**Meeting of the Board**
4 – 6 April 2017
Songdo, Incheon, Republic of Korea
Provisional agenda item 11(e)

**GCF/B.16/07/Add.07**

14 March 2017

# Consideration of funding proposals – Addendum VII

## Funding proposal package for FP044

**Summary**

This addendum contains the following three parts:

a) A funding proposal titled "Tina River Hydropower Development Project" submitted by the World Bank;
b) A no-objection letter issued by the national designated authority or focal point; and
c) Environmental and social report(s) disclosure.

The documents are presented as submitted by the accredited entity, and national designated authority or focal point, respectively.

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GREEN CLIMATE FUND

# Funding Proposal

## Version 1.1

**The Green Climate Fund (GCF) is seeking high-quality funding proposals.**

Accredited entities are expected to develop their funding proposals, in close consultation with the relevant national designated authority, with due consideration of the GCF's Investment Framework and Results Management Framework. The funding proposals should demonstrate how the proposed projects or programmes will perform against the investment criteria and achieve part or all of the strategic impact results.

| | |
|---|---|
| Project/Programme Title: | Tina River Hydropower Development Project |
| Country/Region: | Solomon Islands |
| Accredited Entity: | The World Bank |
| Date of Submission: | 30 September 2016 |

## Contents



***Note to accredited entities on the use of the funding proposal template***

- Sections **A, B, D, E** and **H** of the funding proposal require detailed inputs from the accredited entity. For all other sections, including the Appraisal Summary in section F, accredited entities have discretion in how they wish to present the information. Accredited entities can either directly incorporate information into this proposal, or provide summary information in the proposal with cross-reference to other project documents such as project appraisal document.
- The total number of pages for the funding proposal (excluding annexes) is expected not to exceed 50.

**Please submit the completed form to:**

fundingproposal@gcfund.org

Please use the following name convention for the file name:
"[FP]-[Agency Short Name]-[Date]-[Serial Number]"

| **A.1. Brief Project / Programme Information** | | | |
|---|---|---|---|
| **A.1.1. Project / programme title** | | **Tina River Hydropower Development Project** | |
| A.1.2. Project or programme | | Project | |
| **A.1.3. Country (ies) / region** | | **Solomon Islands** | |
| **A.1.4. National designated authority (ies)** | | **Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM)** | |
| **A.1.5. Accredited entity** | | **The World Bank** | |
| A.1.5.a. Access modality | | ☐ Direct ☒ International | |
| A.1.6. Executing entity / beneficiary | | Executing Entity: Ministry of Finance and Treasury (MOFT)<br>Beneficiary: Ministry of Mines, Energy and Rural Electrification (MMERE) and the Project Company | |
| A.1.7. Project size category (Total investment, million USD) | | ☐ Micro (≤10)<br>☒ Medium (50<x≤250) | ☐ Small (10<x≤50)<br>☐ Large (>250) |
| A.1.8. Mitigation / adaptation focus | | ☐ Mitigation ☐ Adaptation ☒ Cross-cutting | |
| A.1.9. Date of submission | | 30 September 2016 | |
| A.1.10. Project contact details | Contact person, position | Takafumi Kadono, Senior Energy Specialist<br>Erik Johnson, Senior Social Development Specialist | |
| | Organization | The World Bank | |
| | Email address | tkadono@worldbank.org<br>ejohnson1@worldbank.org | |
| | Telephone number | +65-6517-1240 | |
| | Mailing address | World Bank Singapore Office, 10 Marina Boulevard, Marina Bay Financial Centre Tower 2 #34-02, Singapore 018983 | |

A.1.11. Results areas *(mark all that apply)*

Reduced emissions from:

- ☒ Energy access and power generation
  (E.g. on-grid, micro-grid or off-grid solar, wind, geothermal, etc.)
- ☐ Low emission transport
  (E.g. high-speed rail, rapid bus system, etc.)
- ☐ Buildings, cities and industries and appliances
  (E.g. new and retrofitted energy-efficient buildings, energy-efficient equipment for companies and supply chain management, etc.)
- ☐ Forestry and land use
  (E.g. forest conservation and management, agroforestry, agricultural irrigation, water treatment and management, etc.)

Increased resilience of:

- ☐ Most vulnerable people and communities
  (E.g. mitigation of operational risk associated with climate change – diversification of supply sources and supply chain management, relocation of manufacturing facilities and warehouses, etc.)
- ☐ Health and well-being, and food and water security
  (E.g. climate-resilient crops, efficient irrigation systems, etc.)
- ☒ Infrastructure and built environment
  (E.g. sea walls, resilient road networks, etc.)
- ☐ Ecosystem and ecosystem services
  (E.g. ecosystem conservation and management, ecotourism, etc.)

## A.2. Project / Programme Executive Summary (max 300 words)

*Please provide a brief description of the proposed project/programme, including the objectives and primary measurable benefits (see investment criteria in section E). The detailed description can be elaborated in section C.*

The objective of the Tina River Hydropower Development Project (TRHDP; the "Project") is to lower the system average cost of electricity supply and diversify generation capacity in favor of clean, renewable sources. As the main alternatives to diesel generation are renewable energy such as hydropower and solar photovoltaics (PV), diversification will lead to significant reductions in greenhouse gas (GHG) emissions in a power system which is almost entirely reliant on diesel generation. The combined share of renewable energy generation sources (hydro and solar) on the Honiara grid is expected to shift from 3% in 2017 to 67% at the time of expected TRHDP commissioning in 2022. This shift away from diesel generation will also lead to more stable, lower electricity tariff to Solomon Islands Electricity Authority (SIEA, operating as 'Solomon Power') customers, with the final magnitude of savings to be assessed at the time of power purchase agreement (PPA) signing between SIEA and the Project Company.

A request is made for the Green Climate Fund (GCF) to provide $70 million of 0% loan over 40 years including 10-year grace to finance a portion of the debt of the Project Company to develop the Tina River Hydropower Plant (Component 1), and a grant of $16 million as co-financing for the access road (Component 2) with the Government of Australia. This is part of a concessional funding package sought from several organizations described below. Since the sharp drop in oil prices since 2015, the cost of diesel generation has dropped significantly – in order to ensure that the Project is competitive with the current diesel generation cost, and to incentivize SIEA to transition to renewable energy at this scale, concessional finance is required to fund all of the Project's debt.

**Significantly reduce GHG emissions.** The Project is a 15 MW hydropower plant which will annually generate 78.35 gigawatt-hours (GWh) (65% of the 120 GWh demand projected in Honiara in 2022) with a net GHG emission reduction of 49,500 $tCO_2eq$/year and a total of 2.48 million $tCO_2eq$ over the 50 year life of the Project. The annual GHG emission reduction potential of the Project is more than two and a half times higher than Solomon Islands Government's (SIG) commitment in the Intended Nationally Determined Contribution (INDC) to reduce emissions by 18,800 $tCO_2eq$/ year by 2025, and 60% higher than the target reduction of 31,125 $tCO_2eq$/year by 2030 with appropriate international assistance. The Project has by far the largest GHG emission reduction potential in the Solomon Islands. The Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM), the National Designated Authority (NDA), has issued its No Objection and is fully supportive of the Project.

**Shift from nearly 100% diesel to majority renewable energy.** The Project is the first utility-scale hydropower plant and will also be the first privately-invested build-own-operate-transfer (BOOT) project in Solomon Islands. It is also the first sizeable renewable energy development in a 97% diesel generated system, with reservoir capacity that will provide flexibility to the power system to enable higher penetration of PV power without the need for large and expensive energy storage or diesel generators running at low efficiencies to respond to the intermittent PV output. This dramatic transition from diesel to renewable energy and from public investment to private investment can be replicated in other small island nations with similar constraints.

**Reduce the cost and volatility of a diesel-driven electricity tariff to stimulate household and business savings and investment.** Retail electricity tariff in Solomon Islands is one of the highest in the world at US¢82/kWh for residential customers due to the high cost of diesel. The Project is expected to contribute to lowering the tariff so that the significant cost burden to households and businesses can be eased, and to enable SIEA to invest more in increasing the grid-connected electrification rate of 12%. Global oil prices are currently at historic lows, but the Project will enable SIEA to lock-in to a favorable PPA price for the 30-year concession period which will significantly limit its exposure to global oil price fluctuations. As the Project is to be developed by a private investor as a BOOT scheme, SIG will be handed over the Project at no cost at the end of the concession period. This will not only drastically reduce the generation cost for SIEA, but will significantly save SIG's foreign currency denominated expenditures on energy.

**Economic efficiency.** Assuming total Project development cost of $233.98 million, the emissions reduction per unit of investment over the project life of 50 years is 10.6 $kgCO_2eq$/$. In terms of the impact of the requested GCF financing of $86 million ($70 million loan plus $16 million grant), the impact delivered is 28.8 $kgCO_2eq$/GCF$.

**Financial viability.** The Project is designed to satisfy the financial viability of the (i) private investor, and (ii) SIEA which is the off-taker. The concessional funds from GCF and other co-financiers will enable the private investor's return on equity to be met while keeping the PPA tariff at levels that would incentivize SIEA to enter into a PPA and take a monumental step towards a renewable energy dominant power system. Concessional funds from GCF and other

sources are critical to reduce the financing cost to strengthen the Project's financial viability and to support SIEA's transition from diesel power to renewable hydropower.

| A.3. Project/Programme Milestone | |
|---|---|
| Expected approval from accredited entity's Board (if applicable) | 30/05/2017 |
| Expected financial close (if applicable) | 30/06/2017 |
| Estimated implementation start and end date | Start: 01/07/2017<br>End: 30/06/2022 |
| Project/programme lifespan | 50 years |

## B.1. Description of Financial Elements of the Project / Programme

*Please provide:*

- *an integrated financial model in Section I (Annexes) that includes a projection covering the period from financial closing through final maturity of the proposed GCF financing with detailed assumptions and rationale; and a sensitivity analysis of critical elements of the project/programme*

- *a description of how the choice of financial instrument(s) will overcome barriers and achieve project objectives, and leverage public and/or private finance*

The Tina River Hydropower Plant (Component 1) is a dam-tunnel type hydropower scheme of 15 MW which is expected to be developed by a Project Company with majority shareholding by a private developer on a BOOT basis. SIEA will be the off-taker through a PPA. Concessional loan financing of $70 million from the GCF is being requested to partially finance the debt requirement of the Project Company while other concessional financiers such as the Asian Development Bank (ADB)[1] and the Economic Development Cooperation Fund of the Government of South Korea (EDCF) have provided commitment letters indicating their interest to co-finance the debt tranche. The International Renewable Energy Agency (IRENA)/Abu Dhabi Fund for Development (ADFD) Project Facility has advised SIG that it will provide a concessional loan in the amount of $15 million towards the Project. The World Bank (Accredited Entity) is committed, pending its Board approval, to finance the equity share of the Project Company to be owned by SIG.

The access road (Component 2) is required to gain access to various sites during construction and for the operation of the Hydropower Plant during operations. While the Plant (e.g. dam, tunnel and powerhouse) is a revenue generating asset, the road is a public investment which does not generate revenue in itself. As such, Government of Australia (GoA) is considering providing up to AUD17 million (approx. USD9 million for the road and USD2 million for technical assistance; and the balance for World Bank management fees) in grant financing. GCF grant financing of USD16 million is sought to fill a gap in the required financing for the road which is estimated at USD25 million. A mix of grant and loan financing from GCF would be consistent with World Bank and ADB financing for Solomon Islands which is also a mix of loan and grant financing, reflecting the country's status as both a least developed country and small island developing state. The difficulty of attracting private sector financing for a large-scale investment project in a small island state such as Solomon Islands is also significant, and the financing of critical enabling infrastructure such as the access road is an important element of the package to make such an investment attractive. To avoid the interface risk of a separate road contractor not being able to complete the road by when the engineering-procurement-construction (EPC) contractor is to commence construction of the main Hydropower Plant, the access road will be included in the EPC contract. However, the fixed cost of the access road will be ring-fenced and grant funded so that its cost will not increase the PPA tariff to levels which are too high for SIEA to accept.

The transmission line (Component 3) will be developed by SIEA, outside the BOOT scheme, also in order to reduce the cost of Component 1. World Bank loan and grant as well as IRENA/ADFD loan will co-finance its construction, while SIEA will also provide counterpart financing.

Finally, the World Bank and Australian grants will finance the technical assistance (Component 4) to support the activities of SIG during implementation of the Project.

For Component 1, SIG and the project's private developer have substantially agreed to an EPC cost for the Hydropower Plant of $144.2 million (inclusive of tax; exclusive of the access road or transmission line). For the project to be viable including the financing cost and to incentivize SIEA to accept the PPA, the financing mix needs to result in a 30-year levelized tariff of no more than US¢22/kWh. As indicated below, GCF concessional debt finance of $70 million (and grant financing of $16 million for the access roads) is needed to reach that level. It should be noted that the PPA payments will be made for the available capacity of the Hydropower Plant rather on an energy basis. An estimation of the levelized tariff, based on estimated average annual generation over 30 years and project costs, is needed for SIEA to decide whether Hydropower Plant is less expensive than the unit cost of diesel-generated electricity.

[1] SIG has requested ADB assign funding from the ADB country allocation to the project and ADB is currently undertaking due diligence.

GoA confirmation/approval of funding is expected by end-March 2017; GCF confirmation/approval of funding expected April 6, 2017; EDCF confirmation/approval of funding expected end-April 2017; ADB confirmation/approval of funding is expected April or May 2017; and IDA confirmation/approval of funding expected May 30, 2017. KW financing has already been approved by its Board.

Financing agreements for all financiers are expected to be signed by end-June 2017, with some delays possible, particularly given the practice of preparing GCF legal documents after approval. It should be noted that until all financing terms have been negotiated and approved by the various financiers, the final project cost will not be confirmed. In the case of multiple financiers, such staggered of approvals are to be expected.

The attached **Integrated Financial Model Annex** for Component 1 calculates the total annual revenue requirement of the Project Company in order to meet its operation and maintenance expenditure, debt service, required equity return and tax obligations for an operational period of 40 years. The annual revenue requirement is divided by the estimated average energy generated of 78.35 GWh to yield an annual generation tariff. A levelized tariff is derived for the PPA operating period of 30 years.

The model makes certain simplifications – for example, it is assumed that there will be no "trapped cash" and that the project company can distribute all free cash for equity as dividends. The model also assumes that depreciation will be equal to debt service and does not compute any depreciation tax shield. Since the Solomon Islands tax laws require payment of income tax or dividend tax (but not both), this simplification is appropriate. All assumptions on capital and operating costs, debt and equity costs, taxation and construction period are included in the worksheet "Assumptions" in blue font.

The base case assumes zero commercial debt – in order to derive the amount of commercial debt required if GCF debt is reduced, the base case figure of $70 million loan from GCF can be reduced and a goal-seek or Solver function performed to solve for the amount of required commercial debt.

**Sensitivity Analysis.** Sensitivity analysis around the volume of GCF loan is provided in section F.1 to demonstrate the minimum concessionality required for the Project to be viable. Assuming that the requested GCF funding is made available, sensitivity analysis was conducted around other critical elements including: (i) 15% increase in EPC cost requiring additional IRENA/ADFD financing of $5.73 million; and (ii) no EDCF financing requiring additional IRENA/ADFD financing of $10.73 million plus commercial debt of $24.72 million. As IRENA/ADFD funds are needed to finance Component 3, any application of these funds for Component 1 debt financing will have to be off-set by an additional request by SIG for IDA financing under the next IDA cycle (IDA18). The sensitivity analysis results are shown below.

| | Base Case | EPC cost over-run +15% (5% over contingency); funded with IRENA/ADFD debt | No EDCF financing; commercial & IRENA/ADFD financing instead |
|---|---|---|---|
| EPC (incl. Tax) | 144,200,000 | 151,410,000 | 144,200,000 |
| Contingency Used | 15,000,000 | 15,000,000 | 15,000,000 |
| Development costs* | 15,000,000 | 15,000,000 | 15,000,000 |
| MIGA premium & insurance during construction | 3,500,000 | 3,500,000 | 3,500,000 |
| | 177,700,000 | 184,910,000 | 177,700,000 |
| Interest during construction | 3,460,452 | 3,867,284 | 8,587,064 |
| Total project cost | 181,160,452 | 188,777,284 | 186,287,064 |
| | | | |
| Debt (75%) | | | |
| GCF | 70,000,000 | 70,000,000 | 70,000,000 |

| | | | |
|---|---|---|---|
| EDCF | 31,600,000 | 31,600,000 | - |
| ADB - loan | 18,000,000 | 18,000,000 | 18,000,000 |
| ADB - grant | 12,000,000 | 12,000,000 | 12,000,000 |
| IRENA/ADFD | 4,270,000 | 10,000,000 | 15,000,000 |
| Commercial | - | - | 24,720,000 |
| *Total debt* | 135,870,000 | 141,600,000 | 139,720,000 |
| Equity (25%) | | | |
| Sponsors (KW & HEC) | 25,290,452 | 27,177,284 | 26,567,064 |
| SIG (via WB) | 20,000,000 | 20,000,000 | 20,000,000 |
| *Total equity* | 45,290,452 | 47,177,284 | 46,567,064 |
| **30-year Levelized Tariff (including O&M) in US¢/kWh** | **21.09** | **22.19** | **24.17** |

** Contingency is to secure up-front funding for unforeseen cost increases or schedule delays*
*** Development costs include technical, financial, insurance and legal advisors and sponsors' costs. A breakdown of specific costs is not available at this time as these costs are still under negotiation between SIG and K-Water.*

As described in section F.1, the maximum PPA price acceptable to SIEA is US¢22/kWh. The first sensitivity analysis case with 15% EPC cost increase requiring $5.73 million of IRENA/ADFD loan will increase the levelized tariff to US¢22.19 which exceeds the maximum PPA price. Although the EPC contract is a fixed-price contract, an increase in EPC cost is a possibility as there are exclusions related to certain adverse geological risks in the reservoir area which the EPC contractor is not in a position to take.

The second sensitivity analysis case with no EDCF financing is included as this is the least firm co-financing source compared to the World Bank's IDA resources ADB's Asian Development Fund resources. A decision by EDCF not to finance is, however, unlikely since (i) EDCF has recently concluded a Co-financing Framework Agreement with the World Bank, and (ii) EDCF has expressed its strong interest to co-finance with GCF. Nonetheless, the analysis demonstrates that under this scenario the levelized tariff increases to above US¢24 as a larger volume of IRENA/ADFD and commercial debt become necessary. Given that the World Bank's IDA resources and ADB's Asian Development Fund resources cannot be increased further due to country allocation ceilings, the Project can only attain a levelized tariff of US¢22/kWh with a GCF loan of $86 million if EDCF financing is unavailable.

- *a breakdown of cost estimates for total project costs and GCF financing by sub-component in local and foreign currency and a currency hedging mechanism: For example, under the component of drilling activity for a geothermal exploration project, sub-components would include civil engineering works, drilling services, drilling equipment and inspection test.*

| Component | Amount (for entire project) | Currency | Amount (for entire project) | Local currency | GCF funding amount | Currency of disbursement to recipient |
|---|---|---|---|---|---|---|
| Component 1: Hydropower Plant (EPC contract, financing charges, contingencies) (Co-financed by World Bank at USD20 m, EDCF at USD31.6 m, ADB at USD30 m, IRENA/ADFD at 4.27 m and Private sector developer at USD25.29m.) | 181.16* | million USD ($) | 0.00 | million SBD | 70.00 | million USD ($) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Component 2: Access Road (Co-financed with GoA at USD9 m, and constructed by EPC contractor.) | 25.00 | million USD ($) | 0.00 | million SBD | 16.00 | million USD ($) |
| Component 3: Transmission Line (Supply and install contract to be financed by WB at $10.6 m and IRENA/ADFD at $10.73 m. Design being funded by SIEA) | 22.82 | million USD ($) | 0.00 | million SBD | 0.00 | million USD ($) |
| Component 4: Technical Assistance (Various activities**; to be financed by WB at USD3 m, and GoA at USD2 m) | 4.5 | million USD ($) | 4.00 | million SBD | 0.00 | million USD ($) |
| Total project financing | 233.48 | million USD ($) | 4.0*** | million SBD | 86.0 | million USD ($) |

* Component 1 cost includes debt and equity financing for the EPC contract for the Hydropower Plant, contingency, development costs, Multilateral Investment Guarantee Agency (MIGA) premium and other costs, and interest during construction (IDC). IDC includes the capitalized interest related to interest payments to the concessional financiers on loan amounts drawn during construction.

** Includes supporting SIG's Project Office's day-to-day activities, recruiting experts of the Dam Safety Advisory Panel and the Environmental and Social Panel, contracting independent bodies to monitor the implementation of the Environmental and Social Management Plan and the Land Acquisition and Livelihood Restoration Plan, etc.

*** SBD4.0 million estimated to be USD0.5 million at exchange rate of USD1.00 = SBD8.00.

- *a breakdown of cost/budget by expenditure type (project staff and consultants, travel, goods, works, services, etc.) and disbursement schedule in project/programme confirmation (term sheet) as included in section I, Annexes.*

For Component 1, the Project Company will finance the $181.16 million project cost through 75% debt ($135.87 million) and 25% equity ($45.29 million). The private sector investor's cost of (return on) equity is targeted at 13%. The breakdown of the Component 1 cost is provided below.

| Component 1 – Items | Amount ($ million) |
|---|---|
| A. EPC Cost (including taxes) | 144.20 |
| B. Contingency | 15.00 |
| C. Development Cost | 15.00 |
| D. MIGA and Other Costs[2] | 3.50 |
| E. Interest during Construction | 3.46 |
| Total | 181.16 |

The drawdown schedule for Component 1 (Tina River Hydropower Plant), which is relevant to the GCF funds, is as follows.

[2] A MIGA PRI has been requested by the project sponsor. Discussions are ongoing between K-water and MIGA.

| Year | Percentage | Equity | Debt – Total | Debt – GCF Only |
|---|---|---|---|---|
| 2018 | 40% | 18.11 | 54.36 | 28.00 |
| 2019 | 20% | 9.06 | 27.17 | 14.00 |
| 2020 | 20% | 9.06 | 27.17 | 14.00 |
| 2021 | 20% | 9.06 | 27.17 | 14.00 |
| Total | 100% | 45.29 | 135.87 | 70.00 |

The drawdown schedule for Component 2 (access road), which is relevant to the GCF funds, is as follows.

| Year | Percentage | GoA | GCF |
|---|---|---|---|
| 2017 | 50% | 4.50 | 8.00 |
| 2018 | 50% | 4.50 | 8.00 |
| Total | 100% | 9.00 | 16.0 |

## B.2. Project Financing Information

| | Financial Instrument | Amount | Currency | Tenor | Pricing |
|---|---|---|---|---|---|
| **(a) Total project financing** | **(a) = (b) + (c)** | 233.98 | million USD ($) | | |
| (b) GCF financing to recipient | (i) Senior Loans | 70.00 | million USD ($) | 40 years | 0 % |
| | (ii) Subordinated Loans | | Options | | |
| | (iii) Equity | | Options | | |
| | (iv) Guarantees | | Options | | |
| | (v) Reimbursable grants * | | Options | | |
| | (vi) Grants * | 16.00 | million USD ($) | | |
| | ** Please provide economic and financial justification in section F.1 for the concessionality that GCF is expected to provide, particularly in the case of grants. Please specify difference in tenor and price between GCF financing and that of accredited entities. Please note that the level of concessionality should correspond to the level of the project/programme's expected performance against the investment criteria indicated in section E.* | | | | |
| | Total requested (i+ii+iii+iv+v+vi) | 86.00 | million USD ($) | | |

| | Financial Instrument | Amount | Currency | Name of Institution | Tenor* | Pricing | Seniority |
|---|---|---|---|---|---|---|---|
| (c) Co-financing to recipient | Equity | 25.29 | million USD ($) | Private investor | 34 yrs | 16.00%** | |
| | Equity | 20.00 | million USD ($) | SIG (using IDA credit) | 34 yrs | 2.00-4.00% | |
| | Senior Loans | 13.60 | million USD ($) | IDA*** | 40 yrs | 0.75% | junior |
| | Senior Loans | 30.00 | million USD ($) | ADB*** | 32 yrs | 1.50% | pari passu |
| | Senior Loans | 31.60 | million USD ($) | EDCF | 40 yrs | 0.05% | pari passu |
| | Senior Loans | 15.00 | million USD ($) | IRENA/ADFD | 15 yrs | 2.00% | pari passu |
| | Grant | 11.00 | million USD ($) | GoA**** | n/a | n/a | |
| | Counterpart Finance | 1.49 | million USD ($) | SIEA | n/a | n/a | |

Lead financing institution: World Bank

* Financing provided with a tenure beyond the 34-year PPA will be repaid through an escrow account held by the Project Company

** This is the proposed ROE that will provide the private sponsor with an IRR of 13%.

| | |
|---|---|
| | *** IDA includes $8.9 million grant and ADB includes $12.0 million of grant.<br><br>**** GoA funds will be provided to World Bank denominated in Australian Dollars when entrusted to the World Bank, but will be denominated US Dollars in the financing agreement between the World Bank and SIG. GoA has indicated interest to provide up to AUD17 million which is equivalent to approximately USD12.7 million. However, this includes World Bank management fees, and the available amount for the project is USD11 million. |
| | ** Please provide a confirmation letter or a letter of commitment in section I issued by the co-financing institution.*<br><br>*Letters have been provided by GoA, KEXIM/EDCF, KW and ADB. IRENA/ADFD has already announced its decision to provide US$15.0 million to SIG.* |
| (d) Financial terms between GCF and AE (if applicable) | *In cases where the accredited entity (AE) deploys the GCF financing directly to the recipient, (i.e. the GCF financing passes directly from the GCF to the recipient through the AE) or if the AE is the recipient itself, in the proposed financial instrument and terms as described in part (b), this subsection can be skipped.*<br><br>As stated in the Term Sheet, the requested Accredited Entity Fee is eight per cent (8%) of the total GCF Proceeds, subject to finalization of the AMA and FAA. The GCF interim policy on fees indicates the cap is eight per cent (8%) of the GCF funding for medium scale public sector projects/programs. It should also be noted that the Accredited Entity fee is not included in the project budget in section (b) above. |

## B.3. Financial Markets Overview (if applicable)

*How market price or expected commercial rate return was (non-concessional) determined?*

The private sponsor has stated that their required Internal Rate of Return (IRR) is 13% over the entire life of the PPA, including the construction period. This IRR equates broadly to a Return on Equity of around 16%. The regulated equity return for independent power producers (IPPs) in countries with more IPP experience, such as Indonesia and Pakistan, can be 15% to 17%, therefore, the 13% return required by the private sponsor is judged to be favorable.

*Please provide an overview of the size of total banking assets, debt capital markets and equity capital markets which could be tapped to finance the proposed project/programme.*

The Project requires maximum concessionality for it to be financially viable largely due to high cost of investment and the low cost of the diesel alternative forecasted for the project life which has been adjusted downwards due to the recent low oil prices.

Nonetheless, commercial banks were consulted, but, even with partial risk guarantee (PRG) cover, their appetite for projects in Solomon Islands (on project finance basis) was limited due to lack of precedent.

In case concessional financing is not sufficient to fully finance the debt tranche, commercial loans from multilateral financial institutions such as the International Finance Corporation (IFC), ADB Private Sector Operation Department and/or European Investment Bank (EIB) may be considered, but even their terms would increase the PPA tariff above levels acceptable to SIEA as demonstrated in section B.1.

Equity and debt capital markets are not expected to participate in the project as it would be the first large scale private power project in Solomon Islands.

*Please provide an overview of market rates (i.e. 1-year T-Bill, 5-year government bond, 5-year corporate bond (specify credit rating) and 5-year syndicate loan.*

Indicative loan pricing provided by multilateral financial institutions (on project finance basis) was LIBOR plus a margin of 500 - 800 bps.

*Provide examples or information on comparable transactions.*

There is a lack of comparable projects in the Pacific region that have achieved financial close. The margin on loans for first in country projects in Myanmar and sub-Saharan Africa is 400 to 500 bps.

## C.1. Strategic Context

*Please describe relevant national, sub-national, regional, global, political, and/or economic factors that help to contextualize the proposal, including existing national and sector policies and strategies.*

**Country Context.** The Solomon Islands is a small island state that is recovering from many years of intermittent political turmoil and civil strife. The civil strife during 1998-2003 disrupted the functioning of state and social institutions which resulted in a 40 percent GDP decline. With the support of its neighbors led by Australia, SIG restored law and order and other basic state functions, particularly in finance, through the deployment of the Regional Assistance Mission to the Solomon Islands (RAMSI). In 2005, the Solomon Islands benefited greatly from substantial debt forgiveness, arrears clearance and complementary domestic debt restructuring under the Honiara Club Agreement (HCA) with traditional development partners, including Australia, New Zealand, the European Investment Bank (EIB) and the European Union (EU).

The Solomon Islands economy has rebounded since the civil unrest, but remains vulnerable to external shocks. The economy recovered relatively strongly based on export of commodities such as logging and mining. However, the global financial crisis in 2009 hit the Solomon Islands hard, resulting in a sharp contraction in output, a budget crunch and a depletion of foreign currency reserves. SIG recognized the need for significant reductions in its current spending levels, especially those with significant impact on the balance of payments. The oil price spike of 2008 when oil price reached $150/barrel increased Solomon Islands' vulnerability to oil price volatility, and the country's balance of payments came under severe pressure as fossil fuel makes up a significant portion of all imports. To mitigate the impact of high cost diesel fuel which the economy has suffered particularly during 2011-2014 when oil prices fluctuated around $100/barrel, the Government took the initiative in considering options for development of domestic sources of energy, particularly hydro and other renewables. At the same time, while the country had benefited from the HCA, the arrangement had also placed a moratorium on new loans, which made public financing of larger infrastructure projects very difficult. While this moratorium has since been lifted, it gave an initial impetus to the drive for private sector participation in infrastructure development, financing and operation - a policy that was later embedded in SIG's National Development Strategy (NDS) 2011-2020.

**NDS and the Power Sector.** Universal supply of reliable grid-connected electricity is a great challenge in Solomon Islands where its population is scattered across 90 inhabited islands. The national electrification rate is reported to be 45%, but many of those are only supplied by small PV panels typically of 20 Wp. The percentage of households supplied by SIEA, the state-owned power utility, is merely 12% nationally. SIG recognizes the importance of providing equitable access to basic services including electricity to alleviate poverty and to develop the economy, and the NDS 2016-2035 (April 2016) views the energy sector as a key enabling factor to support its poverty alleviation effort, accelerate access to better health care and education services, and improve the standard of living and livelihoods of rural and urban communities. While the NDS emphasizes the need to accelerate rural electrification, it places equal importance on ensuring "reliable and affordable power supply in all urban centers by promoting use of renewable energy, opening the market to IPPs, appropriate prepaid tariff structures and ensuring SIEA has sound technical and managerial expertise for an efficient and effective SOE [state-owned enterprise]." The Project, which is an IPP using renewable energy with a public-private partnership (PPP) approach whereby SIEA and SIG are actively involved in the formulation of the project, is fully consistent with this strategy.

**Solomon Islands National Energy Policy (SINEP; 2014)** was formulated with a vision to "unlocking the development potential of Solomon Islands' economic base through a dynamic and effective energy sector". Appreciating the low electrification rate, SINEP sets ambitious targets to increase access to electricity in urban areas to 100% by 2020, and to 35% by 2020 in the rural areas. In line with the SINEP, the Ministry of Mines, Energy and Rural Electrification (MMERE) has recently launched an initiative to double the number of households supplied by SIEA from 15,500 to 30,000 by 2021, and SIEA has started to develop solar-diesel-battery hybrid mini-grids in the outer islands to serve the remote rural populations. This is in line with NDS's other energy strategy to "provide reliable and affordable electricity in rural areas, vigorously promoting assessment of potential renewable energy resources and development of those which are technically sound and can be made financially viable."

Under the renewable energy thematic area, the SINEP establishes a target to "increase the use of renewable energy sources for power generation in urban and rural areas to 50% by 2020." This is also an ambitious goal given that SIEA's main power grid in the capital city of Honiara with an available capacity of 30.7 MW is 97% diesel generators. While a 1 MW grid-connected solar, grant-funded jointly by the governments of the United Arab Emirates and New Zealand, has recently been commissioned its installed capacity is insignificant compared the SINEP target. This solar farm is only treated as a pilot project, and the SINEP instead prioritizes the development of the Tina River Hydropower

Development Project. The Project's 15 MW installed capacity will generate 78.35 GWh per annum which is 65% of the 120 GWh demand projected for Honiara in 2022 when the Project is scheduled to come on line.

**Intended Nationally Determined Contribution (INDC).** Details of the INDC can be found in section C.2 below.

**Project Background.** Recognizing the need for SIEA to increase its generation capacity, while reducing its dependency on expensive imported fuel with volatile prices, and reducing its GHG emissions, the Bank commissioned the *Guadalcanal Renewable Development Concept Study (2006)* which was completed in February 2006. The study investigated three major catchments in Guadalcanal – Tina River of Ngalimbiu catchment, Mbalasuna River of the Nuhu catchment, and Ngheunaha and Kolokumaha Rivers of the Choha catchment – and concluded that the Tina River has the best hydropower potential to serve the future load in Honiara. The scheme conceptualized in this study was a two-stage cascade development: the first stage involving a weir and a tunnel utilizing 152 m of head, discharge of 13-17 $m^3/s$ with an installed capacity of 16-21 MW to generate 99-130 GWh/year; and the second stage involving a 60 m dam with a powerhouse at its toe with a head of 85 m, discharge of 12-15 $m^3/s$ with an installed capacity of 15-21 MW to generate 69-91 GWh/year.

Subsequently in 2007, the *Solomon Sustainable Energy Projects – Hydropower Component – Pre-Feasibility Study* (pre-FS) was conducted. This pre-FS first reconfirmed that the Tina River of the Ngalimbiu catchment is the most favorable river for hydropower development and assessed three options based on site visits, 1:50,000 scale digital topographical maps with 20 m contours, and hydrological data from Lungga River as well as rainfall data from Honiara and Henderson stations. The pre-FS recommended the first of the three options which involves a 10 m weir just downstream of the confluence of the Tina River and the Mbeambea Rivers and an 8.7 km tunnel creating a net head of 180.5 m. With a design discharge of 20 $m^3/s$ and installed capacity of 32 MW, the scheme was simulated to annually generate 126 GWh.

From 2010 to 2015, with the support of the World Bank, EIB and Australian Government, the *Tina River Hydropower Development Feasibility Study* (FS) was prepared in three phases. It involved hydrological analysis, geotechnical investigation, and optimization of the hydropower scheme through economic analysis of various technical options. While the FS progressively assessed several options, the final recommendation was a scheme consisting of a 64 m roller-compacted concrete (RCC) dam, power intake, 3.3 km headrace tunnel, powerhouse housing 3 units of 5 MW turbine-generators, and a tailrace channel. The dam will create a 2.8k km long reservoir with total storage volume of 6.9 million $m^3$ and a surface area of 305,000 $m^2$ at full supply level of 175 m. Design discharge is 18 $m^3/s$ and the 15 MW plant will generate 78.35 GWh a year.

During the FS preparation, both public financing and private sector financing were considered.

(i) **Public or mostly public sector financed**. It was clear from the World Bank's assessment that SIG did not have the funds to fully or partially finance a project of this scale. WB allocation was small and no other concessional funds were stated to be available at the time. Further, public borrowing was limited by the terms of the Honiara Club Agreement in effect in 2009-11 when the project structure was conceived. In addition, a publicly funded project would have to have construction supervised by, and be operated by SIEA which does not have the hydropower expertise to either supervise construction or operate the Project.

(ii) **Private sector financed.** In power generation projects, the common implementation modes are BOO (build own operate), BOOT, BLT (build lease transfer) and variations around these modes. In BLT, the lease period is typically short compared to BOOT or BOO, and thus annual payments are expensive. Between BOOT and BOO, the former was selected because the estimated tariff in a BOO is only marginally less than that in a BOOT because the equity returns post 30 years are very small in present value terms. Once the project is transferred after 30 years of operation, SIG/SIEA can benefit from very low cost electricity for the remainder of the plant's useful life as capital costs would have been amortized, leaving only O&M costs which are small in comparison. At the end of the 30-year period, SIEA will have been trained by the Project Company how to operate the facility so that it will have the full capacity to do so.

Based on the above assessment, it was decided that the Tina River Hydropower Project will be developed on a BOOT basis by a Project Company under a 34-year concession (including a 4-year design and construction period).

All the electricity generated by the Project will be sold to SIEA, the offtaker, who will pay a capacity-based tariff in accordance with the PPA to be entered between the Project Company and SIEA. SIG will guarantee certain obligations such as foreign exchange convertibility and transferability as will be stipulated in the Government Guarantee Agreement and in the Implementation Agreement to be concluded between the Project Company and SIG. At the end of the concession period, the Project will be handed over to SIG at no cost as will be stipulated in the PPA.

The declining cost of diesel since the FS was contracted in 2010, has put additional pressure on project costs and the resulting tariff, prompting SIG to make an effort to minimize or eliminate the need for commercial borrowing by pursuing as much concessional financing as possible. SIG is also seeking to enable the project through the provision of an access road entirely funded through grant financing. GoA has expressed an interest in providing a grant in AUD equivalent to USD9 million, leaving a gap of $16 million to cover the full estimated cost of USD25 million. Grant financing for the access road from GCF is further justified by (a) the non-revenue generating nature of the road as a public investment, enabling infrastructure asset; (b) aligning with the combined grant/loan approach of ADB and WB which reflects the country's status as both a least developed country and small island developing state; (c) the need to further enhance the viability of the project and incentivize SIEA to transition to renewable energy by limiting the cost of the PPA and resulting tariff.

It may be noted that SIG's Debt Management Framework sets a limit on the stock of debt at 30% of the GDP. Currently, the debt to GDP is approximately only 8%, and SIG is capable and willing to take on the concessional loans and guarantee the obligations of SIEA under the Project.

## C.2. Project / Programme Objective against Baseline

*Describe the baseline scenario (i.e. emissions baseline, climate vulnerability baseline, key barriers, challenges and/or policies) and the outcomes and the impact that the project/programme will aim to achieve in improving the baseline scenario.*

According to the INDC, GHG emission from Solomon Islands in 2015 is approximately 700,000 $tCO_2eq$ per year. The business-as-usual (BAU) scenario up to 2030 is derived by extrapolating fossil fuel consumption data for the 1994-2010 period. While the INDC does not provide a figure for the BAU emission in future years, the Solomon Islands' conditional contribution with international assistance is the reduction of GHG emission by 18,800 $tCO_2eq$ per year by 2025 and by 31,125 $tCO_2eq$ per year by 2030. The Project will annually generate 78.35 GWh of electricity and displace existing and future diesel generation of the same amount, equivalent to net GHG emission reduction of 49,500 $tCO_2eq$ each year (assuming grid emission factor of 650 $tCO_2eq/GWh$). The Project, therefore, has the potential to double the emissions reductions envisaged in the INDC.

In terms of climate vulnerability, Solomon Islands, as a small island developing state, is extremely susceptible to climate change, particularly threatened by rising sea levels, severe drought and increased intensity of tropical cyclones. While the main benefits of the Project are related to the mitigation of climate change effects through GHG emission reduction, it also has the climate adaptation benefit of regulating the natural flow of the Tina River behind its dam for enhanced management of downstream flows during times of droughts and floods. In particular, the dam reservoir is designed with Full Supply Level (FSL) at EL 175m and Normal Operating Level at EL 172 m providing about 1 million $m^3$ of storage capacity for flood control.

## C.3. Project / Programme Description

*Describe the main activities and the planned measures of the project/programme according to each of its components.*

*Provide information on how the activities are linked to objectives, outputs and outcomes that the project/programme intends to achieve. The objectives, outputs and outcomes should be consistent with the information reported in the logic framework in section H.*

**Objective.** The objective of the Tina River Hydropower Development Project (TRHDP; the "Project") is to lower the cost of electricity supply and to reduce GHG emission by displacing a large share of diesel-generated energy with clean hydropower.

**Fund-level impact:** reduced emissions through increased low-emission energy access and energy generation.

**Project outcome:** increased number of small, medium and large low-emission power suppliers.

**Project outputs.** The Project comprises four Components (with different financing sources and structures), each with its own output as follows:

**Component 1: Tina River Hydropower Plant.** Output is that Tina River Hydropower Plant is commissioned. Component 1 will consist of the construction of a roller-compacted concrete (RCC) dam 72 m in height (from assumed foundation), power intake, 3.3 km headrace tunnel, powerhouse housing 3 units of 5 MW turbine-generators, and tailrace channel. The dam will create a 2.8 km long reservoir with storage volume of 6.9 million $m^3$ and a surface area of 30 hectares at FSL 175 m. Design discharge is 18 $m^3/s$ and the plant will generate 78.35 GWh a year after deducting station auxiliary use and transformer losses. The Tina River Hydropower Plant will be developed on a BOOT basis by the Project Company (a Special Purpose Vehicle, SPV) under a 34-year concession (including a 4-year design and construction period). The Project Company is expected to be established by the main sponsor (Korea Water Resources Corporation: K-Water) and SIG. K-Water will hold 51% of the shares while SIG will hold the balance of 49% through its state-owned investment vehicle – Investment Corporation of the Solomon Islands (ICSI). At the end of the concession period, the Project Company (K-Water owning a majority stake) will transfer its shares to SIG and thus the ownership of the power plant. A Shareholder Agreement is being drafted and will be finalized in form and substance satisfactory to the World Bank by the time of project appraisal.

Activities towards achieving the output are: (i) preparation of a tender design by the Project Company; (ii) procurement of an EPC Contractor by the Project Company; (iii) execution of the contract (i.e. construction of the Project) by the EPC Contractor; and (iv) testing and commissioning by the Project Company and certification by SIEA.

**Component 2: Access Road.** Output is that the access road, designed to withstand extreme precipitation caused by climate change, is completed. The access road will be run from Kukum Highway to the Project site divided into two lots. Lot 1 is the upgrading of the 13.2 km existing gravel road from Kukum Highway to Managakiki Village. Lot 2 is the construction of a new 5.5 km access road from Managakiki Village to the powerhouse and dam sites. The design life of the road is 20 years (normal for gravel pavement in high rainfall areas), but with satisfactory maintenance, this could extend to 30+ years. Lot 1 would be maintained by SIG as an asset in the national road network to enhance the mobility and well-being of the local communities, while Lot 2 would be maintained by the Project Company as part of the operations of the hydropower plant. Maintenance costs are estimated as 3-4% of construction cost, annually.

Activities towards achieving the output are: (i) construction of the access road by the EPC contractor; ii) supervision of construction by Independent Engineer.

**Component 3: Transmission Line.** Output is that the transmission line is commissioned. SIEA's routing and design study of November 2016 identified that the transmission voltage should be increased from the previously envisaged 33 kV to 66 kV to reduce losses. SIEA has also decided that the transmission line (23 km) should have a physical contingency by erecting two parallel single-circuit transmission lines rather than a double-circuit line. As a result, additional works at higher voltage has become necessary at the connection point –the existing Lungga Power Station.

Activities towards achieving the output are: (i) preparation of transmission line detailed design by SIEA; (ii) procurement of a supply and install contractor by SIEA; (iii) procurement of construction supervision consultants by SIEA; (iv) construction of the transmission line by the supply and install contractor; and (v) testing and commissioning by the contractor and certification by SIEA.

**Component 4: Technical Assistance.** Output is that project management capacity is strengthened through expertise provided by the panel of experts: (i) Dam Safety Advisory Panel (DSAP) comprising experts on dam, geology, seismology and hydrology/sedimentology; and (ii) Environment and Social Panel (E&S Panel) comprising experts on environment and sociology; as well as (iii) an independent monitoring agent on the implementation of the environmental monitoring and management plan, and the gender action plan; and (iv) an independent monitoring agent on the implementation of the land acquisition and livelihood restoration plan. Component 4 will also support the day-to-day project management of the MMERE Project Office, and the annual audits.

Main activities towards the achievement of the output is (i) recruitment of DSAP and E&S Panel by the MMERE Project Office; (ii) mobilization of DSAP and E&S Panel semi-annually during construction, at the time of testing and

commissioning, and annually during the first three years of operation; (iii) recruitment of independent monitoring agents by the MMERE Project Office; (iv) mobilization of the independent monitoring agents semi-annually during construction, at the time of testing and commissioning, and annually during the first five years of operation; and (v) recruitment of the access road tendering and supervision consultants.

## C.4. Background Information on Project / Programme Sponsor (Executing Entity)

*Describe the quality of the management team, overall strategy and financial profile of the Sponsor (Executing Entity) and how it will support the project/programme in terms of equity investment, management, operations, production and marketing.*

The consortium of Korea Water Resources Corporation (K-Water or KW) and Hyundai Engineering Company (HEC; collectively KW-HEC) has been selected by SIG as the preferred bidder through a competitive investor selection process facilitated by IFC as the transaction advisor. The selection process started with a request for expressions of interest published in 2011 and re-published in May 2014. Sixteen firms expressed interest in 2011 and 17 firms in 2014. On July 25, 2014, request for qualification was published which was purchased by 10 firms, but only two submissions were received by the submission deadline on November 21, 2014. Both bidders were prequalified based on stringent criteria including:

- The Lead Member or its Affiliate must have equity ownership interest in at least 200 MW of power generation capacity;
- The Lead Member or its Affiliate must own, based on its own percentage of equity stake, at least 50 MW of power generation capacity;
- Details of at least one IPP that has achieved financial close in the last ten years, in respect of which the Lead Member or its Affiliate invested equity of at least $15 million;
- Details of at least one IPP that has achieved financial close in the last ten years, in respect of which the Lead Member or its Affiliate raised debt of at least $100 million on Project Finance basis; and
- Lead Member to demonstrate a net worth in excess of $500 million in aggregate for each of the past two fiscal years.

However, one bidder withdrew before the final proposal submission deadline. The Government nevertheless decided to proceed with the sole remaining bidder through a negotiated contract, and granted an exclusive development right to KW-HEC to prepare the Project and sign the PPA by 31 October 2017. KW is the state-owned enterprise in Korea responsible for bulk water supply and distribution, as well as hydropower generation. The company has extensive experience in developing, financing and operating hydropower plants in Korea (1074 MW), with 61% market share in the country. Overseas, KW owns and operates the 218 MW Angat hydropower project in the Philippines. A list of overseas IPP/BOOT hydropower projects under construction or development is shown below together with financiers involved.

| Name of Project | Capacity | Status / lenders |
|---|---|---|
| Patrind Hydro in Pakistan | 150MW | Construction stage / ADB, IFC, IsDB, K-exim |
| Nenskra Hydro in Georgia | 280MW | Financing stage / EBRD |
| Upper Karnali Hydro in Nepal | 900MW | Development stage / ADB, IFC |
| Pursat Hydro in Cambodia | 80MW | Development |
| Peusangan 4 Hydro in Indonesia | 85MW | early stage development |
| Bongka Hydro in Indonesia | 201MW | early stage development |
| Middle Paung Laung Hydro in Myanmar | 155MW | early stage development |

KW and SIG have agreed that KW will be the controlling shareholder with 51%, whereas SIG will hold 49%. SIG intends to utilize the concessional loan to be provided by the World Bank for its equity contribution, requiring only a minimum return on equity to service its debt and to cover its administration costs. As a result, the cost of equity can be lowered

significantly compared to the initial arrangement in which KW-HEC consortium was to inject 81% of the equity. Part of this 81% was to be held by the expected EPC contractor, HEC, but HEC will no longer retain an equity stake in the Project Company. KW and HEC are unrelated entities. Given the importance of the Project, the Bank has mobilized $20 million of additional World Bank financing (beyond the normal Solomon Islands country allocation) for this purpose.

Under the 34-year concession (including 4-year design and construction period), KW-HEC will construct the hydropower facility (EPC contractor is expected to be HEC), and operate the facility for 30 years. As detailed in section E.5.2, KW particularly has international experience in developing, managing and operating hydropower projects. It also has a strong financial position, and its board has already approved equity participation of up to $25 million.

## C.5. Market Overview (if applicable)

*Describe the market for the product(s) or services including the historical data and forecasts.*

SIEA is a state-owned power utility with a monopoly on generation, transmission, distribution and retail sale of electricity. SIEA will be the sole off-taker of the energy generated by the Project under a PPA. In the aftermath of civil unrest which ended in 2003 and poor management, SIEA was in financial crisis until 2012. Its financials were turned around in 2013 owing to the strong intervention of SIG and support provided through the World Bank-financed Sustainable Energy Project (SISEP) launched in 2008. With such a history, the SIEA's customer base has only increased modestly from about 11,500 in 2009 to 15,500 in 2015 (the population of Solomon Islands is around 600,000), while nationwide (including the Honiara grid and provincial outstations) energy generation has also increased modestly from under 83.5 GWh in 2009 to 87 GWh in 2015.

The average electricity tariff is approximately US¢85/kWh – the highest in the Pacific and one of the highest in the world. This is due to the high cost of diesel generation, but also due to the tariff methodology which passes on the cost of fuel when costs are high, but does not adequately passes on the benefit of lower cost of fuel. MMERE and SIEA are in the process of amending the tariff methodology so that the lower generation cost of SIEA (including the PPA tariff) will be appropriate reflected in a lower retail tariff.

Many of the households consume less than 50 kWh/month due to the high tariff, and are expected to be able to afford more if the tariff is reduced through lower generation cost and revision to the tariff methodology. It may be noted that the majority of the households use prepaid meters through which one can control expenditure on electricity.
Data on disposable income is unavailable, but some data is available from the Solomon Islands 2012/13 Household Income and Expenditure Survey (published October 2015). While the report recognizes the discrepancy between income data and expenditure data (where there is net surplus when comparing average income-expenditures, and net deficit when comparing median income-expenditure), the following table provides an indication of household income-expenditure situation.

**Table 23: Comparison of household and per capita net average and median income (excluding imputed rent)**

| Area | Average (SBD) | | Median (SBD) | |
|---|---|---|---|---|
| | Per household | Per capita | Per household | Per capita |
| **Urban** | | | | |
| Income | 114,793 | 19,072 | 58,791 | 10,508 |
| Expenditure | 99,007 | 16,449 | 73,147 | 12,443 |
| **Net urban** | **15,786** | **2,623** | **-14,356** | **-1,935** |
| **Rural** | | | | |
| Income | 45,116 | 8,011 | 29,928 | 5,104 |
| Expenditure | 44,340 | 7,874 | 35,772 | 6,152 |
| **Net rural** | **776** | **137** | **-5,844** | **-1,048** |
| **National** | | | | |
| Income | 57,379 | 10,067 | 33,131 | 5,798 |
| Expenditure | 53,961 | 9,467 | 39,546 | 6,856 |
| **Net national** | **3,418** | **600** | **-6,415** | **-1,058** |

During this time, SIEA managed to strengthen its financial and technical capacities, and has begun to apply its enhanced profits to embark on an ambitious program of investments aiming to double the number of customers to 30,000 by 2021, at which point electricity demand is forecast to reach 110 GWh. Peak load is also projected to increase from 14.4 MW in 2015 to 21.1 MW by 2020, spurred by an increased customer base, commercial developments connected to the Honiara grid, and demand which has been suppressed in the past due to SIEA's insufficient capacity to generate, transmit and distribute electricity.

Today, SIEA's total installed capacity (all diesel generators except for the 1 MW of PV commissioned in late-2016) is 32.6 MW, but its available (de-rated) capacity is 30.7 MW. Many of the diesel units are also old and inefficient while others are effectively non-operational or have reduced output, and are scheduled for decommissioning. SIEA plans to retire 7 MW in 2024, 3 MW in 2037 and 10 MW in 2039. In the absence of the Project, and without new units, the available capacity in 2039 will be around 13.7 MW when also considering lower output of operating units due to superannuation. By this time, peak demand is forecast to be almost 50 MW, and SIEA's business-as-usual investment plan involves installing new diesel generators to serve the growing demand and to maintain a sufficient reserve margin.

*Describe the competitive environment including the list of competitors with market shares and customer base and key differentiating factors (if applicable).*

The Electricity Act also gives SIEA the authority to issue licenses to third parties to generate and/or distribute power. Due to the high cost of electricity and system unreliability, several businesses operate their own off-grid, diesel generation systems, but none are selling electricity to consumers. Only Solomon Tropical Products sell to the Honiara grid when requested by SIEA under what is understood to be a loose contract.

Apart from the Project, there are no other IPPs being planned in Solomon Islands. A potential geothermal project of 10-20 MW on the Savo Island had once been explored, but the investor has expressed that it will exit its interest from the project. The geothermal resource availability had not been confirmed and the risk of laying a submarine cable in the deep ocean trench between Guadalcanal Island (where Honiara is located) and Savo Island had always been a concern, especially if two cables were to be installed to ensure N-1 redundancy.

*Provide pricing structures, price controls, subsidies available and government involvement (if any).*

While the Project sponsor was selected through a competitive process, only two bidders were pre-qualified and one of the bidders withdrew due to its own corporate reasons before proceeding to the full bidding stage. Therefore, the

Project cost and financing are now being negotiated between the Sponsor and the MMERE Project Office on behalf of SIG. The International Finance Corporation (IFC) is supporting the negotiations in order to ensure that the levelized cost of energy from the Project is at a level acceptable to SIEA. SIG will not provide direct subsidies, but will enter into a Government Guarantee Agreement and Implementation Agreement to undertake certain obligations such as the provision of land and facilitation of Project Company registration and operation. SIG is also willing to accept low returns on equity shares and accept the risk of on-lending concessional financing to the Project Company in an effort to bring down the cost of the Project as much as possible. Once the project agreements have been negotiated between SIG, SIEA and the Sponsor, the Bank will appraise the substantially agreed documents to ensure that they are in compliance with the Bank's requirements.

The World Bank's Procurement Regulations (July 2016) indicates that "The Bank may finance the cost of a project or a contract procured under PPP arrangements, such as build-own-operate (BOO), build-operate-transfer (BOT), and build-own-operate-transfer (BOOT) concessions or similar types of private sector arrangements, if the selection: (a) is consistent with the Bank's Core Procurement Principles; (b) reflects the application of the Bank's Anti-Corruption Guidelines; and (c) is consistent, as appropriate, with the requirements set out in these Procurement Regulations" and that "The private partner selected in accordance with Annex XIV, Public-Private Partnerships, then procures the Goods, Works, Non-consulting Services, and/or Consulting Services required for the facility from eligible sources, using its own procedures." The Bank is in the process of confirming that the selection of project sponsor satisfies this requirement. Preliminary findings indicate that it has.

## C.6. Regulation, Taxation and Insurance (if applicable)

*Provide details of government licenses or permits required for implementing and operating the project/programme, the issuing authority, and the date of issue or expected date of issue.*

The Electricity Act of the Solomon Islands stipulates that SIEA, a body corporate set up under MMERE, is the authority to issue license to third parties to generate and/or distribute power. The legal due diligence executed by IFC on behalf of Government (and therefore, confidential) has concluded that there is no legal impediment to the proposed BOOT arrangement, and that the Project Company "could produce and sell the electricity it generates to SIEA under a power purchase agreement". This position has been confirmed by the Solomon Islands Attorney General's Chambers. The Environment Act of 1998 and the Environment Regulation of 2008 require development consent for Project activities to be obtained from MECDM. An Environmental and Social Impact Assessment (ESIA) has been undertaken and submission for development consent will be undertaken by K-Water. MECDM is regularly briefed on the status of the Project and has not specified any concerns that would affect the granting of development consent.

*Describe applicable taxes and foreign exchange regulations.*

The Project will likely be eligible for tax exemption subject to application by the Project Company and evaluation by SIG's Tax Exemption Committee. Under SIG's obligations under the Implementation Agreement, it will facilitate approvals upon application by the Project Company to allow the Project Company to convert to US Dollars any and all Solomon Islands Dollars for the purposes of implementing the Project; and also permit the free transfer of all funds and financial settlements by the Project Company from the Solomon Islands necessary to implement the Project. The Project Company is expected to be established by end-March to allow representatives to participate in World Bank negotiations in April 2017.

*Provide details on insurance policies related to project/programme.*

The PPA and the Implementation Agreement will require the Project Company to insure the Project in a prudent and proper manner in accordance with good industry practices. In addition, it is expected that the Multilateral Investment Guarantee Agency (MIGA) will provide four-point political risk cover (war, expropriation, currency inconvertibility and breach of contract coverage) for the Project. 'Builders all risk' insurance during construction is included in the project costs. The project will maintain operational insurance against physical damage and business interruption – this cost is included in the O&M cost estimate. Both MIGA costs and insurance premium will be covered by the PPA tariff.

## C.7. Institutional / Implementation Arrangements

*Please describe in detail the governance structure of the project/programme, including but not limited to the organization structure, roles and responsibilities of the project/programme management unit, steering committee, executing entities and so on, as well as the flow of funds structure. Also describe which of these structures are already in place and which are still pending. For the pending ones, please specify the requirements to establish them.*

As detailed in section C.3, the Project comprises four components, each with separate implementation arrangements. The Contractual Arrangements diagram attached as an annex to this Proposal illustrates the mapping of accountabilities for the Project. The Project Office in MMERE will have overall responsibility for ensuring effective project implementation across the components. In addition, SIG will form a Steering Committee comprising Ministry of Finance and Treasury (MOFT), MMERE, MECDM and the Ministry of Infrastructure Development (MID); and the donors will form a Donor Coordination Committee to collectively ensure adequate implementation and fiduciary control, as well as to streamline reporting requirements by SIG.

**Component 1: Tina River Hydropower Plant.** The Project Company will be implementing agency which will develop the Tina River Hydropower Plant by contracting an EPC contractor. The Project Company will enter into a 34-year PPA with the SIEA, under which it will own and operate the hydropower plant and sell the generated electricity to SIEA over the 30-year operation period. The Project Company will also enter into a Government Guarantee Agreement and an Implementation Agreement with SIG. The Project Company will be established once SIG confirms its equity participation into the Project Company. The likely shareholding structure is 51% K-Water and 49% SIG. At the request of the MOFT, the World Bank has earmarked $20 million loan for SIG for this purpose.

Debt financing totaling $135.87 million is proposed to be provided by concessional financiers including ADB ($18 million loan and $12 million grant), EDCF ($31.6 million), IRENA/ADFD ($4.27 million) and GCF ($70 million). It is expected that all loans will be lent to SIG, individually under separate loan agreements. SIG will then on-lend to the Project Company through respective subsidiary loan agreements, while passing on the financing sources' concessionality as much as possible.

**Component 2: Access Road.** The Project Company will also be the implementing agency for this Component. The access road is proposed to be funded by GoA grant (up to approx. $9.0 million) and GCF grant ($16.0 million). Inclusion of the access road into the EPC contract for Component 1 is being agreed between SIG and K-Water. The decision was made to integrate the access road in the EPC contract in order to avoid the integration risk between the two contracts, whereby the road contract may not complete in time for the EPC contractor's mobilization. The access road, however, is categorized as a separate component because its fixed cost will be ring-fenced and will be grant-funded so that its cost will not drive the PPA levelized cost to levels beyond what is acceptable to SIEA. Subject to GoA's financial approval processes and budget availability, the anticipated grant funds from GoA would be transferred to a trust fund administered by the World Bank and would be managed together with its own resources. The trust fund has already been established within the World Bank as GoA's contribution for Project preparation is being executed by the World Bank in the same manner.

**Component 3: Transmission Line.** SIEA will be the executing agency which will develop the transmission lines by contracting a supply and install contractor, and own and operate it. Financing for the transmission line is expected to be sourced from the World Bank's allocation ($4.7 million of loan and $5.9 million of grant) and IRENA/ADFD ($10.73 million), as well as counterpart financing by SIEA ($1.49 million). The World Bank and IRENA/ADFD will, respectively, enter into a loan agreement with SIG which will on-lend the resources to SIEA under subsidiary loan agreements. This implementation arrangement and fund flow is the same as the ongoing SISEP financed by the World Bank.

**Component 4: Technical Assistance.** MMERE, represented by its Project Office, will be the executing agency to benefit from the technical assistance. It is proposed to be funded by a WB grant ($3 million) and GoA grant (up to $2 million). Subject to GoA's financial approval processes and budget availability, the anticipated grant funds from GoA would be transferred to the same trust fund as the access road grant funds, administered by the World Bank and managed together with its own resources. The World Bank will provide the grant funds to SIG under a financing agreement, and SIG will make budgetary allocations to MMERE to implement the various agreed technical assistance activities.

*Describe construction and supervision methodology with key contractual agreements.*

For Component 1, the Project Company and the EPC contractor will enter into a fixed-price turnkey contract, and the works (Components 1 and 2) will be supervised by the Project Company. In addition, the Project Office will also supervise the construction to ensure that the laws and regulations of SIG are adhered to. In addition, the Independent Engineer, to be recruited and financed jointly by the Project Company and SIEA, will ensure that the provisions of the PPA are met. Furthermore, DSAP, recruited by the Project Office under Component 4, will review the detailed design and construction to ensure the integrity and safety of the hydropower plant with a particular focus on the dam.

The transmission line (Component 3) will be supervised by SIEA with the assistance of a consulting firm which SIEA maintains on a retainer basis.

The independent monitoring agents and the E&S Panel, recruited by the Project Office under Component 4 will ensure the enforcement of measures stipulated in the Environmental and Social Management Plan and the Land Acquisition and Livelihood Restoration Plan.

See **Annex: Contractual Arrangements** for a diagram of various legal agreements that will likely be executed as a part of each component of the project, as well as the monitoring and coordination mechanism.

*Describe operational arrangements with key contractual agreements following the completion of construction. If applicable, provide the credit analysis of key counterparties of key contractual agreements and/or structural mitigants to cover the counterparty risks.*

Under the BOOT arrangement, the Project Company will operate the Plant for a concession period of 30 years. During this time, under the Implementation Agreement, the Project Company is required to provide training to SIEA personnel in preparation for handing over of the project to SIEA or other entities designated by SIG. SIEA will also engage financial and technical experts to determine whether the Project Company is meeting the terms of the PPA, including the commissioning of the hydropower facility.

## C.8. Timetable of Project/Programme Implementation

*Please provide a project/programme implementation timetable in section I (Annexes). The table below is for illustrative purposes. If the table format below is used, please refer to the activities as numbered in Section H. In the case of outputs, please mark when all the required activities will be completed.*

| | 2017 | | | | 2018 | | | | 2019 | | | | 2020 | | | | 2021 | | | | 2022 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TASK | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 | Q16 | Q17 | Q18 | Q19 | Q20 | Q21 | Q22 | Q23 | Q24 |
| ***Output 1. Tina River Hydropower Plant*** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 1.1. Sign PPA* | | ▼ | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 1.2. Financial close* | | | ▼ | | | | | | | | | | | | | | | | | | | | | |
| *Activity 1.3. Procurement of EPC Contractor* | | | ▼ | | | | | | | | | | | | | | | | | | | | | |
| *Activity 1.4. Execute EPC contract (major design items)* | | | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 1.5. Execute EPC contract (construction)* | | | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 1.6. Commissioning* | | | | | | | | | | | | | | | | | | | | ▼ | | | | |
| ***Output 2. Access Road*** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 2.1. Detailed design* | | | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 2.2. Procurement of contractor* | | | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 2.3. Execute works contract* | | | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 2.4. Hand-over* | | | | | | | | ▼ | | | | | | | | | | | | | | | | |
| ***Output 3. Transmission Line*** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 3.1. Detailed design* | IN 2016 | | | | | | | | | | | | COST UPDATE | | | | | | | | | | | |

| | 2017 | | | | 2018 | | | | 2019 | | | | 2020 | | | | 2021 | | | | 2022 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TASK | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 | Q16 | Q17 | Q18 | Q19 | Q20 | Q21 | Q22 | Q23 | Q24 |
| *Activity 3.2. Procurement of contractor* | | | | | | | | | | | | | | | ■ | ■ | | | | | | | | |
| *Activity 3.3. Execute contract* | | | | | | | | | | | | | | | | ■ | ■ | ■ | ■ | | | | | |
| *Activity 3.4. Hand-over* | | | | | | | | | | | | | | | | | | | ▼ | | | | | |
| ***Output 4. Technical Assistance*** | | | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 4.1. Project Office Support (contracting)* | ■ | | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 4.2. Project Office Support (implementation)* | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |
| *Activity 4.3. Access Road Supervision Consultants (contracting)* | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 4.4. Access Road Supervision Consultants (implementation)* | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | |
| *Activity 4.5. Expert Panels (contracting)* | ■ | | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 4.6. Expert Panels (implementation)* | | | ▼ | | ▼ | ▼ | | ▼ | | ▼ | | | | ▼ | | | | ▼ | | ▼ | | ▼ | | |
| *Activity 4.7. Independent Monitoring Agents (contracting)* | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | |
| *Activity 4.8. Independent Monitoring Agents (implementation)* | | | | ▼ | | ▼ | | ▼ | | ▼ | | ▼ | | ▼ | | ▼ | | ▼ | | ▼ | | ▼ | | |

## D.1. Value Added for GCF Involvement

*Please specify why the GCF involvement is critical for the project/programme, in consideration of other alternatives.*

**Component 1.** GCF's concessional financing (40 year tenor including grace period of 10 years with 0% interest) of $70 million is critical to reduce the financing cost for the country's first utility-scale hydropower plant to be developed and operated by the private sector. The Project costs are high since it will be located in a remote island with seismic and geotechnical challenges as well as the need to import virtually all construction materials, equipment and skilled personnel. Being the first BOOT project in a remote island without precedents, with high perceived risks and little potential for expended market access, there is limited private investor interest, and the cost could not be reduced through competition. Without GCF's concessional financing, the levelized cost of energy per kWh of the Project will be higher than the levels acceptable for SIEA, especially given the current low level of global oil prices. GCF's concessional financing will be instrumental in changing SIEA's business model, displacing a significant portion of its GHG-emitting diesel generators, and enabling the transformational step-change to a predominantly renewable generation mix with the progressive integration of grid-connected solar PV farms.

Other alternative sources of concessional financing have been duly considered for Component 1. For private sources, as described above, there was little commercial bank appetite even with IDA partial risk guarantee (PRG) and with MIGA insurance. Regarding public sources of finance, various development partners were considered. Apart from the Accrediting Entity's own IDA resources, the following financiers are considering support for this transformational Project: ADB (Asian Development Fund resources), EDCF of the Government of South Korea, and IRENA/ADFD. EDCF in particular has manifested its strong interest to co-finance the Project with GCF.

**Component 2.** Access to the Tina River Hydropower Plant site is a challenge given the difficult terrain and dense vegetation of the mountains of the Solomon Islands. This is particularly true for the Project, since the site has been selected in the upstream stretches of the Tina River to avoid any physical relocation. The cost is further increased by the need to design the access road to withstand high intensity precipitation expected due to climate change. While GoA is considering to provide $9 million grant for the access road construction, GCF grant of $16 million is also critical as no other sources of funds could be identified.

## D.2. Exit Strategy

*Please explain how the project/programme sustainability will be ensured in the long run, after the project/programme is implemented with support from the GCF and other sources, taking into consideration the long-term financial viability demonstrated in E.6.3. This should include a description of strategies for longer term maintenance of physical assets (if applicable).*

Once the Project is commissioned, the Project will generate stable revenue for the Project Company through available capacity payment by SIEA which will be sufficient to cover the cost of construction, annual operation and maintenance (O&M) cost, periodic overhaul of electro-mechanical equipment typically at 10 year intervals, as well as the remaining SIG debt service beyond the 34-year concession period (including 4-year design and construction). If the levelized cost of the energy of the Project can be lowered through the provision of GCF's concessional financing, SIEA will be able to lower its cost-of-services and improve its financial position while also reducing the level of retail tariff to improve the welfare of the population and boost the country's industry. Upon transfer of the facility to SIEA at the end of the 30-year operation period, the cost of electricity generated from the hydropower facility will drop dramatically as it will only comprise O&M costs and residual debt service and equity costs for an additional 7 years, in the case of 40-year repayment periods for GCF, EDCF, and IDA.

In this section, the accredited entity is expected to provide a brief description of the expected performance of the proposed project/programme against each of the Fund's six investment criteria. Activity-specific sub-criteria and indicative assessment factors, which can be found in the Fund's Investment Framework, should be addressed where relevant and applicable. This section should tie into any request for concessionality made in section B.2.

## E.1. Impact Potential

Potential of the project/programme to contribute to the achievement of the Fund's objectives and result areas

### E.1.1. Mitigation / adaptation impact potential

*Specify the mitigation and/or adaptation impact, taking into account the relevant and applicable sub-criteria and assessment factors in the Fund's investment framework.*

The Tina River Hydropower Development Project is a 15 MW hydropower project which will annually generate 78.35 GWh of clean renewable energy to displace equivalent amount of energy generated by current and future diesel generators. Assuming grid emission factor of 650 $tCO_2eq/GWh$ for a 100% diesel system, the net GHG emission reduction potential of the Project is 49,500 $tCO_2eq$ per year after deducting potential emissions during construction, land clearing, and the reservoir following the World Bank's "*Guidance Note: Greenhouse Gas Accounting for Energy Investment Operations*" (June 2013). The GHG emissions reduction potential is higher than SIG's commitment in the INDC to reduce emissions by 18,800 $tCO_2eq$ per year by 2025 and by 31,125 $tCO_2eq$ per year by 2030 with appropriate international assistance.

*When applicable, specify the degree to which the project/programme avoids lock-in of long-lived, high emission or climate-vulnerable infrastructure.*

A hydropower plant can typically have a life of over 50 years, even up to 100 years. The Project will be developed on a BOOT basis with a concession period of 30 years (plus 4-year of design and construction) after which the facility will be handed-over to SIEA. The Project will be a free-source of clean energy for SIEA (except for nominal emissions during construction and from the reservoir), and will dissuade SIEA to introduce new diesel units with high operating costs and high GHG emissions. The Project's dam has been designed to provide a dead storage volume of 3.2 million $m^3$ which is expected to only fill up after 65 years under a base case sediment inflow projection. The active storage volume will provide spinning reserves and load following capacity which will enable further penetration of intermittent renewables such as PV.

### E.1.2. Key impact potential indicator

*Provide specific numerical values for the indicators below.*

| | | | |
|---|---|---|---|
| *GCF core indicators* | *Expected tonnes of carbon dioxide equivalent (t $CO_2$ eq) to be reduced or avoided (Mitigation only)* | *Annual* | 49,500 $tCO_2$ eq |
| | | *Lifetime* | 2.48 million $tCO_2$ eq (over 50 years, noting that the life of the plant is likely to significantly exceed this period) |
| | • *Expected total number of direct and indirect beneficiaries, disaggregated by gender (reduced vulnerability or increased resilience);*<br>• *Number of beneficiaries relative to total population, disaggregated by gender (adaptation only)* | *Total* | 180,000 individual members of SIEA customer households nation-wide will benefit from access to low-emission energy, reduced cost of electricity and improved air quality (in Honiara); of which 87,300 are women. |
| | | *Percentage (%)* | 27% of total population |

| | |
|---|---|
| *Other relevant indicators* | *Examples include:*<br>• *Expected increase in the number of households with access to low-emission energy*<br>• *Expected increase in the number of small, medium and large low-emission power suppliers, and installed effective capacity*<br>• *Expected increase in generation and use of climate information in decision-making*<br>• *Expected strengthening of adaptive capacity and reduced exposure to climate risks*<br><br>Increase in generated renewable energy from 0.073 GWh (by SIEA's 50 kW pilot PV) in 2015 to 78.35GWh by 2022 by the Project. The percentage of renewable energy generated will increase from 0% (total system generation of 86.8 GWh) in 2015 to 65% (total projected demand of 120 GWh) at the time of commissioning of the Project. |

*Describe the detailed methodology used for calculating the indicators above.*

**Expected tonnes of carbon dioxide equivalent ($tCO_2$ eq) to be reduced or avoided**

*Energy generated by Project.* Average annual energy of 78.35 GWh generated by the Project has been calculated in detail in the feasibility study based on 30 years of observed and synthesized hydrological data of the Tina River. Observed river discharge data for the Tina River is only available for 4 years from June 2010 to June 2014. Synthetic discharge data was produced by a runoff model using observed rainfall data from Henderson rain gauging station and Chupukarma rain gauging station. The 30-year synthetic discharge data produced through the hydrological analysis was used for the energy generation simulation model. The FS Hydrological Analysis Annex has been submitted as a part of this proposal. The Project design has been optimized as a 15 MW (5 MW x 3 units) to achieve the highest net present value (NPV). Details can be found in the feasibility study report (Phase 3 Report and Phase 3 Addendum Report).

*GHG reduction by Project.* The Honiara grid system is currently supplied 97% by diesel generators. SIEA's investment plan, in the absence of the Project being developed as a BOOT scheme by a private investor, comprises only diesel generation. The energy generated by the Project, therefore, fully displaces current and future diesel generation of the same amount (i.e. 78.35 GWh per year). There is no official grid emission factor for the Honiara grid reported by MECDM, and is assumed to be 650 $tCO_2e$/GWh using World Bank's default emission factor for diesel generators. The gross GHG emissions reduction is, therefore, calculated to be 650 $tCO_2eq$/GWh x 78.35 GWh = 50,900 $tCO_2eq$ per year, or 2.55 million $tCO_2eq$ for the Project life.

*GHG emissions from Project.* Potential GHG emissions from the Project comprises (i) emission from the reservoir; (ii) land clearing, and (iii) those emitted during construction. Potential GHG emissions from the reservoir is calculated based on emissions factor of 4.5 $tCO_2eq$/GWh for a reservoir in a "tropical – wet" climate and with a power density of 50 W/$m^2$ and a plant factor of 60%. Power density is calculated by dividing the installed capacity (15 MW = 15,000,000 W) by the reservoir surface area (305,000 $m^2$). This emissions factor multiplied by the annual energy of 78.35 GWh gives annual emissions of 352.6 $tCO_2eq$. While the project life is assumed to be 50 years, the dam is conservatively assumed to be existent for 100 years, giving a lifecycle GHG emission of 35,260 $tCO_2eq$.

Potential GHG emissions from land clearance is calculated using the biomass density emission factor of 264 $tCO_2eq$/ha for a "moist deciduous forest". The land expected to be cleared by the Project is 110 hectares (ha) including 30 ha of reservoir and land needed for the access road and transmission lines. Therefore, GHG emission is 29,040 $tCO_2eq$.

Potential GHG emission from construction activities is calculated by applying the construction emission factor of 1 $tCO_2eq$/GWh. For 78.35 GWh production for 50 years, the lifecycle GHG emission from construction is 3,900 $tCO_2eq$.

*Net GHG emission reduction.* The sum of potential GHG emission from the Project is calculated to be 68,200 $tCO_2eq$ for the life of the Project. From the above, the net life cycle GHG emissions reduction of the Project is 2.55 million – (35,260 + 29,040 + 3,900) = 2.48 million $tCO_2eq$, or 49,500 $tCO_2eq$ per year for the Project's life of 50 years.

**Expected total number of direct and indirect beneficiaries, disaggregated by gender**

*Number of beneficiaries.* The number of beneficiaries have been derived from the number of households SIEA plans to connect by 2021 multiplied by the average size of households. SIEA has reported its current number of customers to be 15,500, and has embarked on an ambitious electrification plan to increase the number of customers to 30,000. According to the *Solomon Islands 2012/13 Household Income and Expenditure Survey* (published in October 2015), the average household size is 6.5 persons per household in Honiara. However, the national average household size of 6.0 persons per household to be conservative.

*Proportion of women.* According to the same survey, of the total population of 610,077, 295,929 are women equivalent to 48.5% of the total. The percentage is 48.3% in Honiara, but the national data is used to be consistent with the household size used above. Therefore, the number of women benefiting from the Project is derived to be 87,300.

There would be more limited indirect beneficiaries compared to direct beneficiaries. Approximately 3,000 people (based on 2009 Census figures for the villages included in the benefit share area) of the Bahomea tribal area are expected to indirectly benefit from the project through the proposed benefit-sharing mechanism which will provide funds for community development investments.

*Describe how the project/programme's indicator values compare to the appropriate benchmarks (i.e. the indicator values for a similar project/programme in a comparable context).*

Comparable hydropower plants (in terms of capacity and RCC design) in nearby locations would include Nadarivatu in Fiji (40 MW) and Gazelle in Papua New Guinea (10 MW) compared to the proposed Project. GHG emissions values are not available for these projects, but would be expected to be very similar given similar climate and geographic conditions in the Melanesian region.

## E.2. Paradigm Shift Potential

Degree to which the proposed activity can catalyze impact beyond a one-off project/programme investment

### E.2.1. Potential for scaling up and replication (Provide a numerical multiple and supporting rationale)

*Describe how the proposed project/programme's expected contributions to global low-carbon and/or climate-resilient development pathways could be scaled-up and replicated including a description of the steps necessary to accomplish it.*

**Hydropower can leverage increased solar penetration to scale up renewables on the Honiara grid.** The cost of solar panels, inverters and energy storage systems have reduced drastically in recent years, but higher penetration of intermittent solar power requires a firm generation source to balance the intermittent output of solar farms. A hydropower plant with regulation capacity can respond quickly to variable solar outputs and facilitate higher penetration of grid-connected solar power in the future. Diesel generators can also function as a backup, but it will require the units to be running at low outputs so that they can be ramped up instantly when solar outputs drop. This means that the generators will be running at low efficiencies which will, not only increase SIEA's cost of supply, but increase GHG emissions.

The Project, therefore, is instrumental in transforming SIEA's Honiara grid from being almost 100% dependent on diesel generation to being a system with high penetration of hydropower and solar power. If the Project can facilitate the integration of 30 MWp of solar power into the Honiara grid, it will be able to annually displace approximately 45 GWh of diesel-based electricity according to a calculation using NREL PVWatts assuming solar insolation of 5.75

kWh/m$^2$/day. Using the default emission factor of diesel of 650 $tCO_2$-eq/GWh, the emissions reduction potential is 29,200 $tCO_2$eq/year on top of the 49,500 $tCO_2$eq/year expected from the Project.

**Overcoming barriers to development on customary land**. One of the most significant barriers to development in Solomon Islands is the securing of land for large scale investments due to the predominance of customary land in the country and the difficulty of reaching durable agreements on the use of such land. If the innovative land acquisition process that the Project has developed is sustainable, it will provide an instructive model for future investment projects in Solomon Islands and elsewhere in Melanesia, where similar challenges with customary land exist. In addition to introducing innovations into Solomon Islands statutory land acquisition process, the introduction of a benefit sharing mechanism, to ensure that communities in the project area receive direct benefits from the Project, will further add to the lessons that can be drawn for improving the prospects of attracting foreign investment in the Pacific.

**Paving the way for more hydropower in Guadalcanal.** Successful completion and operation of the Tina River Hydro facility would provide SIEA with valuable experience in hydropower operation and build confidence in the prospects of investing in future hydropower project in Guadalcanal and elsewhere in Solomon Islands. The pre-feasibility study for Tina Hydro identified sites further up in the Tina River catchment which would become more feasible with the Tina River facility in place. In addition to feeding the Honiara grid, an additional hydropower facility could offer lower cost electricity to the nearby Gold Ridge gold mine which is currently not operational due to high operational costs, including electricity. Other projects which have been developed in the past, but never realized, such as the 8 MW Komarindi hydropower project in Guadalcanal could also be revisited to displace further diesel and increase the proportion of renewable energy on the Honiara grid.

**Replicating hydropower BOOT in the Pacific.** The "*Second Pacific Energy Investors Forum – Final Report*" prepared by the Pacific Power Association in August 2016 with funding from the Asian Development Bank suggests that more governments in the Pacific are turning to IPPs to meet electricity demand. The report expects IPP installed capacity across the Pacific (including Papua New Guinea) to increase 7-fold from 112 MW in 2016 to 745 MW in 2021 of which most are renewable energy projects. The volume of investments is estimated to be over $2 billion, and the report emphasizes the need to overcome barriers such as (i) high cost environment due to remoteness and size; (ii) land rights issues; (iii) difficulty in obtaining financing; (iv) capacity of governments/utilities to negotiate and undertake PPAs; and (v) current low diesel prices. These barriers are what the Project has been experiencing and overcoming. The experience and the business model created by the Project are expected to be replicated in the other small island development states (SIDS) of the Pacific who all face similar constraints.

**Replicating the hydro-PV hybrid model in the Pacific.** SIDS of the Pacific also have low electrification rates and high tariffs due to heavy dependence on diesel oil. The average tariff for residential customers in the Pacific is reported to be ¢45/kWh and has hindered economic growth.[3] Moreover, reliance on imported fuel poses an energy security threat, and also depletes limited foreign currency reserves. All Pacific SIDS have abundant solar resources and the respective governments are keen to harness them. The Project can be replicated in such Pacific nations to accelerate the scaling up of solar power through provision of hydropower as the firm capacity to regulate the frequency to balance the variable output of solar.

### E.2.2. Potential for knowledge and learning

*Describe how the project/programme contributes to the creation or strengthening of knowledge, collective learning processes, or institutions.*

**Knowledge and learning through Project preparation.** The Project is the first utility-scale power plant in the Solomon Islands to be developed on a BOOT arrangement. IDA, with financial support from the Government of Australia, has been supporting SIG and the Project Office under MMERE to identify and develop a bankable feasibility study since 2007 to attract investor interest, and the IFC has been the transaction advisor to SIG providing support in the competitive selection of the investor and in negotiating on the commercial terms of the BOOT scheme. Developing large infrastructure and simultaneously introducing public-private partnerships in SIDS have unique

[3] 2015. Pacific Power Association, *Performance Benchmarking Report for Pacific Power Utilities*, 2012 Fiscal Year

challenges, and all stakeholders have been exposed for the first time to planning and design of utility-scale hydropower project, optimization of the power system with generation sources other than diesel units, transparent and competitive selection of investors, commercial terms of the Project, government guarantees and undertakings, negotiation with private investors, financial structuring, environmental and social safeguards, benefit-sharing mechanism, gender action plan, etc. SIG has significantly built their capacities in all these areas with the support of global experts in hydropower planning and design, environmental safeguards, migratory fish, land acquisition, gender, climate change resilience, benefit-sharing, power system planning, finance, legal and PPP. SIG is also benefiting from the continuous professional advice provided by the Dam Safety Advisory Panel and the Environmental and Social Panel to ensure that the Project is designed based on international best practice.

**Knowledge and learning during Project Operation.** Pursuant to the Implementation Agreement and the PPA, the Project Company will operate the Project for 30 years. During this time, as per the requirement to be stipulated in the PPA, SIEA personnel will be trained to learn the O&M of a hydropower plant. Since SIEA does not have any experience operating a hydropower plant, the training program is critical for SIEA to build its O&M capacity of the plant which will be handed-over to them at the end of the concession period. Such training will not only be on daily O&M of the plant, but also on optimization of reservoir operations including flood control functions of the dam, sediment management and flushing/sluicing, monitoring and management of environmental impacts, periodic maintenance of major equipment, and replacement of electro-mechanical equipment after about 10-15 years.

Since the Honiara grid has historically been supplied only by diesel generators, SIEA will also have the opportunity to learn about hydro-thermal dispatch to optimize the system operation. The system will also initially include low penetration of grid-connected solar (currently 1 MWp) which is expected to increase significantly once SIEA obtains experience in effectively using the Project's frequency regulation function to absorb the intermittency of the solar outputs.

### E.2.3. Contribution to the creation of an enabling environment

*Describe how proposed measures will create conditions that are conducive to effective and sustained participation of private and public sector actors in low-carbon and/or resilient development that go beyond the program.*

The Project is the first ever utility-scale power plant to be developed and operated by a private investor under a BOOT arrangement, and perhaps the largest development project in the country's history. At 2015 GDP of $1.1 billion, the $216.1 million project would represent 19% of GDP. The successful completion of the project would be a significant boost to investor confidence in the country. The Project is also a flagship public-private partnership (PPP) project where the hydropower facility would be built and operated by the private sector and access road and the transmission line are developed respectively by public sector agencies, MMERE and SIEA. MMERE has been instrumental in preparing a bankable feasibility study report, and MOFT is the champion for obtaining concessional financing to bridge the financing gap between the expected return by the private investor and the acceptable level of PPA price expected by SIEA as the offtaker. The experience and knowledge obtained through this Project will equip SIG and SIEA to attract interest of investors to invest in the Solomon Islands power sector. Given the high profile of the Project, its success is critical to send a positive message to prospective investors that SIG and SIEA are serious and reliable partners for IPP/BOOT projects. It is expected that the Project will pave the way for further private sector investment in the power sector, particularly in grid-connected solar power, in which SIEA is already showing great interest. As mentioned in section E.2.1, the Project's success is expected to boost investor confidence across the Pacific where there is growing interest in prospective renewable IPPs.

### E.2.4. Contribution to regulatory framework and policies

*Describe how the project/programme strengthens the national / local regulatory or legal frameworks to systematically drive investment in low-emission technologies or activities, promote development of additional low-emission policies, and/or improve climate-responsive planning and development.*

Legal due diligence executed by IFC found that there are no legal and regulatory barriers for the development of the Project by a private investor, and the preparation of the Project has so far not required reform of the legal and regulatory framework. However, discussions on the implementation arrangements, government guarantee and undertakings, and the power purchase agreement have drastically developed the understanding of SIG and SIEA to negotiate fairly and transparently with the private investor while also enhancing its understanding of appropriate risk allocation between the public and private players. Successful international tendering, negotiation, contracting and execution of a 30-year PPA with an IPP for the purchase of clean, renewable energy will demonstrate the potential of future PPP activities.

## E.3. Sustainable Development Potential

Wider benefits and priorities

### E.3.1. Environmental, social and economic co-benefits, including gender-sensitive development impact

**Environmental co-benefits**

**(a) Reducing air pollution.** The nearly 100% diesel generation based system not only emits carbon dioxide, but causes local air pollution through the emission of nitrogen oxides, carbon monoxides, hydrocarbons and particulate matters. While measurement data is unavailable, it is believed that emissions from the diesel generators have adverse impact on the ambient air quality of Honiara. In particular, the Lungga Power Station includes three generators with low efficiencies. Wind data from Honiara's Henderson Airport indicate that the winds predominantly occur from the east – northeast direction, so the emissions are believed to directly affect the population of Honiara. The Honiara Power Station (3.0 MW) has newer units commissioned in 2013, but are located in the center of the city. There are also several establishments in Honiara which run their own captive diesel generators due to the high cost of SIEA's retail tariff. The Project will displace SIEA's diesel generation, and, by reducing the retail tariff, it will also reduce self-generation by diesel generators, thereby improving the air quality of Honiara.

**(b) Reducing noise pollution, and soil and water contamination.** These diesel generators also cause noise pollution, and also have risks of contaminating the soil and water through spillage during transportation, storage and operation. Reduction of diesel generation resulting from the Project will also reduce such risks.

**(c) Watershed management.** Solomon Islands has abundant pristine forests, but they are being destroyed rapidly due to uncontrolled logging. The Project has prompted active discussions on protecting the upstream reaches of the Tina River watershed, because the natural water retention capacity of the watershed is dependent on preserving the forest, and rich vegetation prevents soil erosion and landslides which may increase inflow of sediments into the Project's reservoir. The benefit-sharing mechanism detailed below is expected to include activities conducive to preserving the watershed, thereby conserving the natural habitat and its biodiversity.

**Social co-benefits**

**(a) Stable and more affordable electricity retail tariff.** The tariff methodology of SIEA obliges SIEA to pass on the variable fuel cost to the consumers. While global crude oil prices are relatively low compared to its peak during 2011-2014, the customers in the Solomon Islands are exposed to this volatility. The fixed PPA price will provide customers with a more stable, low tariff throughout the concession period. When the hydropower facility is handed over at no cost to SIG at the end of the concession period, the generation cost from the Project will be free, apart from minimal O&M costs, which will further lower the retail tariff. This would enable households to enhance their income earning capacity through use of power for productive and social purposes. Lower costs of power would also reduce the costs of doing business for small and medium enterprises (one of the most significant obstacles to private sector

development in the country), thus increasing profits and stimulating investment and job creation leading to increased prosperity for lower income households.

**(b) Lower cost of water supply.** The Solomon Islands Water Authority (SIWA) is SIEA's largest customer, and since its water tariff is linked to the electricity tariff, the reduction in the latter will benefit the population in Honiara also with reduced water tariff.

**(c) Community development.** A unique benefit-sharing fund will be established which directs a portion of the net benefit of the Project to the Tina River communities, providing them with direct management responsibility for the funds and the ability to invest according to the evolving needs of the communities. Japan Social Development Fund, administered by the World Bank is expected to provide seed-money to prepare the communities to manage the funds, and also to implement benefit-sharing activities prior to the generation of revenue from the Project, including job training, electrification and rural water supply projects as requested by the communities.

**(d) Improved cultural and natural preservation.** The benefit-sharing mechanism designed to be implemented in conjunction with the Project will finance community-driven initiatives throughout the life of the Project to promote eco-tourism, sustainable development through cultural preservation and appreciation of natural resources.

**Economic co-benefits**

**(a) Creation of jobs and income opportunities.** Unlike diesel generators or solar farms, construction of a hydropower plant requires greater number of laborers and subcontractors. The Project is expected to create more than 300 local jobs and benefit the local construction industry. Under the Implementation Agreement, job seekers local to the Tina River locale will receive first preference for these positions and will also be provided with pre-employment and job skills training under a separate benefit-sharing scheme to be designed and piloted with funding from the Japan Social Development Fund.

**(b) Lower tariff promoting economic development.** In its National Development Strategy (NDS) for 2016-2035, SIG recognizes the need to provide affordable electricity in order to achieve increases in industrial productivity, as an essential element of the sustainable and inclusive growth goal. The lower retail tariff is expected to spur economic activities, create job opportunities and contribute to socio-economic development of the Solomon Islands.

**(c) Balance of Payments.** SIG is extremely supportive of the Project since the import of diesel fuel makes up a considerable portion of all imports. The oil price shock in 2008 and the high prices during 2011-2014 have severely eroded the country's balance of payments. With the Project providing electricity US¢4.5/kWh lower (on a levelized cost basis) than SIEA's diesel production costs, it will help improve the balance of payments during the concession period, even though payment of the PPA price will continue to be made in foreign currency. After the concession period, SIG will be able to significantly improve its balance of payment when the hydropower facility is handed over at no cost to SIG.

**(d) Disaster risk management.** Honiara is located in the pathways of tropical cyclones and is frequently impacted by flooding. The devastating floods of April 2014 impacted 52,000 people and left more than 10,000 people in evacuation shelters. Flooding caused widespread destruction of businesses, houses, and public infrastructure. Total damage and losses from the flooding are estimated at $108 million or 9.2 percent of the gross domestic product. Although Tina River is only one of the rivers flowing into the Iron Bottom Sound, the regulation capacity of the Project's dam will be able to control floodwaters. The dam can also protect the riparian communities from the frequent flash floods that are reported to occur in the Tina River basin.

**Gender-sensitive economic impact**

**(a) Mainstreaming gender through Land Acquisition and Livelihood Restoration Plan (LALRP).** Given that men are traditionally dominant in decision-making, the Project Office has held separate smaller consultation meetings for women and youth to empower them to speak their minds. From such meetings, specific livelihood restoration activities that benefit women were formulated. As a key component of these consultations the Project Office has facilitated individual bank accounts for all tribal members, including women and children, to ensure land payments are received equally. Payments to children under the age of 18 years are held in trust accounts exclusively for the

payment of school fees. Women representatives have reserved roles in the executive committees of the co-operative corporate entities established for each tribe to manage ongoing investment funds and 50% ownership in the core land management company. Women are also engaged as community liaison officers with ongoing roles in facilitating community consultations, and have participated in the first round of business training provided to landowning tribes.

**(b) Employment opportunities and equal pay.** The LALRP and the Gender Action Plan (GAP) ensures that women are provided with job training and opportunities created by the Project, and that women receive equal pay for equal work. The implementation of the LALRP and GAP will be independently monitored by consultants commissioned by the Project Office under Component 4 of the project.

**(c) Small-scale community infrastructure.** Through public consultations including consultations for the preparation of the GAP, it was found that affected women prioritized access to water supplies and job training. In particular, the supply of clean water was the priority of many women since they currently spend a significant amount of time to fetch water from the streams. The pilot benefit-sharing mechanism JSDF project intends to invest in developing community water supply systems to relieve women from this drudgery as well as providing jobs training and working with SIEA to extend its distribution network.

## E.4. Needs of the Recipient

Vulnerability and financing needs of the beneficiary country and population

### E.4.1. Vulnerability of country and beneficiary groups (Adaptation only)

*Describe the scale and* intensity of vulnerability of the country and beneficiary groups, and elaborate how the project/*programme addresses the issue (e.g. the level of exposure to climate risks for beneficiary country and groups, overall income level, etc).*

As indicated above, Honiara is prone to floods as witnessed in the devastating event of April 2014 which impacted 52,000 people and left more than 10,000 people in evacuation shelters. The access road (Component 2), therefore, must be designed to withstand high intensity precipitation expected to be caused by climate change. This entails constructing higher embankments with increased thickness of top course and base course, larger capacity drains, and larger diameter of culverts for rainwater to flow underneath the road from one side to the other without washing away the road. Such climate-proof design considerations cause the construction cost to be extremely expensive and requires grant funding.

### E.4.2. Financial, economic, social and institutional needs

*Describe how the project/programme addresses the following needs:*

- *Economic and social development level of the country and the affected population*
- *Absence of alternative sources of financing (e.g. fiscal or balance of payment gap that prevents from addressing the needs of the country; and lack of depth and history in the local capital market)*
- *Need for strengthening institutions and implementation capacity.*

**Economic and social development level and affected population.** Solomon Islands is a small island state with a population of 615,800 dispersed across more than 300 inhabited islands, and with a per capita GDP of $1,940 in 2015. It has among the lowest population densities (19 persons/km$^2$) and urban populations (19%) in the world, with roughly 81 percent of the population living in rural areas. The population of Honiara is 68,650 and the number of households is 10,630. The economy has been growing at approximately 5% per annum on average since 2003.

The civil strife from 1998 to 2003, and briefly again in 2006, disrupted the functioning of state and social institutions resulting in a 40 percent decline in GDP. With the support of its neighboring countries led by the Government of Australia, SIG restored law and order and other basic state functions, particularly in finance. In 2005, the Solomon Islands benefited greatly from substantial debt forgiveness, arrears clearance and complementary domestic debt restructuring under the Honiara Club Agreement (HCA). The economy rebounded based on commodities such as logging and mining, but the global financial crisis in 2009 hit the Solomon Islands hard resulting in a sharp contraction in output, a budget crunch and a depletion of foreign currency reserves. The oil price spike of 2008 also added to Solomon Islands' vulnerability as the country's balance of payments came under severe pressure, because fossil fuel imports make up a significant portion of all imports. Since power generation is a major consumer of diesel fuel SIG started to consider options for development of domestic sources of energy, particularly hydro and other

renewables. The National Energy Policy (2014) stresses the importance of renewable energy development, and places high priority on the Tina River Hydropower Development Project.

**Absence of alternative sources of financing.** While the country had benefited from the HCA, the arrangement had also placed a moratorium on new loans, which made public financing of larger infrastructure projects difficult. While this moratorium has since been lifted, it gave an initial impetus to the drive for private sector participation in infrastructure development, financing and operation - a policy that was later embedded in the National Development Strategy (2011-2020). Thus, in 2008, SIG requested the World Bank's support for development of the Project on a BOOT basis. In line with the NDS, the National Energy Policy (2014) also promotes generation projects to be developed through private sector participation and specifically mentions the Project as its priority project to spearhead public-private partnership.

The Project was initially to be financed by the Project Company's private equity and commercial loans. However, the capital investment costs could not be driven down through the competitive investor selection process due to lack of private sector interest. The high development costs are the result of the need to import nearly all construction materials and skilled labor, high contingencies due to unfamiliar and potentially unpredictable working environment, challenging geological and seismic environment that requires conservative design, as well as the perceived offtaker risk and government risk since this is the first large BOOT project in the history of the Solomon Islands.

While the Project Office has endeavored to negotiate with the sponsors to reduce the base cost (i.e. the EPC cost), it was determined that it is unlikely to significantly reduce further due to the lack of precedent in the Solomon Islands, the challenging geological, topographical and seismological conditions, and the sponsors ready to accept a relatively low return on equity. Therefore, in order to lower the total project cost to levels that translate into a levelized cost of energy that is low enough for SIEA to offtake the energy, the collective efforts of SIG, the World Bank and IFC turned to mobilizing concessional funds to lower the financing costs. The World Bank and the Asian Development Bank have committed, in principle, $33.6 million and $30.0 million, respectively, but further financing from these two sources is not possible due to their respective country allocation ceilings and their need to support activities in the other sectors in the country. SIG has reached out to the Government of South Korea's EDCF which is the concessional arm of the Korean Export-Import Bank (KEXIM) which is keen to support the project with concessional financing of up to $31.6 million, particularly if there is GCF co-financing. In addition, the Government of Australia intends to finance part of the cost of the access road to be developed by SIG, and a portion of the World Bank's financing will be directed to the development of the transmission line to be constructed by SIEA. In addition, IRENA/ADFD announced in January 2017 that it will provide a concessional loan of $15.0 to SIG for the Project.

Despite such efforts, additional concessional financing is required especially due to the recent low cost of diesel. While SIEA understands that the Project will protect itself from volatility of future oil prices and potentially oil price spikes that it experienced not so long ago in 2008 (Brent spot price reached $138/barrel), recent low oil price levels have promoted unfounded expectations that oil prices will remain low. Diesel generation is also within SIEA's comfort zone as it has been operating it for decades, and a departure from near-100% reliance on diesel generation will need a strong financial advantage over its standard practice. It is of critical importance to reduce the financing cost, and therefore the total project cost of the Project, so that the Project's levelized cost becomes sufficiently lower.

**Need for strengthening institutions and implementation capacity.** As mentioned in sections E2.2 and E2.3, the Project is the first utility-scale hydropower project and is also the first BOOT project. Areas requiring institutional strengthening are as follows:

**(i)** **MMERE Project Office** has been instrumental in preparing a bankable feasibility study, selecting sponsors through a transparent and competitive process, negotiating with the sponsor on technical and commercial aspects of the Project, preparing safeguards documents, implementing land acquisition including numerous rounds of consultations, outreach programs and gender mainstreaming efforts, assisting the Ministry of Infrastructure Development in the design of the access road, and, most importantly, being the champion of the Project. Over the years, with the support of the Bank (with financing from various development partners particularly the Government of Australia) and IFC, the Project Office has significantly developed its capacity. Their capacity on project preparation will continue to be strengthened as the Project enters the final stages of negotiation with the sponsor and financial close. However, it will need to build its capacity on implementation

including project management, monitoring and management of environmental and social impacts, watershed management, further community outreach and managing the requests (and potential complaints) as the Project becomes a reality for the affected people, implementation of the livelihood restoration programs and the benefit-sharing mechanism, etc. A portion of the World Bank's IDA allocation and the GoA grant is expected to support the Project Office to execute these activities and to retain necessary experts under Component 4.

**(ii)** **SIEA**, as the off-taker of the Project, has been the entity representing SIG in granting the exclusive development right to the prospective sponsor, and has developed its capacity significantly on commercial and technical terms of the PPA. SIEA has also advanced its understanding on utility-scale hydropower planning, design and operation, as well as on system planning involving more than just diesel generators. Going forward, it will need to develop its capacity on optimized dispatch of a thermal-hydro system and familiarize itself with reservoir operations since capacity payment to the Project Company means that, while the Project assets are owned and operated by the Project Company, SIEA will instruct its operation as if it were its own. At the moment, financial support has not been requested, but the World Bank will consider providing assistance if requested. In the longer-term, the Project Company is responsible under the PPA to train SIEA personnel on the operation of the hydropower plant as the assets will be handed over to SIG at the end of the concession period.

**(iii)** **MOFT** has been engaged in the Project discussion as the ministry representing SIG on the Government Guarantee Agreement and the Implementation Agreement. It has since significantly stepped up its involvement as concessional financing became necessary for the Project. MOFT is taking the lead on attracting concessional financing, and is leading the discussions with the World Bank, Government of Australia, ADB, EDCF, and was the initial point of contact for discussions with the GCF Secretariat. It has also reached out to prospective financiers including the European Investment Bank, IFC Investment and IRENA/ADFD, and has successfully secured a concessional loan of $15 million from IRENA/ADFD Through this experience, MOFT has drastically strengthened its literacy on project finance and on its function to onlend such funds to the Project Company. Furthermore, in an effort to reduce the Project's financing cost, MOFT has agreed in principle for SIG to hold 49% of the Project Company's shares using the World Bank's IDA loan while expecting a nominal return on equity which will only be sufficient to administer and service the loan. MOFT expects SIG to hold interest in the Project Company through its public investment vehicle called ICSI which manages government's stake in the state-owned enterprises. However, as it will be their first experience to hold shares in a private special purpose company, institutional strengthening is required. Once the arrangement is decided, the World Bank will perform a financial management assessment and will consider providing support in ensuring adequate fiduciary control and governance.

(iv) **MMERE** has been a strong supporter of the Project and has prioritized the Project in the NEP. It is expected that the success of the Project will open up to more renewable energy development, and promote further private sector investment as SIEA will be seen as a credible offtaker. MMERE's responsibility is to institutionalize the Project's experience so that the lessons learned are fully reflected in its effort to create an enabling environment. It may be noted that the Project, with the support of the World Bank and partners such as the Government of Australia, had been able to accommodate a long gestation period, but future renewable energy projects which are expected to be of a smaller scale will not be able to endure long lead times involving negotiation on numerous issues. MMERE will have to facilitate the creation of a favorable environment conducive to private sector investment in renewable energy.

*(v)* **MECDM** has been instrumental, as the National Designated Authority for GCF, in interfacing with the GCF Secretariat and spearheading the Project's access to GCF financing. As the Project becomes firm, MECDM will need to update the Intended Nationally Determined Contributions (INDC) since GHG reduction potential of this Project – which is by far the largest contributor in curbing GHG emissions – needs to reflect the detailed calculation conducted by the World Bank. MECDM will also need to build its capacity in monitoring and evaluation of actual GHG reductions, as well as ensure that the environmental impacts of the Project and future renewable energy projects are adequately managed by the developer. In addition, since the Nationally Appropriate Mitigation Actions (NAMAs) have not been prepared, MECDM may require assistance to formulate it.

## E.5. Country Ownership

Beneficiary country (ies) ownership of, and capacity to implement, a funded project or programme

E.5.1. Existence of a national climate strategy and coherence with existing plans and policies, including NAMAs, NAPAs and NAPs

*Please describe how the project/programme contributes to country's identified priorities for low-emission and climate-resilient development, and the degree to which the activity is supported by a country's enabling policy and institutional framework, or includes policy or institutional changes.*

The relevant climate polices and strategies, and the coherence of the Project is as follows:

**Solomon Islands National Climate Change Policy (NCCP).** As a small island development state which emits relatively small volumes of GHG, and is at the receiving end of the impacts of climate change, particularly the rising sea level, the NCCP for 2012-2017 places greater focus on country's adaptation policy. However, it does stress its commitment to strengthen the capacity of the government, private sector and other relevant institutions to develop and implement renewable energy strategies. It also stresses that SIG will need new technology for mitigation, and further articulates that technology transferred for use in Solomon Islands should be proven and adaptable, environmentally friendly, appropriate to user, culturally friendly, and can be managed on a sustainable basis. The hydropower technology adopted by the Project is in alignment with the needs of SIG.

**INDC.** SIG has committed in its Intended Nationally Determined Contribution (INDC) to reduce emissions by 45% below 2015 levels (approximately 700,000 $tCO_2eq$ per year) by 2030 with appropriate international assistance. It is reported that 95% of the national emissions inventory derives from fossil fuels, with carbon dioxide being the only gas targeted for emission reduction as it comprised 95% of the inventory.

Solomon Islands' conditional contribution (with international assistance) aims to reduce emissions by 18,800 $tCO_2e$ annually by 2025 below 2015 level, and by 31,125 $tCO_2e$ annually by 2030, of which 39% of the reduction will be from the power sector. Starting from year 2020, this equates to a total reduction of 218,500 $tCO_2eq$ by 2030. The INDC lists the Project as the one with by far the largest mitigation option with a potential to reduce 319,355 $tCO_2eq$ by 2030, which is 150% of the total reduction target. The Project is not included in the total reduction since the contribution to the Project is "conditional on adequate and timely international assistance".

The Project's cumulative emission reduction potential up to 2030 in the INDC has been calculated using a much larger amount of energy being generated by the Project which seems to be based on an earlier pre-feasibility study report which envisaged a cascade development of two hydropower plants in one river. As indicated in section E.1, the latest design envisages annual generation of 78.35 GWh which will displace diesel generation to reduce emission by 49,500 $tCO_2eq$ per annum.

**Solomon Islands National Energy Policy.** As detailed in section C.1, SINEP establishes a target to "increase the use of renewable energy sources for power generation in urban and rural areas to 50% by 2020." The Project's 15 MW installed capacity will generate 78.35 GWh per annum which is 65% of the 120 GWh demand projected in 2022 when the Project is scheduled to come on line.

**NAMAs.** Not prepared by MECDM yet.

**NAPAs/NAPs.** Not relevant as Project is a mitigation project.

E.5.2. Capacity of accredited entities and executing entities to deliver

*Please describe experience and track record of the accredited entity and executing entities with respect to the activities that they are expected to undertake in the proposed project/programme.*

**The World Bank** is the Accredited Entity. The World Bank, through its International Development Association (IDA) operations, has a proven track record in the energy sector of the Solomon Islands. It has been providing assistance to SIEA since 2008 through the ongoing Sustainable Energy Project (SISEP; originally for $4 million-equivalent) for which an additional financing was approved in 2013 for $13 million equivalent. The objective of SISEP is to assist SIEA to develop its technical, operation and financial management capacities, as well as supporting its investments to augment the Honiara grid system. The World Bank has also recently approved in July 2016 the Electricity Access Expansion Project (SIEAEP; $2.5 million from the Global Partnership on Output based Aid) which aims to provide targeted subsidies to help the low-income households pay the one-off upfront initial connection fees. The Project is

expected to contribute to SIEA and SIG's target to increase the customer base from 15,500 currently to 30,000 by 2021.

With regards the Project, the World Bank has been supporting the Project and SIG since its identification in 2006. By utilizing financial support from development partners such as the Government of Australia and the European Investment Bank, the World Bank has been supporting the preparation of a bankable feasibility study, selection of an investor through transparent and competitive bidding procedure, preparation of safeguards documents, facilitating the arrangement of concessional finance, and ensuring that international best practices are adopted in all aspects of the Project.

**Consortium of Korea Water Resources Corporation and Hyundai Engineering (K-Water - HEC)** are the preferred Project sponsors responsible for securing financing, development and operation over the concession period, while HEC is also the preferred EPC Contractor. K-Water was founded in 1967 and operates 16 multi-purpose dams and integrated regional water supply systems in South Korea. It is also the leader in renewable energy and operates 25% (1,335 MW) of all domestic renewable energy installments. Since 1994, K-Water has also aggressively advanced its overseas business, and is now engaged in 32 overseas projects in 21 countries. This includes the Patrind Hydropower Project (150 MW; $436 million) in Pakistan under a 34-year BOT concession. Another example is the Angat Dam Project (218 MW; $469 million) in the Philippines for which a concession has been granted for 50 years since November 2014. On top of such international experience as the project sponsor of hydropower projects, K-Water's net worth of $11,000 million (2013) also demonstrates their financial strength to undertake the Project as the main project sponsor.

**Solomon Island Electricity Authority (SIEA)** is the Project off-taker and will also invest in the transmission line to distribute power from the Project. It is also the body authorized, under the Electricity Act, to issue license to third parties to generate electricity. Until 2011, SIEA was in financial crisis and close to insolvency, with severe cash-flow problems and with poor and inconsistent information available to management. However, by the end of 2011, SIEA had improved its cash flow position by focusing on key aspects of the commercialization program that SISEP supported. As a result of such efforts, SIEA, made a drastic turnaround from losses until 2010 to a net profit of SBD68 million in 2012, increasing since to SBD107 million in 2015. SIEA, therefore, is a viable offtaker. SIG will also guarantee the obligations of SIEA under the Government Guarantee Agreement. As the executing entity of the transmission line component, SIEA has substantial experience developing and operating transmission lines, and is also familiar with the World Bank's relevant policies including those on safeguards, procurement, financial management and anti-corruption.

**Ministry of Finance and Treasury (MOFT)** represent SIG in the Government Guarantee Agreement and the Implementation Agreement. It will facilitate mobilization of concessional financing, and may also lend to the Project Company and/or hold equity stakes in the Project Company on behalf of SIG; as well as provide funds to MMERE for the construction of the road and to SIEA for the construction of the transmission line. As indicated in section E.4.2, MOFT has significantly developed its capacity to understand its obligations and is likely to honor them as a shareholder of the Project Company.

**Ministry of Mines, Energy and Rural Electrification (MMERE)** is responsible for supervising the Project through its Project Office (PO), and will jointly represent SIG with MOFT in the Implementation Agreement. More detail regarding MMERE's capacity has been provided above in section E 4.2.

### E.5.3. Engagement with NDAs, civil society organizations and other relevant stakeholders

*Please provide a full description of the steps taken to ensure country ownership, including the engagement with NDAs on the funding proposal and the no-objection letter.*

The Project has been a priority, national impact project since the initial set-up of a Project Office in the Ministry of Mines, Energy and Rural Electrification in 2010. Every year since the creation of the Project Office, the Solomon Islands Government has provided national budget financing for the operation of the Project Office, including between 5-8 staff, office costs, community engagement, and project preparation activities. Strong support has been expressed by all three of the Prime Ministers which have served during this period, with the project often cited in speeches. MECDM, the NDA for Solomon Islands, has been supportive of the project from the beginning. The Ministry has

provided advice on processes for development consent for a private developer/operator, provided feedback on draft social and environmental reports, participated actively in government task force meetings on the project and is actively supporting this proposal. The National Climate Change Policy, 2012-2017, development by MECDM, identifies hydropower as one of the most significant investments that could be made to reduce GHG emissions. The NDA has provided significant support to the World Bank as the Accredited Entity to prepare this funding proposal, and has cited the Project when signing the immunity and privileges agreement with GCF's Interim Executive Director at the sidelines of the United Nations General Assembly on 21 September 2016. The no-objection letter issued by the NDA is attached.

The public is informed about project developments on a regular basis through the media and through community consultations. The Project Office has an active program of community engagement that informs those affected as to project developments and the way in which the project will affect them. Community-based groups, local government (ward, provincial and national MP), engage in community and other Project Office-facilitated discussions to share their views on the project. The Project Office also conducts consultations with local and international NGOs with a presence in Solomon Islands.

*Please also specify the multi-stakeholder engagement plan and the consultations that were conducted when this proposal was developed.*

In 2012, the Project Office prepared a Stakeholder Engagement Plan (submitted as part of this proposal) which laid out specific actions for engaging with each stakeholder group, including the form (i.e. meetings, radio, etc.) and frequency of the activities. This Plan has provided a guide for stakeholder engagement over the few years, since it was developed. Targeted consultations and interviews have also been conducted for various studies including the feasibility study, social assessment, environmental assessment, land identification and acquisition, and gender assessment. The Project Office also keeps a record of every meeting held in the field, in their office or elsewhere, including the date, location, participants, topics discussed and actions to be taken. The Project Office has recorded more than 250 meetings over the last 5 years.

## E.6. Efficiency and Effectiveness

Economic and, if appropriate, financial soundness of the project/programme

### E.6.1. Cost-effectiveness and efficiency

*Describe how the financial structure is adequate and reasonable in order to achieve the proposal's objectives, including addressing existing bottlenecks and/or barriers; providing the **least concessionality;** and without crowding out private and other public investment.*

Given the low oil price environment, drop in the price of diesel generation and lack of consensus on future oil prices, the financial structure has been adjusted from the initial assumption of mainly commercial financing, to optimize concessional debt finance so as to achieve parity between the hydropower generation cost and current diesel generation cost. The level of private sector equity investment remains at a level that optimizes private investment and provides sufficient incentives to the private investors to perform their obligations under the PPA and other project agreements.

*Please describe the efficiency and effectiveness, taking into account the total project financing and the mitigation/ adaptation impact that the project/programme aims to achieve, and explain how this compares to an appropriate benchmark. For mitigation, please make a reference to E.6.5 (core indicator for the cost per tCO2eq).*

**High cost environment.** The cost of the hydropower plant is expensive compared to international standards, but is efficient in the context of the Pacific Islands. Due to the remoteness, its inability to harness economies of scale, the need to import nearly all equipment and materials, and absence of a market and competition, the Pacific Island states all suffer from the high cost environment. Even among the small island development states of the Pacific, the development cost in Solomon Islands is higher than countries with higher GDP/capita with a stable socio-economic environment and a track-record in hydropower development such as Fiji and Samoa. ADB has reported that a hydropower project it financed in Papua New Guinea (similar GDP/capita but with a larger power system and a track-record in developing multiple hydropower plants) had a unit based cost of around $6-7 million/MW, but explained that the project benefited from the rapid depreciation of the local currency during the bidding process which lowered the

cost of civil works denominated in the local currency. It may be noted that a civil works contractor with experience to develop a sizeable hydropower plant cannot be found in the Solomon Islands.

A conceivable alternative renewable energy source would be solar PV, but the 1 MWp solar farm which is being commissioned by SIEA now (grant funded jointly by the governments of the United Arab Emirates and New Zealand) cost $4.21 million without the cost of land. The unit investment cost of $4.21 million/MWp is also extremely expensive compared to other parts of the world. It is worth noting that the very first pilot 50 kWp installed on the rooftop of SIEA's parking lot cost the Japan International Cooperation Agency $450,000 in 2015, which is equivalent to $9 million/MWp. This does not demonstrate that the unit cost has reduced between the two solar projects, but points to the fact that a lack of economy of scale leads to extremely high costs. Generally, it is an important reminder that the cost of this Project should not be compared with the cost of alternatives in different parts of the world.

**Land constraints to new, alternative projects.** Due to the complex nature of customary land in the Solomon Islands (as well as in most other countries in the Pacific), the availability of land for the Project is an immense advantage. While all the compensation has not been paid yet, SIG identified five tribes who claim customary rights over the Project site through a customary process, and has successfully agreed on the terms of the compensation. For an alternative project of equal magnitude, it is expected that several years will be needed to settle the customary land issue. It may be noted that the land acquired for the Project is mostly around a mountain valley with steep slopes ideal for a hydropower project, and therefore inefficient to introduce other alternatives such as solar PV.

**Hydropower facilitates step-change in solar integration.** It may be possible to introduce increments of solar PV, but (i) land acquisition is a challenge especially if many small patches of land are required in different parts of Honiara to distribute the PV farms in order to mitigate the risk of a small cloud causing output drops across all facilities; (ii) continuous financial support for numerous small projects will be necessary since capital cost of solar is also very expensive in the Solomon Islands, and (iii) there is a limit to the penetration level of solar due to its intermittency as well as the lack of inertia it gives to the power system.

**Efficient and effective GHG emission reduction by hydropower.** The actual data on the performance of SIEA's 50 kWp pilot rooftop solar indicates that the plant factor is 21% on average over a year. Since any solar farm in the same region can be assumed to have a similar plant factor, it can be said that the plant factor of solar is one-third of the Project which has a plant factor of 61%. This means that for solar to produce the same amount of energy as the Project, and therefore displace the same amount of energy and reduce GHG emission from diesel generation, 45 MW of solar is needed. Assuming 1 ha is needed for 1 MW of PV, acquiring 45 ha of relatively flat land would be a great challenge in Honiara.

**Least-cost capacity expansion.** Ultimately, the effectiveness of the Project cannot be measured by assessing the Project against another alternative in an either-or situation. Therefore, SIEA has diligently commissioned a least-cost generation capacity expansion analysis to understand the most efficient combination of generation sources to serve growing demand. While details of this analysis is provided in section F.1, the analysis found that the best least-cost option is a combination of the Project, new solar PV with and without storage, and limited capacity of diesel generators.

### E.6.2. Co-financing, leveraging and mobilized long-term investments (mitigation only)

*Please provide the co-financing ratio (total amount of co-financing divided by the Fund's investment in the project/programme) and/or the potential to catalyze indirect/long-term low emission investment.*

The total Project cost is $233.98 million. Financing from the various sources excluding GCF is expected to be $147.98 million, while the requested GCF financing is $86 million. The co-financing ratio is 1.72.

The Project's ability to provide spinning reserves and load following reserves will enable a higher penetration of solar PV. Assuming that 15 MW of solar will be integrated at the unit cost of $3.0 million/MW, the co-financing volume is increased from $147.98 million to $192.98 million, thereby increasing the co-financing ratio to 2.24.

### E.6.3. Financial viability

*Please specify the expected economic and financial rate of return with and without the Fund's support, based on the analysis conducted in F.1.*

Financial viability is particularly important for Component 1. As explained in section F.1, sensitivity analysis around the availability and volume of GCF concessional loan has demonstrated that the Project will not be able to provide the required return on equity to the private investor at the level of PPA price acceptable to SIEA without the provision of $70 million from GCF.

*Please describe financial viability in the long run beyond the Fund intervention.*

The GCF fund is requested to partially debt finance the Project which will be developed by the Project Company under a BOOT modality. The GCF loan will be close to fully serviced by the end of the 34-year concession period (as most concessional financing will provide for a 40-year repayment period), and once the facility is transferred to SIG, SIEA will be able to generate at no cost except for the minimal O&M costs and residual SIG debt service. SIEA will also conduct O&M for the transmission line, and SIG will maintain the access road as part of its national road system. Given that hydropower plants typically have a life of more than 50 years and even up to 100 years, the financial viability of the Project is robust. It may be noted that the Feasibility Study has indicated that under the base case sediment inflow scenario (50,000 $m^3$/year), the dead storage of the reservoir will only be filled up after 65 years, and can be further extended with regular flushing operations. Even if the dead storage is filled up, sediment removal is possible by dredging especially since the reservoir is not that deep. The Feasibility Study estimates this cost to be approximately $1.0 million every five years.

*Please describe the GCF's financial exit strategy in case of private sector operations (e.g. IPOs, trade sales, etc.).*

The Project will be developed under BOOT modality whereby the Project Company will develop and operate the Project for 30 years and transfer the facility to SIG at the end of the concession period. GCF financing will be paid off by SIG after the 40 year life of the proposed loan, by which time SIG would have taken ownership of the facility and would be experiencing a significant reduction in electricity costs as a result of not having to make PPA payments after the 30 year PPA operating period, but rather only covering the costs of O&M and debt service of SIG loans as well as any equity returns to SIG investors during Years 34 to 40.

Through the O&M training provided during the concession, SIEA is expected to build capacity to conduct O&M by themselves. Since the cost of the facility would be substantially amortized by the end of the concession, SIEA will easily be able to finance the O&M cost out of the large savings it enjoys when the Project is transferred to them.

### E.6.4. Application of best practices

*Please explain how best available technologies and practices are considered and applied. If applicable, specify the innovations/modifications/adjustments that are made based on industry best practices.*

Hydropower is a well-established renewable energy technology which delivers dispatchable energy to the system and can also function to provide ancillary services including spinning reserves and load following (frequency control) capacity. In addition, hydropower plants provide "inertia" to the system which helps the system to be stable under conditions of varying load and/or output of other generators. Other renewables such as solar and wind are not able to provide such functions, and while it is not a problem from the grid operation perspective when the penetration is low, such intermittent renewable sources without inertia will destabilize the grid once the penetration is high. Since the Project is aimed, not to make incremental increases of renewable energy, but to transform SIEA's grid from being supplied nearly 100% by diesel to a system with a major renewable energy share, hydropower is the best available technology.

As described in E.2, there are a number of innovations on land acquisition, land management and benefit sharing that will provide best practice examples for Solomon Islands and elsewhere. The land acquisition process utilized the compulsory acquisition division of the Land and Titles Act, but it added several activities including: the use of traditional/indigenous leaders to identify land owners through customary processes; the signing of a Process Agreement between landowners and government which was a condition of land acquisition and which provided ongoing benefits to landowners such as royalties; establishment of tribal accounts for every tribal member to receive an equal portion of compensation and royalties directly; establishment of a joint landowner/government land

management company which will allow previous landowners to still play an active role in the management of land which they sold to the government.

A benefit sharing mechanism would channel 15% of the ongoing net benefit of the hydropower facility (derived from the savings between diesel and hydropower prices) to the affected community. A fund shall be established to receive and manage the funds and the community shall be assisted to establish governance arrangements and procedures. An initial investment in water supply, extension of the electricity grids into local communities and job training shall be provided as early benefits during the construction period, before the benefit sharing funds begin to flow. This initial investment and the design of the benefit share fund are components of the Japan Social Development Fund project which is being prepared in parallel.

## E.6.5. Key efficiency and effectiveness indicators

*GCF core indicators*

Estimated cost per t $CO_2$ eq, defined as total investment cost / expected lifetime emission reductions (mitigation only)

| | |
|---|---|
| (a) Total project financing | $233.98 million |
| (b) Requested GCF amount | $86 million |
| I Expected lifetime emission reductions overtime | 2.48 million $tCO_2eq$ |
| (d) Estimated cost per $tCO_2eq$ (d = a / c) | $94.54 / $tCO_2eq$ |
| I Estimated GCF cost per $tCO_2eq$ removed (e = b / c) | $34.75 / $tCO_2eq$ |

*Describe the detailed methodology used for calculating the indicators (d) and I above.*

The lifetime GHG emission reduction, as detailed in section E.1.2, is 2.48 million $tCO_2eq$ (over 50 years, noting that the life of the plant is likely to significantly exceed this period), or 49,500 $tCO_2eq$ per year.

*The following is a summary of the calculations made to determine the expected lifetime emissions reductions overtime.*

| **Generation Emissions from Diesel (Counterfactual)** | | | |
|---|---|---|---|
| Annual Energy | 78.35 | GWh | |
| EF of Diesel | 650 | $tCO_2eq$/GWh | |
| Annual Baseline Emissions | 50,900 | $tCO_2eq$/GWh | |

| | | |
|---|---|---|
| **Baseline emissions - tCO2e (annual)** | | 50,900 |
| **Project emissions -tCO2e (annual)** | Reservoir Emissions | 705.2 |
| | Land Clearing | 580.8 |
| | Embodied Material and Energy Emissions during Construction | 78.4 |
| Net Annual Emissions (annual) | | -49,500 |
| Total Net Emissions (over 50 years) | -2,48 million | |

Expected volume of finance to be leveraged by the proposed project/programme and as a result of the Fund's financing, disaggregated by public and private sources (mitigation only)

As indicated in section E.6.2, GCF financing of $86 million is expected to leverage $147.98 million of co-financing for the Project alone. The indicative breakdown of the $147.98 million is as follows:

Public Sources

| | | |
|---|---|---|
| - World Bank IDA | $33.60 million | (of which $8.9 million is grant) |
| - ADB Asian Development Fund | $30.00 million | (of which $12.0 million is grant) |
| - Government of Australia | $11.00 million | (all grant) |
| - IRENA/ADFD | $15.00 million | (all loan) |
| - Government of South Korea (EDCF) | $31.60 million | (all loan) |
| - SIEA | $1.49 million | (counterpart financing) |
| **Public Total** | **$122.69 million** | (83% of co-financing) |

Private Sources

| | | |
|---|---|---|
| - Sponsor | $25.29 million | |
| **Private Total** | **$25.29 million** | (17% of co-financing) |

*Describe the detailed methodology used for calculating the indicators above.*

The volume of public concessional financing including GCF was derived based on a financial model to achieve a levelized cost of energy which is lower than that of SIEA's business-as-usual scenario that is nearly fully dependent on diesel generation, while securing appropriate return to the private sponsors. As indicated in section B.3, the private sponsor's return will be between 13% and 15%.

*Please describe how the indicator values compare to the appropriate benchmarks established in a comparable context.*

The cost of the hydropower plant is expensive compared to international standards, but is reasonable in the context of the Pacific Islands which all suffer from the high cost environment due to the remoteness and small scale of development. The expected equity return of 13-15% is industry standard, and is in line with the preferred sponsor's experience with hydropower BOOT projects in other countries.

| | |
|---|---|
| Other relevant indicators (e.g. estimated cost per co-benefit generated as a result of the project/programme) | An estimated 300 jobs will be created during the period of construction and 25-30 jobs will be created for operations and maintenance. |

**** The information can be drawn from the project/programme appraisal document.***

## F.1. Economic and Financial Analysis

*Please provide the narrative and rationale for the detailed economic and financial analysis (including the financial model, taking into consideration the information provided in section E.6.3).*

**Feasibility study-level economic analysis.** Economic analysis for the Project was conducted under the Feasibility Study Phase 3 in 2014, and updated in November 2015, by comparing "with Project" against "without Project" cases for the 50 year horizon. The "without Project" case considered the scenario where SIEA meets growing demand by continuing to install diesel generators. The "with Project" case also involves diesel generation since the Project alone cannot meet all the demand during the horizon of the analysis. The economic benefit considered is predominantly the avoided cost of diesel generation. In this analysis, the economic benefit of GHG emission reduction is not accounted for. The resulting economic internal rate of return (EIRR) was 17.8%.

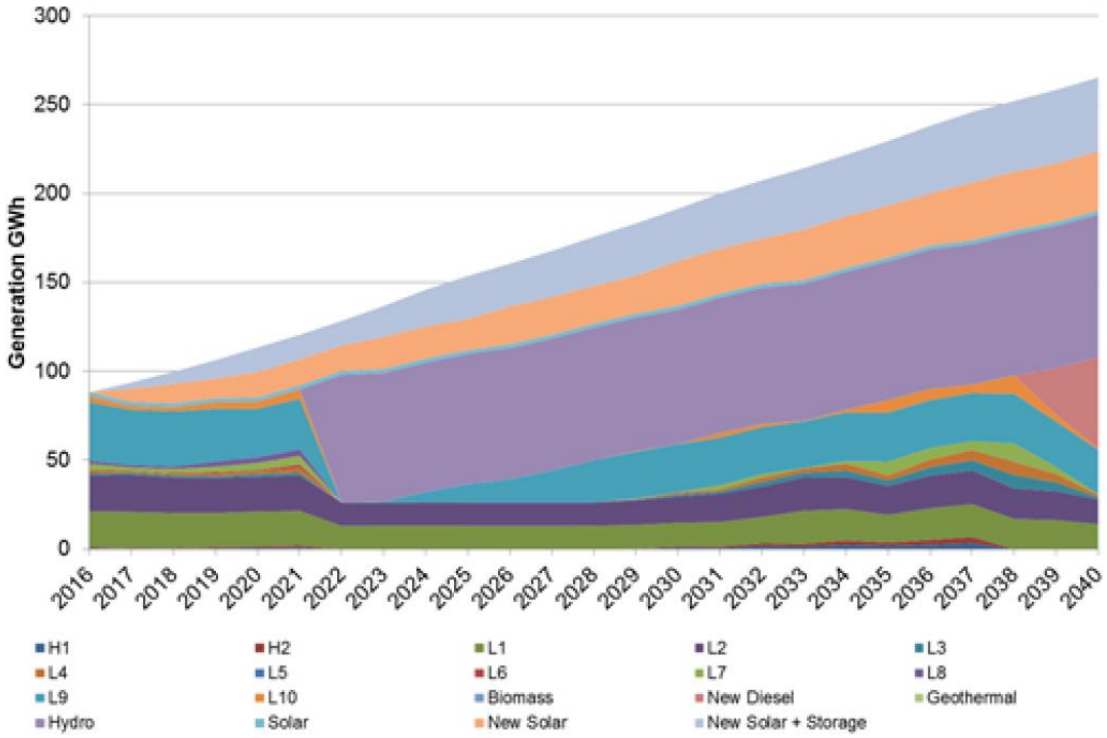
**Least-cost generation capacity expansion plan**. To inform its decision-making with regards to the Project, SIEA commissioned a least-cost generation capacity expansion plan in July-August 2016 including (i) power system planning that will ensure G-2 reserve margin, and a (ii) dispatch model to optimize the generation of various sources to meet the hourly load under a range of demand scenarios. It may be noted that G-2 reserve margin is a critical system design criterion ensuring sufficient reserve margin when the largest unit is offline due to maintenance.

The least-cost analysis considered existing and new diesel generation, new hydro (i.e. the Project, using updated data and cost), new solar with and without storage, new geothermal and biomass. The levelized cost of energy of the Project is determined to be US¢ 22/kWh. Geothermal envisaged was a specific 10 MW project proposed on Savo Island, but was not included in the analysis due to lack of data, unproven resources and risk of connecting such a large unit by a submarine cable. Data for solar power referred to actual insolation and PV output data based on the 50 kW pilot rooftop solar installed in the SIEA premises. Assessment of the solar performance found that PV generation is subject to significant minute by minute output generation, and assumed that 0.8 MW of load following capacity is required for every 1.0 MWp of installation to compensate for the random fluctuations. The solar with storage option does not require load following capacity, but was assumed to need 4 MWh of energy storage capacity instead. Furthermore, in consideration of system stability, the penetration of solar without storage was capped at 40% of the maximum load, and 50% for solar with storage.

Demand forecast was provided by SIEA following their distribution network expansion strategy to double the number of residential and small business customers from 15,500 in 2016 to 30,000 by 2021. Given that the electrification rate is 60% even in the capital city, this seems to be a plausible target. The base case demand forecast assumed 6% annual growth until the mid-2020's and moderate to 3.5% per annum for the rest of the planning time horizon. It may be noted that while the demand growth during 2010 – 2015 was only 1.0%, SIEA has reported 6% growth during the past 12 months. This is believed to be the result of the new 10 MW diesel units commissioned in January 2016 which has enhanced system reliability and alleviated suppressed demand.

Oil price was projected to increase to $80/barrel by 2030 and remain at the same level during the planning horizon.

Based on these assumptions, the result of the base case least-cost generation capacity expansion plan was concluded to involve: (i) the Project (15 MW) being commissioned in 2022 by when peak load is forecast to be 25 MW and annual energy of 120 GWh; (ii) solar with storage and without storage will be developed continuously over the simulated period; and (iii) new diesel units will be commissioned in 2029 as a result of limitations of solar integration into the system.

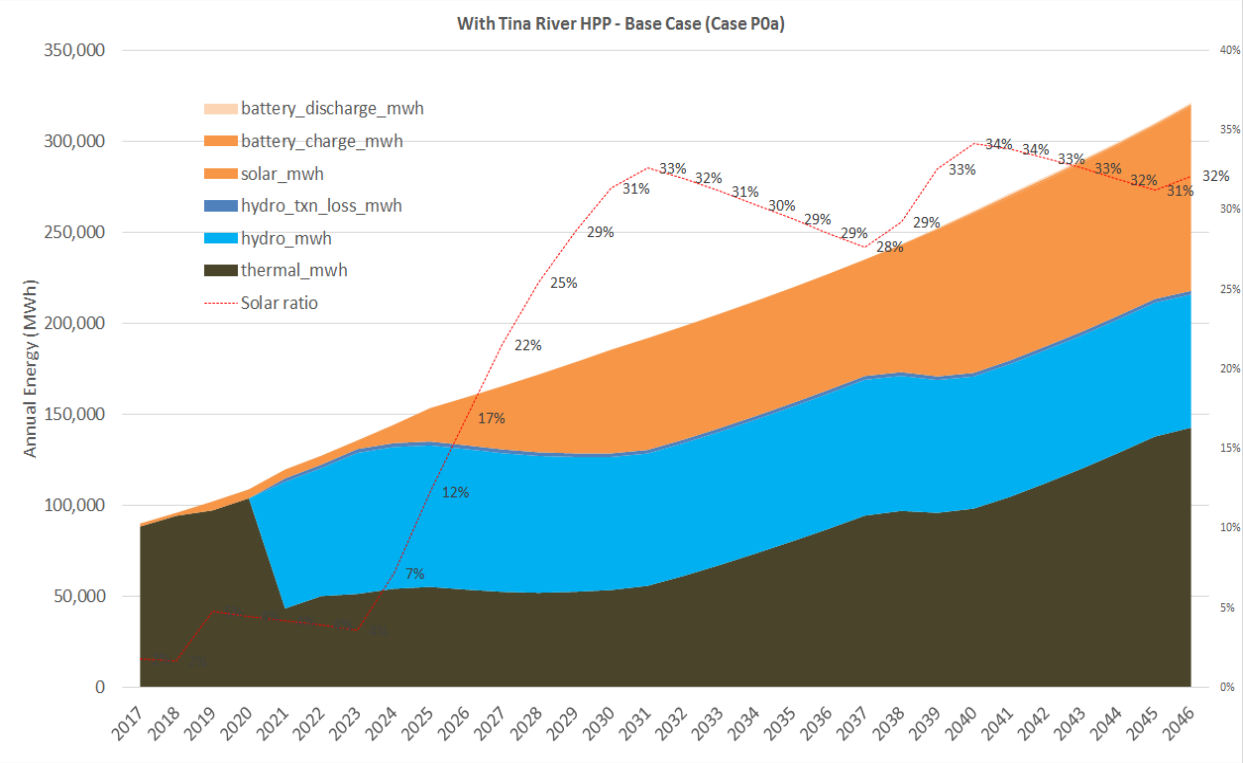


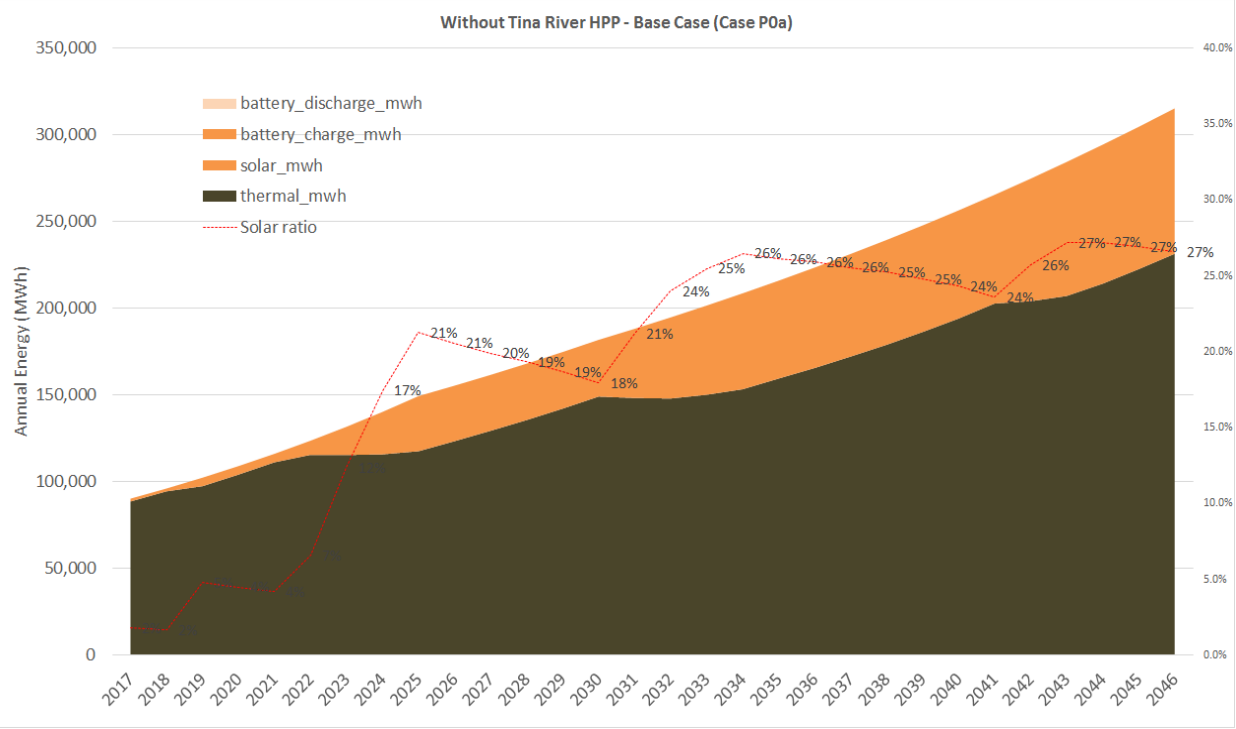

Source: August 2016. Least Cost Modelling of Future Generation Expansion Options for the Honiara Electricity System (Draft Report). Marsden Jacob Associates.

Sensitivity analysis has demonstrated that the outcome is particularly susceptible to changes in demand growth forecast. Under the slow demand growth at 2.5% per year, the Project is still found to be economical, but its entry would be delayed to 2030. A combination of higher levelized cost of energy of the Project, due to increases in construction cost and/or financing and other cost, and lowered demand growth will make the Project unviable.

**Revised Economic Analysis.** The World Bank has conducted a separate economic analysis to assess the project's economic viability in accordance with the Bank's guidelines. For this, the Bank commissioned an independent system optimization study to derive the "with project" and "without project" scenarios. The optimization model used similar parameters as the least-cost study done by Solomon Power, but used 3% discount rate which was calculated based on two times the forecasted real GDP/capita growth rate as per the Bank's guidelines, and assumed the project to be commissioned in 2021. The "with project" and "without project" scenarios derived show that Tina River Hydropower displaces more diesel generation and increases the penetration PV. The project acts as an "enabler" for PV because it provides frequency regulation and spinning reserves needed to respond to the intermittency of PV outputs.

The economic analysis was conducted based on the "with project" and "without project", and included the social value of carbon in the benefit stream as per the Bank's guidelines. The analysis resulted in an EIRR of 7.1% which is much lower than the EIRR calculated in the Feasibility Study because of the investment cost now being higher for the project while the cost of fuel is much lower. Nevertheless, the EIRR exceeds the hurdle rate determined to be 3% in the Solomon Islands. A Monte Carlo analysis which assessed the combination of various risks such as higher capital cost, delay in commissioning, reduced hydrology, lower fuel prices showed that the probability of the EIRR being lower than 3% is 9.3%.




Source: November 2016. Least-Cost System Expansion. Concept Consulting Group (Dr. Grant Read and Dr. Ramu Naidoo).

**Financial analysis.** A detailed financial analysis for the Project was conducted by IFC. The financial analysis used the construction cost proposed by the preferred investor (offered as a fixed price), and assumed 75/25 debt equity

ratio. It was also assumed that 51% of the equity will be held by the private investor (with assumed equity IRR of 13%) while the balance of 49% will be held by SIG with lower returns that are only sufficient to repay IDA which it will borrow for its equity contribution in the Project Company. The structure of the debt assumes $30 million of concessional financing from ADB (including $12 million grant), $31.6 million from EDCF and $4.27 million from IRENA/ADFD, while several scenarios on the volume of GCF loan were considered to confirm the minimum concessionality needed to obtain the required equity IRR for a PPA price estimated at a maximum of US¢22/kWh. The shortage of concessional loans, due to smaller volumes of GCF loan and limitations on IDA, ADB and EDCF country allocations, was estimated to be filled by commercial bank loans and the balance of total IRENA/ADFD funding of $15 m.

| GCF loan (0%; 40 yrs) | $70 million* | $50 million | $35 million | $0 million |
|---|---|---|---|---|
| Equity IRR (price capped at US¢22/kWh) | 14.4% | 11.4% | 8.1% | negative |

Source: IFC estimates.

* Excludes $16 million grant requested from GCF since the grant is directed to the financing of Component 2 which does not impact the PPA tariff.

It may be noted that the assumed 13% equity IRR is at the lowest end of the 13% to 15% range being discussed based on international precedent and regulated equity returns for IPPs and previous projects implemented by the sponsor.

*Based on the above analysis, please provide economic and financial justification (both qualitative and quantitative) for the concessionality that GCF provides, with a reference to the financial structure proposed in section B.2.*

The least-cost generation capacity expansion plan demonstrates that the Project is an economically viable generation source for SIEA to serve projected demand growth over the planning time horizon. This analysis is performed with the Project's levelized cost of energy set at a minimum of US¢22/kWh which can only be obtained if all Project debt is sourced from low-cost, concessional sources.

The financial analysis also confirms that to obtain an equity IRR of 13% (the level assumed to be the hurdle rate for investors to invest in the Project) or higher, US$70 million from GCF is required.

The consequence of not being able mobilize $70 million* and having to rely on commercial bank loans is the Project cost increasing, mainly through much higher interest during construction which in turn raises the levelized cost of the Project to levels which may make the Project unviable. While the exact figure cannot be disclosed, SIEA, the offtaker will likely expect a PPA price at or below US¢22/kWh.

It should be noted that although commercial banks were consulted, commercial bank appetite for a project in the Solomon Islands (on project finance basis) is limited due to lack of precedent. In addition, equity and debt capital markets are not expected to participate in the project as it would be the first large scale private power project in the Solomon Islands.

The concessional 0% loan of $70 million with a 40 year tenor including a 10-year grace period from GCF is, therefore, critical for SIEA to part from its heavy reliance on diesel generation and make a transformational change into a power system supplied predominantly by renewable energy.

* Excludes $16 million grant requested from GCF since the grant is directed to the financing of Component 2 which does not impact the PPA tariff.

## F.2. Technical Evaluation

*Please provide an assessment from the technical perspective. If a particular technological solution has been chosen, describe why it is the most appropriate for this project/programme.*

Hydropower is a well-established renewable energy technology which delivers dispatchable energy to the system and can also function to provide ancillary services including spinning reserves and load following (frequency control) capacity. In addition, hydropower plants provide "inertia" to the system which helps the system to be stable under conditions of varying load and/or output of other generators. Other renewables such as solar and wind are not able to provide such functions, and while it is not a problem from the grid operation perspective when the penetration is low, such intermittent renewable sources without inertia will destabilize the grid once the penetration is high. Since the Project is aimed, not to make incremental increases of renewable energy, but to transform SIEA's grid from being supplied nearly 100% by diesel to a system with a major renewable energy share, hydropower is the best available technology.

As described in section C.1, the hydropower planning and design has been optimized through a series of studies since 2006, and least-cost generation capacity expansion plan also confirmed the key contribution of the Project for SIEA to meet its growing demand at the lowest cost while ensuring reliability and stability of the power system.

## F.3. Environmental, Social Assessment, including Gender Considerations

*Describe the main outcome of the environment and social impact assessment. Specify the Environmental and Social Management Plan, and how the project/programme will avoid or mitigate negative impacts at each stage (e.g. preparation, implementation and operation), in accordance with the Fund's Environmental and Social Safeguard (ESS) standard. Also describe how the gender aspect is considered in accordance with the Fund's Gender Policy and Action Plan.*

The full ESIA has been publicly disclosed and is included as an annex to this proposal. Updates to the ESIA may be made from time-to-time, including the addition of a more extensive Executive Summary, which has also been submitted as a supplement to this proposal. Key issues included in the impact assessment include the effect the Project will have on water turbidity during construction, necessitating the supply of alternative clean water for affected communities. In addition, during operation, Tina River downstream of the dam will experience reduced flow at night during dry periods and close to normal flow conditions during the day and evening (peak hours). To mitigate impacts a $1m^3/s$ environmental flow shall be maintained at all times in the 5.7 km by-passed river stretch. The project has potential to restrict upstream migration of native inland fishes and mitigation measures to address this impact are included in the report.

The project construction will clear about 115 ha of terrestrial natural habitats, most of which are disturbed forests with signs of logging activities. Best management practices are provided for vegetation clearance, soil management, erosion management and wildlife protection. In the long term, the restored and improved Black Post Road will improve mobility between local villages and with Honiara, which is a significant positive impact. Regarding cultural heritage, a protocol for managing cultural heritage sites (tambu sites) is also described in the ESIA. For acquisition of the "core Land' required for construction of the hydropower facility, the Government has exceeded the requirement of broad community support based on Free, Prior and Informed *Consultation* (FPIC) as per World Bank Operational Policy 4.10 – Indigenous People (which is applicable to government implemented activities). Because World Bank Performance Standard (PS) 7, Indigenous Peoples, will be applicable to the private sector project developers (and the yet-to-be-established Project Company) upon agreement for them to own, construct and operate the hydropower facility, the Government has met the higher standard of Free, Prior and Informed *Consent*, as required by PS7. Consent as a result of extensive, inclusive and meaningful consultations is, among other things, evidenced by the signature of a Process Agreement with the four landowning tribes (and later extended to a fifth land-owning tribe that was identified during the formal land acquisition process) which specifies terms of compensation for land, additional benefits including royalties and land lease income, as well as co-management arrangements for the acquired land between Government and the landowners. The ESIA also documents the intensive consultation process with the broader community beyond "core" landowning tribes, leading to broad community support and FPIC for the overall design of the project, as per both OP 4.10 and PS7.

During implementation, the Project Company will continue to consult directly with local communities throughout the life of the project using culturally appropriate, inclusive and proven methods and arrangements. To minimize interaction with local communities, non-local workers will be housed outside the Project area, most likely in the

Eastern side of Honiara. It is intended that the majority of the work force will be local, this will be another important benefit for communities.

A Gender Action Plan (GAP), which has also been shared as an annex to this proposal, was completed as part of project preparation, drawing on the results of the social assessment and informing the finalization of the ESIA, the Land Acquisition and Livelihood Restoration Plan (LALRP) and the design of the benefit sharing mechanism. While the Tina River Project will have national impact through the provision of more reliable and affordable electricity, the GAP is principally concerned with the impact of the project on the lives of communities within its immediate footprint area. This focus of the GAP mirrors the localized approach adopted by the Project towards impact mitigation and benefit sharing.

Although employment opportunities will be prioritized for women and men who live within the project area, there may also be some small contracting opportunities available to Solomon Islanders from further afield (including to women-owned businesses). An emphasis on equal pay for equal work, ensuring that the workplace is safe and welcoming for qualified female recruits, and ensuring that female owned businesses are encouraged to compete for supply chain contracts, are all part of the guidelines and standards that the Developer must adhere to. Once the PPA is signed, the project can be presented to the Solomon Islands Women in Business Association and opportunities for women owned businesses could be discussed with the Developer.

Given the baseline of gender inequality in its footprint area, the Tina River Hydro Project has an opportunity to include design and monitoring measures that will, at a minimum, not exacerbate existing challenges faced by women, while at the same time aim to promote their participation and wellbeing. This opportunity is strengthened by i) recent national level policy commitments on gender equality, and the support of donors for the same; ii) the willingness and openness of the Project Office, as the main entity responsible for implementation, to promote gender equality; and iii) dedicated resources for supporting gender mainstreaming in the project.

As per Bank's BP/OP4.37, an emergency preparedness plan will be drafted by the time of the Bank's appraisal, scheduled in mid-March 2017.

As part of project appraisal, the Bank is conducting due diligence to ensure that the project is in compliance with World Bank Performance Standards and Safeguard Policies. The analysis and actions proposed in the ESIA and LALRP are considered to be compliant with these requirements. The Bank's Concept-stage Integrated Safeguard Data Sheet has been shared as a part of this proposal and will be publicly disclosed.

## F.4. Financial Management and Procurement

*Describe the project/programme's financial management and procurement, including financial accounting, disbursement methods and auditing.*

GCF funds would be channeled through the World Bank (Accredited Entity) to the Ministry of Finance and Treasury (MOFT), and then on lent to the Project Company to finance part of the debt component of project financing. The Project Company would repay MOFT who would then repay GCF. The exact nature of the financial transfer and legal arrangements between the Accredited Entity and GCF are under discussion and would be utilized in the most efficient manner for the benefit of the project and implementing agencies.

The Project Company would be required to provide regular financial reports and evidence of implementation to trigger financial transfers or the withdrawal of project funds. Annual audits would also be required and would be a condition of further disbursements. As the Project Company would be responsible for the performance of the EPC contractor, the World Bank would not have any such reporting and auditing requirements for the EPC contractor, but rather reserve the right to investigate any suspected cases of fraud or corruption.

Following the World Bank's standard appraisal procedure, the Accredited Entity will complete due diligence on financial management including financial accounting, disbursement methods and auditing; procurement; and anti-corruption and governance by the time of project appraisal in mid-March 2017.

The World Bank has extensive experience working with MOFT on publicly financed Projects including those that involve on-lending, and grant pass through, to SIEA. For SIEA, the World Bank has been producing semi-annual financial management reports for SISEP since 2008, whereas the recent reports have all concluded that SIEA's financial management performance to be "satisfactory" and assessed the financial management risk to be "moderate".

The World Bank has also been working with MMERE's Project Office for a number of years to prepare the Project using trust funds from development partners such as the Government of Australia. Supervision of financial management performance by MMERE's Project Office has found performance to be satisfactory with a need for capacity enhancements to manage the increased volume of funds during the construction phase of the project.

## G.1. Risk Assessment Summary

*Please provide a summary of main risk factors. Detailed description of risk factors and mitigation measures can be elaborated in G.2.*

As outlined in the section above, financial viability is one of the greatest risks. The various challenges of attracting a developer, constructing and operating the first utility scale hydropower facility in a small, island economy conspire to result in high costs and an electricity tariff level that may not be acceptable for the off-taker. There are also a range of technical issues which are typical for hydropower facility construction such as the uncertainty around geological conditions in the construction of the tunnel, as well as the operational challenge of variable hydrology which is exacerbated by the absence of long period of rainfall and river flow data to build confidence in likely output levels. Environmental and social issues are thoroughly covered in the ESIA. One of the most significant risks to the project and to all development projects in Solomon Islands is the sustainable outcomes of land acquisition and associated compensation. This risk is being managed at the moment through the compensation process and will continue to be an active focus of attention for the PO to ensure that there is full community support for the project throughout construction and operation.

## G.2. Risk Factors and Mitigation Measures

*Please describe financial, technical and operational, social and environmental and other risks that might prevent the project/programme objectives from being achieved. Also describe the proposed risk mitigation measures.*

**Selected Risk Factor 1** The tariff proposed by the developer may be too high for SIEA to accept

| Description | Risk category | Level of impact | Probability of risk occurring |
|---|---|---|---|
| Cost estimates provided so far by K-Water have indicated possible tariff levels that may be above the threshold that SIEA is willing to pay. High construction costs are likely the result of the need to import nearly all construction materials and skilled labor, contingencies due to unfamiliar and potentially unpredictable working environment, limited hydrological information, challenging geological environment that requires conservative design, and other factors. | Financial | High (>20% of project value) | Medium |

Mitigation Measure(s)

*Please describe how the identified risk will be mitigated or managed. Do the mitigation measures lower the probability of risk occurring? If so, to what level?*

SIG is negotiating individual cost items actively with the developer while also seeking to attract as much concessional financing as possible to bring the eventual tariff cost down to levels acceptable to SIEA. The approval of GCF financing of $86 million, including $16 million in grant financing for the access road, would significantly mitigate this risk.

**Selected Risk Factor 2** Geological uncertainties may result in increased works (e.g. tunneling)

| Description | Risk category | Level of impact | Probability of risk occurring |
|---|---|---|---|
| This may result in increased costs of construction. Risks associated with adverse variations from the baseline geological conditions indicated in the Geological Baseline Report provided to bidders would need to be carried out by SIEA. | Technical and operational | Medium (5.1-20% of project value) | Medium |

| | | | |
|---|---|---|---|
| Mitigation Measure(s) | | | |
| SIG is pursuing a fixed price contract which would leave these risks with the developer. | | | |
| **Selected Risk Factor 3** Hydrology | | | |
| Description | Risk category | Level of impact | Probability of risk occurring |
| Drier conditions in some years/seasons than predicated averages will result in lower plant output and the need to utilize more expensive, nonrenewable diesel generation. | Technical and operational | Medium (5.1-20% of project value) | Medium |
| Mitigation Measure(s) | | | |
| Hydrological risks will be borne by SIEA in as much as the Project Company will be paid for available capacity. | | | |
| **Selected Risk Factor 4** Conservation of the upstream area | | | |
| Description | Risk category | Level of impact | Probability of risk occurring |
| The upward and downward migration of fish will be obstructed by the hydropower facility, affecting the fish population in the upstream river system. | Social and environmental | Low (<5% of project value) | High |
| Mitigation Measure(s) | | | |
| The area upstream of the dam will be the object of different measures to ensure sustainable management of the reservoir and adjoining watershed. The reservoir area will be the object of a specific management plan whereas the larger catchment area upstream will be subject to further studies to monitor and precisely determine project impacts and develop if required conservation initiatives with different interested parties, including the SIG. The primary means of maintaining upstream populations and facilitating migration will be a “trap and haul” system to be implemented by the operator with the support of local communities. Details are provided in the ESIA. | | | |
| **Selected Risk Factor 5** Compensation for land acquisition remains incomplete or contentious at the time of construction | | | |
| Description | Risk category | Level of impact | Probability of risk occurring |
| The SIG has made efforts to reduce the project’s footprint by limiting land acquisition to the core area that is required for hydropower facilities and access roads. The tribal leaders have used indigenous processes to establish the owners of the land in the core area and have signed a “Process Agreement” whereby the landowning tribes and SIG agree on the land acquisition process and its future management. The Commissioner of Lands has acquired the land in accordance with the Lands and Titles Act, the appeals process to challenge the acquisition has concluded with no appeal claims filed, and compensation is being | Social and environmental | Low (<5% of project value) | Medium |

| | | | |
|---|---|---|---|
| provided to the five tribes which were identified as customary owners of the core land. Two out of five tribes have received compensation so far and the funds to complete the compensation payments are being held in an escrow account. It is possible that the remaining three tribes continue to hold out and demand higher compensation than the amount offered by the Commissioner. This could entail the risk of disruptive behavior during construction and/or operation as a negotiation tactic. | | | |

Mitigation Measure(s)

SIG is engaged in ongoing discussions with members of all five tribes to ensure that funds are properly received that the remaining three tribes accept the compensation offered and the associated support in establishing tribal co-operative societies, bank accounts and financial management training. Under the Land and Titles Act the time limit for appeals against the award of compensation has expired and the compensation offered exceeds the minimum figure agreed between the parties in the terms of the Process Agreement. Details are provided in the LALRP.

**Other Potential Risks in the Horizon**

*Please describe other potential issues which will be monitored as "emerging risks" during the life of the projects (i.e., issues that have not yet raised to the level of "risk factor" but which will need monitoring). This could include issues related to external stakeholders such as project beneficiaries or the pool of potential contractors.*

At the moment, political support for the project is strong, but this could change depending upon unforeseen circumstances. Ongoing briefings of key government officials will be needed to monitor support and address concerns as they arise. SIEA's financial performance is much improved from previous years. However, this could change if problems of customer repayment recur, technical issues or poor financial management. Due diligence prior to World Bank project appraisal in mid-March will be conducted on SIEA's financial condition to ensure that PPA payments can be confidently met. SIEA's latest audit was unqualified and no concerns have been raised in the auditor's management letter.

** Please expand this sub-section when needed to address all potential material and relevant risks.*

## H.1. Logic Framework.

Please specify the logic framework in accordance with the GCF's Performance Measurement Framework under the Results Management Framework.

| H.1.1. Paradigm Shift Objectives and Impacts at the Fund level[4] | | | | | | |
|---|---|---|---|---|---|---|
| **Paradigm shift objectives** | | | | | | |
| *Shift to low-emission sustainable development pathways* | Please elaborate on the paradigm shift objectives to which the project/programme contributes.<br>The Project will drastically shift the balance of renewable energy in the Honiara-grid from only 3% in 2017 to 65% in 2022, including both hydropower and solar PV. This move to renewable energy will not only result in lower cost electricity tariffs, but reductions in carbon emissions that are nearly 2.5 times higher than SIG's commitment in the INDC of 18,800 $tCO_2eq$ per year by 2025 and about 60% higher than the target reduction of 31,125 $tCO_2eq$ per year by 2030 , This shift away from diesel generation will also lead to more stable, lower electricity prices to SIEA customers, with the final magnitude of savings to be assessed at the time of PPA signing between SIEA and the Project Company | | | | | |
| **Expected Result** | **Indicator** | **Means of Verification (MoV)** | **Baseline** | **Target** Mid-term (if applicable) | **Target** Final | **Assumptions** |
| **Fund-level impacts** | | | | | | |
| *M1.0 Reduced emissions through increased low-emission energy access and power generation* | M1.1 *Tonnes of carbon dioxide equivalent (t CO2eq) reduced or avoided from gender - sensitive energy access and power generation | Emissions reduced per KWh of hydropower reported by SIEA. | 0 | n/a | 2.48 million | 50 year project life, 100 year reservoir life, annual energy 78.35 GWh, EF of diesel 650 tCO2eq/GWh. Emissions reduction could be positively or negatively affected, depending upon SIEA's future choice of other generation options to meet gorwing demand. |
| | Volume of finance leveraged by Fund funding | Ministry of Finance and Treasury verification | 0 | n/a | $147.98 million | Combination of K-Water, IDA, ADB, EDCF, GoA, IRENA/ADFD. Adjustments (reductions or |

[4] Information on the Fund's expected results and indicators can be found in its Performance Measurement Frameworks available at the following link (Please note that some indicators are under refinement): http://www.gcfund.org/fileadmin/00_customer/documents/Operations/5.3_Initial_PMF.pdf

| | | | | | | |
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| | | | | | | increases) and exchange rate fluctuations may take place among any of these financiers before financial close. |

## H.1.2. Outcomes, Components Outputs, Activities and Inputs at Project/Programme level

| Expected Result | Indicator | Means of Verification (MoV) | Baseline | Target | | Assumptions |
|---|---|---|---|---|---|---|
| | | | | Mid-term (if applicable) | Final | |
| **Project/ programme outcomes** | **Outcomes that contribute to Fund-level impacts** | | | | | |
| M6.0 Increased number of small, medium and large low-emission power suppliers | M6.1 Proportion of low-emission power supply in a jurisdiction or market. | SIEA annual generation data. | 0% | n/a | 65% | Demand forecast of 120 GWh in 2022 when Project is commissioned, and Project's expected generation of 78.35 GWh. SIEA's new generation investments before hydropower plant commissioning would affect this outcome. |
| | M6.2 Number of households, and individuals (males and females) with improved access to low-emission energy sources | SIEA customer records | 0 | n/a | 180,000 | SIEA plans to increase the number of customers to 30,000. National average household size of 6.0 persons per household, conservatively. SIEA may not be able to reach this target as it depends on successful |

| | | | | | | |
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| | | | | | | achievement of an ambitious expansion plan. |
| | M6.3 MWs of low emission energy capacity installed, generated and/or rehabilitated | SIEA generation capacity reports | 1MW | n/a | 16MW | Project's 15MW hydro; and existing 1MWp solar being commissioned. Excluding future solar as their developments are dependent on various external factors. This amount could be higher if SIEA investments in additional solar PV in the years leading up to commissioning of the hydropower facility. |
| **Project/ programme components** | **Outputs that contribute to components** | | | | | |
| 1. Tina River Hydropower Plant is commissioned | 15 MW hydropower plant developed on the Tina River | Progress reports prepared by Project Company submitted to MMERE Project Office<br>Testing and commissioning | 0 MW | n/a | 15 MW | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | certification issued by SIEA | | | | |
| 2. Access Road is completed | 18.7 km of paved access road upgraded from Kukum Highway to Managakiki village and new road from Managakiki to Project site | MMERE quarterly project progress reports and completion reports submitted to AE | 0 km | n/a | 18.7 km | Detailed design completed by MID and procurement completed by MMERE Project Office |
| 3. Transmission Line is commissioned | 23 km of two parallel single-circuit transmission line from Project to Lungga Power Station | SIEA quarterly project progress reports and completion report submitted to AE | 0 km | n/a | 2X 23 km | Detailed design completed and procurement and construction conducted by SIEA |
| 4. Project management capacity is strengthened | Assistance provided to retain experts to ensure compliance with AE's policies on safeguards, fiduciary control, etc. and to support day-to-day operation of the MMERE Project Office | MMERE Project Office quarterly progress reports and completion report submitted to AE. | Panel of experts (POE) comprising 3 dam safety experts and two environmental and social experts retained for Project preparation | n/a | Same number of POE retained throughout Project implementation and initial years of operation | |
| **Activities** | **Description** | | **Inputs** | | **Description** | |
| **Output 1: Tina River Hydropower Plant commissioned** | | | | | | |
| 1.1 Sign PPA | Signing of PPA between Project Company and SIEA | | n/a | | | |
| 1.2 Financial close | Full underwriting of all debt | | Total project cost of $181.16 million | | | |
| 1.3. Procurement of EPC contractor | Project Company to procure an EPC contractor | | n/a | | | |
| 1.4. Execution of EPC contract | EPC contactor to design the Tina River Hydropower Plant | | n/a | | | |

| | | | |
|---|---|---|---|
| (major design items) | | | |
| 1.5 Execution of EPC contract (construction) | EPC contactor to procure and construct the Tina River Hydropower Plant | n/a | |
| 1.6 Commissioning | Testing and commissioning certification issued by SIEA | n/a | |
| **Output 2: Access Road completed** | | | |
| 2.1. Detailed design of access road | MID's design consultant to prepare detailed design of the access road | Self-financed by MMERE and managed by MID. | |
| 2.2. Procurement of civil works contractor | MMERE Project Office to procure civil works contractor | n/a | |
| 2.3 Execute works contract | Works contractor to construct access road | $25 million | |
| 2.4. Hand over | MMERE PO to accept hand-over of the access road | n/a | |
| **Output 3: Transmission Line commissioned** | | | |
| 3.1. Detailed design of transmission line | SIEA's design consultant to prepare tender design of the transmission line | Self-financed and managed by SIEA. | |
| 3.2. Procurement of supply and install contractor | SIEA to procure supply and install contractor | n/a | |
| 3.3 Construction of the transmission line | Supply and install contractor to construct the transmission line | $22.82 million | |
| 3.4 Testing and commissioning | Testing and commissioning certification issued by SIEA | n/a | |
| **Output 4: Project management capacity strengthened** | | | |
| 4.1 Project Office support (contracting of key personnel) | MMERE to recruit Project Manager, and PO to recruit key personnel | n/a | |
| 4.2 Project Office support (implementation) | Project Manager and key personnel to supervise progress of EPC contract and coordinate with relevant ministries to ensure Project Company's undertakings are appropriately executed | $2,5 million | Including operating cost of the Project Office for 4 years. |
| 4.3 Procurement of access road | MMERE PO to recruit consulting firm to assist with tendering of the access | n/a | |

| | | | |
|---|---|---|---|
| supervision consultants | road construction civil works contract and supervise the contractor's works | | |
| 4.4 Mobilization of supervision consultants | MMERE PO to mobilize consulting firm for tendering and supervision of civil works contract | $1.0 million | |
| 4.5. Procurement of panel of experts members | MMERE PO to recruit experts on (i) dam, (ii) geology, (iii) seismology, (iv) hydrology/sedimentology, (v) environment, and (vi) sociology | n/a | |
| 4.6. Periodic mobilization of panel of experts | MMERE PO to mobilize experts semi-annually during construction, at testing and commissioning, and annually during first five years of operation | $0.8 million | |
| 4.7. Procurement of independent monitoring agents | MMERE PO to recruit independent monitoring agents to monitor the Project Company's implementation of (i) environmental monitoring and management plan; (ii) land acquisition and livelihood restoration plan; and (iii) gender action plan | n/a | |
| 4.8. Semi-annual mobilization of independent monitoring agents | MMERE PO to mobilize the independent monitoring agents on a semi-annual basis during construction, at the time of testing and commissioning, and annually during first five years of operation | $0.7 million | |

## H.2. Arrangements for Monitoring, Reporting and Evaluation

*Besides the arrangements (e.g. semi-annual performance reports) laid out in AMA, please provide project/programme specific institutional setting and implementation arrangements for monitoring and reporting and evaluation. Please indicate how the interim/mid-term and final evaluations will be organized, including the timing.*

M&E arrangements will comply with the terms specified in the AMA between the World Bank and GCF once this documents are finally agreed and signed by the parties. MMERE will be the lead agency for SIG monitoring and regularly reporting to the World Bank and other stakeholders on overall Project progress. MMERE's reporting will include assessments of performance of the Project Company based on contractual arrangements, drawing on independent supervision reports, as well as the reporting by SIEA on transmission line construction and the road construction contractor. The World Bank will conduct regular (3-4 times per year over the five-year Project period) implementation support missions (ISMs) throughout the duration of the Project to identify and agree with SIG on implementation challenges and actions to address them. The World Bank will coordinate the participation of co-financiers for each mission, liaising with SIG to assess project performance through site visits, community consultations

and meetings with stakeholders. Each mission will conclude with the preparation of an Aide Memoire (summary report) which will be agreed with SIG and other stakeholders. MMERE will monitor overall Project progress, assess the work of SIEA, the access road construction firm, and engage specialists to monitor the construction and early operation of the power plant.

An independent, midterm review report will be contracted by SIG/MMERE and a mission to review the report and prepare its own MTR will be led by the World Bank in coordination with other co-financiers in the third year of the Project and a final evaluation will be conducted at the end of the five year implementation period.

*Please provide methodologies for monitoring and reporting of the key outcomes of the project/programme.*

MMERE and MECDM will monitor the GWhs of diesel displaced by the hydropower facility through reporting by SIEA on generation by source (e.g. diesel, hydro, solar). This data will be converted into GHG emissions reductions and reported by MECDM against national targets. Changes in retail electricity tariffs will be reported by SIEA, identifying the portion represented by the Project and the cost reduction compared to diesel. These cost savings will be calculated using a clear and transparent formula for determining benefit sharing transfers, and used as the basis for finalizing the annual benefit sharing transfer amounts. Specific aspects of PPA performance by the Project Company such as available capacity will be monitored by SIEA to ensure that the terms of the PPA are being honored and that any price adjustments are enacted, as needed.

## I. Supporting Documents for Funding Proposal

| | |
|---|---|
| ☒ | NDA No-objection Letter |
| ☒ | Feasibility Study |
| ☒ | Integrated Financial Model that provides sensitivity analysis of critical elements (xls format, if applicable) |
| ☒ | Confirmation letter or letter of commitment for co-financing commitment (If applicable) |
| ☒ | Project/Programme Confirmation/Term Sheet (including cost/budget breakdown, disbursement schedule, etc.) – *see the Accreditation Master Agreement, Annex I* |
| ☒ | Environmental and Social Impact Assessment (ESIA) or Environmental and Social Management Plan (If applicable) |
| ☐ | Appraisal Report or Due Diligence Report with recommendations (If applicable) |
| ☐ | Evaluation Report of the baseline project (If applicable) |
| ☒ | Map indicating the location of the project/programme |
| ☒ | Timetable of project/programme implementation |

** Please note that a funding proposal will be considered complete only upon receipt of all the applicable supporting documents.*

# No-objection letter issued by the national designated authority

**SOLOMON ISLANDS GOVERNMENT**
***GCF National Designated Authority***

**Our Ref:** GCF 1/2017 27 February 2017

The Green Climate Fund Secretariat
G-Tower, 175 Centre-daero
Yeonsu, Incheon, Republic of Korea

Dear Sir/Madam,

**Re: Funding proposal for the GCF by World Bank regarding Tina River Hydropower Project (TRHPP)**

I refer to the project Tina River Hydropower Project in Solomon Island as included in the funding proposal submitted by World Bank.

The undersigned is the duly authorized representative of the National Designated Authority of the Solomon Islands.

Pursuant to GCF decision B.08/10, the content of which I acknowledge to have reviewed, I hereby communicate our no-objection to the TRHPP as included in the funding proposal.
By communicating our no-objection, it is implied that:

(a) The government of Solomon Islands has no-objection to the project as included in the funding proposal;
(b) The TRHPP as included in the funding proposal is in conformity with Solomon Islands national priorities, strategies and plans, including our Nationally Determined Contribution, National Development Strategy and National Climate Change Policy;
(c) In accordance with the GCF's environmental and social safeguards, the TRHPP as included in the funding proposal is in conformity with relevant national laws and regulations.

I confirm that our national process for ascertaining no-objection to the TRHPP as included in the funding proposal has been duly followed. I also confirm that our no-objection applies to all project activities to be implemented within the scope of the TRHPP.

I acknowledge that this letter will be made publicly available on the GCF website.

Sincerely,

Dr. Melchior Mataki
**GCF/NDA**

**Ministry of Environment, Climate Change, Disaster Management & Meteorology, PO Box 21 Honiara, Tel: +677 23031/32, Email: mmataki@mecm.gov.sb, melmataki@gmail.com**

# Environmental and social report(s) disclosure

| Basic project/programme information | |
|---|---|
| **Project/programme title** | Tina River Hydropower Development Project (Solomon Islands) |
| **Accredited entity** | International Development Association (World Bank Group) |
| **Environmental and social safeguards (ESS) category** | Category A |

| **Environmental and Social Impact Assessment (ESIA)** | |
|---|---|
| Date of disclosure on accredited entity's website | 2016-08-15 |
| Language(s) of disclosure | English |
| Link to disclosure | http://documents.worldbank.org/curated/en/768061471430569820/Environmental-and-social-impact-assessment |
| **Environmental and Social Impact Assessment (ESMP) (included in ESIA above)** | |
| Date of disclosure on accredited entity's website | 2016-08-15 |
| Language(s) of disclosure | English |
| Link to disclosure | http://documents.worldbank.org/curated/en/768061471430569820/Environmental-and-social-impact-assessment |
| **Resettlement Action Plan (RAP)** | |
| Date of disclosure on accredited entity's website | 2016-08-15 |
| Language(s) of disclosure | English |
| Link to disclosure | http://documents.worldbank.org/curated/en/832721471415550419/Land-acquisition-and-livelihoods-restoration-plan |
| **Any other relevant ESS reports and/or disclosures (if applicable)** | |
| Description of report/disclosure | |
| Date of disclosure on accredited entity's website | Click here to enter a date. |
| Language(s) of disclosure | |
| Link to disclosure | http:// |