approximately 25% of the monthly electricity revenue).

The organisation has transitioned from a position of insolvency to a vibrant, fully compliant SOE.

All the above has been possible due to very sound governance from the Board of Directors and a highly focused, well qualified, skilled, dedicated and an experienced Management team. One important catalyst for this remarkable turnaround is SISEP.

9. Key Factors affecting implementation and outcomes:

The implementation of the project suffered and one of the factors contributing to delays was weaknesses in procurement which included delays in evaluation and non-timely submission of no-objections to the World Bank. During 2014-2015 SIEA's capacity to conduct procurement in adherence to the Bank's procurement guidelines were limited and this had an impact on the delivery of the components of SISEP.

Delayed recruitment to critical roles (example procurement specialist, owners engineer) impacted the implementation of the SISEP. Additionally, on a number of instances disbursements/application for disbursements were delayed due to absence of signatories. The project also suffered because SIEA was unable to arrange work permits, visas and resident permits in a timely manner for new appointments.

Another factor that contributed to the delays in implementation was SIEA's inability to source qualified and skilled contractors to carry out the works. The highly skilled contracting market in Solomon Islands is very limited and therefore we have to source design and construct contractors for electricity substation, feeder, transformer upgrade/replacement work from the international market. Given the dis-economies of scale, risk factors associated with the Pacific region and tyranny of distance and lack of logistics SIEA has struggled to attract, engage and retain qualified contractors.

Lack of capacity, experienced personnel in SIEA was another factor which resulted in SIEA not been able to submit the SISEP quarterly reports in a timely manner.

Delayed acquisition of land, easements have also impacted on the implementation of SISEP.

10. Learnings and proposed actions to improve

The key learnings from the implementation of the SISEP is the following:

- In the first instance for all future projects we should recruit to the role of the Procurement Specialist
- SIEA should be well equipped in terms of personnel who are skilled, experienced and well qualified
- Expedite arrangement of work permits, visas and resident permits for all new appointments in a timely manner
- Better liaison with MMERE, MOFT and other Ministries in the Solomon Islands with a view to educate them on the donor funded projects and how they could assist SIEA
- Develop strong professional relationship with the contractors with the aim to improve retention
- Restructure the Capital Works & Planning area with a view to empower young personnel

The role of Procurement Specialist is pivotal in preparing scopes, TORs and assisting and expediting the recruitment to other roles and for the procurement of consultants and contractors (EPC, Design and construct and others). SIEA has already made an excellent beginning in his aspect on the Solomon Islands Electricity Access and Renewable Energy Expansion Project (SIEAREEP). This new project commenced in October 2018 and we have on board since January 2019 a Procurement Specialist.
SIEA has already initiated action to set up meetings with representatives of Ministry of Labour, Industry, Commerce and Immigration. Also a number of meetings have already been held with the Commissioner of Lands with the purpose to resolve issues to expeditiously acquire land for the proposed solar farms and easements for transmission/distribution lines.

SIEA is also having regular meetings with Senior representatives from the Seventh Day Adventist Church to acquire the easement for the proposed 66 kV transmission from Tina River Hydropower site to Lungga Power Station and also for land for the proposed grid connect solar projects at Lungga. It is pleasing to note that this close engagement with the Executive of SDA Church is already bearing fruits.
Representatives from SIEA's corporate services division are having regular catch up meetings with the key personnel in the Ministry of Labour, Industry, Commerce and Immigration (MLICI). Corporate Services Division has already in-sourced the function of arranging work permits, visas and resident permits for expats. This direct close liaison and relationship with the Ministry will assist SIEA to acquire work permits, visas, resident permits in a timely manner for the new appointments and for the renewal of the existing permits.
Since early 2018 SIEA has been developing a young engineer in the Capital Works team and he has been entrusted the responsibility to prepare the quarterly reports for SISEP. The quality of the reports being prepared by him during the last three quarters have shown improvement. Also late last year the Capital Works and Planning areas have been re-structured. In the new structure four managerial roles have been assigned to four young local upcoming engineers. This empowerment has already shown that they are willing to take more responsibility and accept accountability. We will therefore see further improvements in the execution of SIEAREEP.
SIEA has also commenced an Apprenticeship Program and a Line Mechanic Trainee Program. The organization also has strengthened the existing Graduate Training program. Furthermore, SIEA has also put in place a Talent Pool Development and Succession Plan. All these will enable SIEA in the development and sustenance of human capital.
All of the above will place SIEA in good stead to progress all future projects in a timely manner.

11. Sustainability

The structure of the project was designed to ensure all achievements made during its lifetime are sustainable. Instead of recruiting short-term Consultants fly in fly out for the key roles the SISEP was designed in Consultation with the Ministry of Finance and Treasury and the Board of SIEA for long term engagements such that sustainability could be maintained in the long term.
The General Manager, Commercialisation Manager, Chief Financial Officer and General Manager Capital Works were all recruited each for a term of 3 years. For some of these roles an extension of up to 18 months was also provided.
Additionally, the International Board Director was on the Board of SIEA for approximately 6 years.
These long term contracts all funded under SISEP provided continuity of employment/engagement to all the above executive personnel who could then make appropriate changes, policy decisions, enhancing and strengthening reporting at the executive level and the Board level for the long term which started bearing fruits for SIEA and have been sustainable over the last 6 years.
The International Board Director provided mentoring and training to the management and also improved the strategy and policy setting and reporting on generation statistics, the losses, debtors, cash flows, debt recovery. The International Board Director departed in August 2016 and since then there has been no replacement.
Despite this SIEA has continued to perform very well financially and has met all its mandatory statutory obligations in a timely manner. The organization has continued to generate healthy profits, has a strong balance sheet, healthy cash flows and has managed to deliver an extensive capital infrastructure investment program. Furthermore, the key performance indicators in SISEP have shown improvement and sustainability.
SIEA has matured over the last seven years and is now in a position to sustain an ambitious capital investment plan to achieve two key objectives which are:

- **Improve affordability**

- **Improve accessibility**

The sustainability could not have been achieved if SISEP had taken a short term view.

12. Cancellation and reallocation of Funds

In the second half of 2017 it was realized that there would be project cost savings. This was due to savings obtained in the Capital Works contract and to a change in plans as with regards to installation of a transformer in Lungga, as it was decided that it would be more cost efficient for SIEA to purchase the transformer through the project but perform its installation in-house.

At that stage it was estimated that there would be US$2.5million of unallocated funds under the project. In March 2018 this estimate was revised upwards to USD3.3 million.

In light of the above, and given the impending closing date of 31 March 2019, SIEA , through the Ministry of Finance and Treasury, approached the World Bank and requested that a total of US$3.3 million equivalent originally allocated towards IDA credit IDA-53790 be cancelled from the project and reallocated to the Solomon Islands Electricity Access and Renewable Energy Expansion Project (P162902).

The cancellation and re-allocation of funds was approved by the World Bank in March 2018.

However, it needs to be acknowledged that SIEA underestimated in March 2018 the cancellation and re-allocation amount. As a result of this, as at 31 March 2019 the undisbursed amount is USD 0.90 million.

Appendix 1

PROJECT RESULTS FRAMEWORK
ORIGINAL GRANT

Project Development Objectives
The objective of the project is to improve operational efficiency, system reliability and financial sustainability of SIEA.

INDICATOR NAME	**UNIT OF MEASURE**	**DETAILS**	**ACTIONS**	**COMMENTS**
PDO INDICATOR				
STRENGTHENING MANAGEMENT	**TEXT**	Appointment of Commercialisation Manager	Commercialisation Manager appointed June 2009	Completed
		General Manager	GM Appointed	Completed

			March 2010	
		International Director	International Director appointed May 10	Completed
		Appointment of Chief Financial Officer	CFO appointed February 2011	Completed
		Appointment of GM Capital Works	GM Capital Works appointed in December 2014	Completed
FINANCIAL OPERATIONS	**TEXT**	Fuel and lubricant contract through tender	New fuel and lubricant contract sourced through a competitive process providing cost savings- contract signed in April 2010	Completed
		New General Ledger and Billing System	Installation, integration and commissioning of new General Ledger and Billing System completed in August 2010	Completed
		Installation and commissioning of prepayment meters	More prepayment meters were installed and commissioned	End 2018 the count is 14817 prepay meters (87% of all meters)
		Corporate Planning process- to produce a 5 year strategic plan including capital investment plan for the Board	In accordance with the SOE Act the Statement of Corporate Objectives were prepared and delivered to the Accountable Ministers	Completed
RELIABILITY	TEXT	SAIDI	Target 2000	

			minutes annual	1757.6 minutes in March 2019
		SAIFI	Target 85 times	17.5 times in March 2019
		Loss reduction		Reduced from 27% in 2007 to 17.3% in 2019
		Maintenance of generators		All generators are maintained/overhauled as required on the number of hours of operation. A maintenance schedule has been established and adhered to.
		Cooling system improvements		Generator Water cooling system at Lungga Power Station upgraded. This has improved the efficiency of the generators in the Old Power House.
		Technical Training		Training for operators, Linemen training-ongoing

Appendix 2

REVISED PROJECT RESULTS FRAMEWORK

Project Development Objectives
The objective of the project is to improve operational efficiency, system reliability and financial sustainability of SIEA.

Indicator Name	Unit of Measure	Baseline	End Target As at 31 March 2019	Comments
PDO Indicator				
Quarterly financial management reports, and rolling projections for	Text	December 2007 No. The 14 days target was not	Yes (SIEA should achieve the 14 days	Progressive improvements over the years. Achieved

SIEA performance within 14 days after end of each quarter		achieved.	target)	
Number of days between due date of customer bill, and if not paid, notice of arrears		365 days in 2008	15 days	Progressive improvements over the years. Achieved
System Average Interruption Duration Index (SAIDI)	Minutes	51840	2000 minutes annual	**SAIDI** = Sum of (interruption duration in minutes * number of customers affected) divided by the Total number of customers served. In financial year 2017 it was measured as 1920 minutes In financial 2018 it was measured as 2213 minutes. For the first quarter of 2019 it was measured as 1757.6. Achieved.
System Average Interruption Frequency Index (SAIFI)	Times	816	85 times	**SAIFI** = Total number of interruptions divided by Total number of customers served. In financial year 2017 it was measured as 21.6 times. In financial 2018 it was measured as 17.4 times. For the first quarter of 2019 it was measured as 17.5. Achieved.

System losses	**%**	December 2007 at 27%	**18%**	System losses have steadily decreased over the years and now are at 17%. In financial year 2018 it was 17% At the end of March 2019 it was 17.3%. ACHIEVED
Average number of debtor days to collect billed revenue	Days	December 2007 360 days	35 days	Achieved 33.61 days
Collection ratio	Percentage	72	70	60
Revenue per kWh generated	Text	SBD1.39/kWh	SBD 4.5/kWh	Achieved SBD $4.64/kWh
	Intermediate Indicators			
Commissioning of 2 Nos. 10/12.5 MVA 33kV/11kV transformers and a second 33 kV switchboard and a second 11 kV switchboard and associated equipment at Ranadi Substation	Text		31 March 2019	Achieved on 31 March 2019
New Kola'a Ridge 33/11kV Substation commissioned with one 10/12.5MVA transformer, 33 kV and 11 kV switchboards and	Text		31 March 2019	Achieved on 10 March 2019

associated equipment				
Feeder 12 load relocated from Lungga 11kV generation bus to East Honiara Substation	Text		31 March 2019	Achieved on 30 November 2018
Procurement of one 12.5/15MVA 11/33kV transformer at Lungga Power Station	Text		31 March 2019	Achieved in September 2018
Net Profit before Tax	Text	SBD44 million	SBD98 million	Achieved SBD91million, SBD107 million,SBD120 million, SBD80million and SBD80million in 2014,2015,2016,2017 and 2018 financial years respectively

ANNEX 6. SUPPORTING DOCUMENTS (IF ANY)

1. SISEP Project Appraisal Document (P100311, Report No: 43120-SB, June 12, 2008)
2. SISEP Restructuring Project Paper (Report No: 67646 v2, January 22, 2012)
3. SISEP Additional Financing and Restructuring Project Paper (Report No: 84643-SB, February 13, 2014)
4. SISEP Restructuring Project Paper (Report No: RES31408, April 2018)
5. Financing Agreements for SISEP on file
6. Project Agreements on file
7. Regional Engagement Framework FY2006-2009 for Pacific Islands (Report no: 32261-EAP, May 3, 2005)
8. Interim Strategy Note for the Solomon Islands for the period FY10-FY11 (Report No: 53496-SB, March 12, 2010)
9. Solomon Islands Systematic Country Diagnostic Priorities for Supporting Poverty Reduction and Promoting Shared Prosperity (Report No: 115425-SB, June 1, 2017)
10. Country Partnership Framework for Solomon Islands for the period FY2018-FY2023 (Report no: 122600-SB, June 26, 2018)
11. Finding Balance 2016, Benchmarking the performance of state-owned enterprises in island countries, Asian Development Bank, ISBN 978-92-9257-581-6 (Print), 978-92-9257-582-3 (e-ISBN)