



Project Information Document (PID)

Concept Stage | Date Prepared/Updated: 27-Nov-2019 | Report No: PIDC28072



BASIC INFORMATION

A. Basic Project Data

Country Maldives	Project ID P172788	Parent Project ID (if any)	Project Name Innovation in Storage and Renewable Energy Technologies (P172788)
Region SOUTH ASIA	Estimated Appraisal Date Mar 02, 2020	Estimated Board Date May 27, 2020	Practice Area (Lead) Energy & Extractives
Financing Instrument Investment Project Financing	Borrower(s) Ministry of Finance	Implementing Agency Ministry of Environment, FENAKA Corporation Limited, State Electric Company Limited (STELCO)	

Proposed Development Objective(s)

The development objective is to increase generation capacity from renewable energy sources and facilitate integration of renewable energy.

PROJECT FINANCING DATA (US\$, Millions)

SUMMARY

Total Project Cost	117.00
Total Financing	117.00
of which IBRD/IDA	1.00
Financing Gap	0.00

DETAILS

Private Sector Investors/Shareholders

Equity	Amount	Debt	Amount
Non-Government Contributions	50.00	IFI Debt	11.00
Private Sector Equity	50.00	IDA (Credit/Grant)	1.00
		Other IFIs	10.00



		Trust Funds	20.00
Total	50.00		31.00

Payment/Security Guarantee

Financed by Government/SOE Contribution			36.00
IDA Credit Guarantee			36.00
Total			36.00

Environmental and Social Risk Classification

Moderate

Concept Review Decision

Track II-The review did authorize the preparation to continue

Other Decision (as needed)

Not applicable

B. Introduction and Context

Country Context

1. Maldives is an island state comprising 1,192 coral islands grouped into 26 atolls, spread across roughly 115,300 square kilometers of Indian Ocean. The Maldivian population, about 515,696 as of 2018, is widely dispersed across the islands, many of them quite remote, and physically vulnerable to rising sea levels. Eighty percent of the total land area of the country, which is less than 300 square kilometers, is lower than 1 meter above mean sea level. The country’s exposure to natural hazards and climate variability poses a threat to lives and the economy.

2. The extremely dispersed population and the congested capital city of Malé has led to a high cost of service delivery, increased vulnerability to the impact of climate change, and difficulty in creating jobs that match youth aspirations – with the youth unemployment currently at 15.3%. In this context, the government is proceeding with the Greater Malé development strategy to promote voluntary migration to larger islands. Under this strategy, the government is developing infrastructure, housing, and public services; and promoting economic development on the larger islands. The implementation of this strategy is costly and has led to an increase in debt.

3. Growth in Maldives is narrowly driven by the high-end tourism sector (gross value added of 23% in 2017) which is highly volatile. Real GDP growth over the past 5 years averaged at 6.3% supported by a mammoth government-led infrastructure investment program and it is expected to gradually decline to 5% over the medium term. The country has been experiencing persistent fiscal (4.7% GDP in 2018) and current account deficits (25.3% GDP in 2018); accumulation of public debts (72.2% in 2018); and weak foreign reserves (2.7 months of import cover) as a result of narrow economic diversification and inward-looking policies coupled with the burden of infrastructure-heavy imports.



4. According to the World Bank-IMF debt sustainability analysis, Maldives remains at high risk of debt distress. The country faces refinancing risk from international sovereign bonds including the Eurobond issued in 2017 combined with a low level of reserves and financing pressures from amortizations of guaranteed loans for major infrastructure projects. A Sovereign Development Fund has been set up with resources allocated to mitigate anticipated liquidity pressures. Together with the winding down of large-scale infrastructure, debt is assessed sustainable.

5. The government has been taking a more proactive approach to fiscal and public financial management reforms. In the last two years, the Maldives have implemented some measures to strengthen their fiscal position. Thereby, increasing resources for public investment and contained the debt to GDP ratio. The government has also taken steps to improve budget credibility and transparency. Fiscal out-turns are published monthly by the Ministry of Finance (MoF). MoF is also rolling out a new integrated financial management information system to support commitment controls and improve information and fiscal transparency. The Auditor General has published the audit reports on public debt and guarantees.

Sectoral and Institutional Context

6. While the Maldives achieved universal electrification in 2008, at 14-50 US cents/kWh it has one of the highest end-user tariffs in South and South-East Asia - despite significant subsidies at various levels. The total installed electric capacity of the inhabited islands is about 247MW, with the resort islands having an additional 144MW (which are managed independently of the government) and 20 MW on industrial islands. 95% of the installed capacity is dependent on diesel fuel. Total annual electricity consumption is 704 GWh in 2017, about 56 percent of which is accounted for by the Greater Male' area. Electricity demand is projected to grow 7 percent per annum.

7. **Despite high retail electricity tariff, the cost of electricity remains higher, leaving the electricity sector not financially sustainable due to insufficient cost recovery.** STELCO and FENAKA are the two utilities responsible for electricity delivery in the Greater Malé area and the outer islands respectively. Both receive subsidized diesel at 8MVR/liter for power production. While for the most efficient diesel generator in the Maldives estimated costs range of 23-33 US cents/kWh¹, for many of the outer islands costs are much higher and can be as high as 70 US cents/kWh. Thus, the high end-user tariffs quoted in the preceding paragraph are insufficient for cost recovery despite subsidy in diesel pricing and significant additional budgetary support for the utilities.

8. **High dependence on fossil fuel requires significant government subsidy to fuel and electricity.** With almost 95% reliance on diesel fuel for power generation, it results in electricity cost volatility and budget uncertainty as diesel imports range from US\$240-400 million annually. 75% of the fossil fuel imports by the Government of the Maldives (GoM) are for electricity generation and the rest for transport. Fuel subsidies together with additional subsidies to the electricity sector reached about US\$60 million, over 1% of the GDP. As fuel consumption continues to increase, the balance of payment is negatively impacted by increasing import bills and the scale of subsidy to fuel and electricity only increases and undermines fiscal space.

9. **A number of dispersed, small, isolated island-based grid systems pose challenges** in cost of electricity services and integration of renewable energy. STELCO manages 35 powerhouses in 35 islands. With the largest system in Male' for 81 MW, only four other islands have generation capacity larger than 1 MW and the rest 30

¹ On April 2, 2019, Brent Crude is \$69/bbl – corresponding to ~28 US cents/kWh for the most efficient diesel generator.



islands own less than 1 MW capacity. FENAKA operates 148 powerhouses to serve 152 outer island communities. Fuel must be continually supplied to these dispersed islands in small batches. Furthermore, the highly dispersed systems place challenges on system operation and flexibility. All these factors contribute to increasing overall cost of electricity service and limiting potential renewable energy penetration.

10. **The Government of the Maldives has a strong commitment to increasing renewable energy to address such challenges in the power sector.** Peaceful transition of power after the September 2018 elections has ushered in a new government that is prioritizing resilience and sustainability of the country. A transition away from a fossil fuel dominated energy sector towards renewables will be critical for both. Low-cost renewable electricity, in particular solar, can boost security of supply and resilience, diversify the energy mix, and reduce the delivered price of electricity - a government priority. The National Strategic Action Plan for the Maldives (2019-2023) includes a specific pillar for Clean Energy with clear renewable energy targets to increase the share of renewable energy by 20% compared to 2018 levels. The Minister of the Environment announced a target to increase the share of renewable energy to 70% by 2030 at the UN Climate Summit in September 2019. However, despite the government's larger clean energy ambitions as reflected in its NDC commitments and renewable energy targets, renewable energy is only 4.26% of the energy mix to date.

11. **There are still bottlenecks to scaling up renewable energy in the Maldives.** Due to fiscal constraints, public sector investment is limited in renewable energy. Mobilizing private sector investment is therefore important. However, the investment climate for the private sector is still developing and investors still face many challenges, including: i) high risk perception on political and off-taker risks; ii) insufficient cost recovery of electricity services; and iii) convertibility risk of payment in local currency. Furthermore, dispersed small grid systems are not technically capable enough to integrate significant variable renewable energy (VRE) while ensuring reliable supply at lower costs. To scale up renewable energy penetration, investment in grid systems is also required.

12. The Bank-financed Accelerating Sustainable Private Investment in Renewable Energy (ASPIRE) project (P145482) has been under implementation since its approval in 2014 to address the barriers and mobilize private sector investment in renewable energy. It has improved investment climate through risk mitigation and technical assistance and proved the private sector-oriented approach. Phase 1 sub-project of 1.5 MW of rooftop solar PV in Hulhumale' has been operational since March 2018. Phase 2 sub-project for 5 MW in Greater Malé is under tendering. The tariff of the Power Purchase Agreement (PPA) has significantly reduced from 21 US cents per kWh in Phase 1 to potentially 10.9 US cents per kWh, to be confirmed upon awarding, in Phase 2. The ASPIRE project has also mobilized private sector investment in IPPs first time ever in the areas served by the public utilities. However, its achievement has been limited to the Greater Male' area where the grid is large and capable enough to integrate a total of 6.5 MW of solar PV without technical constraints.

13. With support from the Energy Sector Management Assistance Program (ESMAP), the Bank has supported a preliminary assessment on battery energy storage solutions (BESS) in the context of the Maldives. The study² suggests that in the selected five islands there is a potential to integrate about 30 MW of solar PV through deploying battery storage with about 100 MWh capacity. Table 1 summarizes the key results from the study. The Executive Summary of the study was released by the Minister of Environment at the UN Climate Action Summit in September 2019. The findings of this study have informed the design of the project activities as well as pipeline development.

² World Bank. 2019. "Energy Storage Roadmap for the Maldives" World Bank, Washington, DC. License: Creative Commons Attribution CC BY 3.0 IGO



Table 1: Summary of Results - Energy Storage Roadmap for the Maldives

	Greater Male	Addu	Fuvahmulah	Hulhumeedhoo	Thimarafushi
PV Capacity* (MW)	10.0	11.6	5.0	2.0	1.0
BESS Capacity* (MW)	10.0	8.4	5.0	2.0	1.0
BESS Energy Capacity* (MWh)	40.0	33.6	20.0	8.0	4.0
Diesel Capacity* (MW)	191.3	24.0	7.6	1.6	1.2
Total Capacity* (MW)	211.3	44.0	17.8	5.6	3.2
PV Investment** (US\$ million)	14.3	16.8	8.4	3.4	1.7
Battery Investment** (US\$ million)	12.8	12.8	6.4	2.6	1.3
Total Diesel and Lube Oil Savings** (US\$ million)	32.2	34.0	18.8	8.0	3.4
CO ₂ Reduction** (kilotonnes)	140.2	163.5	89.5	37.3	14.8
PV+BESS LCOE (US\$/kWh)	0.140	0.097	0.111	0.111	0.111

LCOE: Levelized Cost of Energy; BESS: Battery Energy Storage Systems; PV: Photovoltaic

* Values are by year 2040 with the Hybrid case

** Values are over the period 2020 to 2040

Relationship to CPF and Higher Level Objectives

14. The proposed Project would support the following two broad engagement areas of the Maldives Revised Country Partnership Framework (CPF):

- (i) Pillar 2: Strengthening natural resource management and climate resilience – The Project aims to support electricity generation from RE and improve climate resilience by diversifying energy mix.
- (ii) Pillar 3: Strengthening Fiscal Sustainability – This Project aims to contribute to strengthening fiscal sustainability by reducing fossil fuel import and thus government subsidy to fossil fuel and electricity.

15. The Project is also aligned with:

- (i) GoM plans and targets under NDC, Strategic Action Plan and its announcement at UN Summit.
- (ii) Mobilizing Finance for Development (MFD): private sector investment will be mobilized for investment in solar PV by leveraging IDA and CTF climate finance
- (iii) Solar Risk Mitigation Initiative (SRMI): The activities are closely aligned to the global initiative developed by the Bank in partnership with AFD, IRENA and International Solar Alliance (ISA) and presents an opportunity for collaboration regarding the implementation of a sustainable solar roadmap in which private investments are leveraged through bankable, cost-optimized projects
- (iv) Global Battery Storage Program: Following the Bank’s commitment to US\$5 billion global battery storage program in 2018, the Project will be one of the first moving projects under the program

C. Proposed Development Objective(s)

16. The project development objective (PDO) for the Project is to increase generation capacity from renewable energy sources and facilitate integration of renewable energy.



Key Results (From PCN)

- 17. Project Development Results Indicators are:
 - (i) Cumulative Installed Generation Capacity of Solar PV
 - (ii) Private Capital Mobilized

D. Concept Description

18. The proposed Project would mobilize private sector investment in solar PV generation capacity, support BESS deployment and grid modernization to enable VRE integration and provide technical assistance for institutional capacity building and pipeline development. The Project design would allow to increase renewable energy penetration in island grid systems with technical constraints to absorbing renewable energy, and thus further scale up investment in renewable energy.

19. The proposed project is consisted of four components as described below.

20. **Component 1 – Solar PV Risk Mitigation (US\$36 million IDA Guarantee and US\$4 million CTF Contingent Recovery Grant).** This component aims to leverage the success of the previous World Bank programs in the Maldives (including the ASPIRE Project (P145482)) to support the government in increasing the solar PV capacity through private sector participation as independent power producers (IPPs). Component 1 will provide risk mitigation package to private sector IPPs which are selected through competitive tendering to install and operate solar PV generation facilities. This component covers various solar PV applications, including rooftop PV, land-based PV and floating PV, across all islands not only Greater Malé and larger islands, but also outer islands and atolls.

21. The structure of the risk mitigation package will be equivalent to that of the ASPIRE Project, which has been proven in the market. As part of the bidding package, a US\$36 million IDA Guarantee and US\$4 million CTF Contingent Recovery Grant will be provided. CTF Contingent Recovery Grant will be used to fund an escrow account to backstop short term payment delays by STELCO/FENAKA under power purchase agreements (PPAs). IDA Guarantee will be provided to partially cover termination events caused by defaults for which either STELCO/FENAKA or the Government of Maldives is responsible.

22. Bids will be prepared and executed in phases, and the Project will support the following multiple phases:

Phase	Scale/type	Location	Indicative Guarantee Amt
Phase 1	11 MW land based solar PV	Addu City, Fuvahmulah City, GDh. Thinadhoo, B. Eydhafushi, Lh. Hinnavaru, and HDh. Kulhudhufushi	US\$9m
	10 MW floating solar PV	Addu City	US\$11m
Phase 2	15 MW floating solar PV	Greater Malé Area	US\$16m
Total	36 MW		US\$36m

23. **Component 2 – Battery Energy Storage Systems (BESS) (US\$13 million CTF Loan).** This component will support deployment of BESS in Addu City and other islands to enable a high penetration of solar PV in the power system while ensuring reliable supply in a cost-efficient manner. As the share of renewable energy in the power system continues to grow, with support under Component 1, particularly rapidly in islands with a smaller grid,



integrating variable renewable energy (VRE) while maintaining or improving quality of service poses significant challenges to STELCO and FENAKA. BESS will be introduced to selected grid systems to provide ancillary services, load shifting and other benefits and address challenges in integrating VRE. A CTF concessional loan of US\$13 million will be provided to procure and operate about 30-40 MWh of BESS in the selected systems. To ensure a proper life cycle management of the BESS deployed under the Project, the contract with suppliers will include provisions on safety infrastructure during operation and used battery management and disposal in accordance with international standards.

24. **Component 3 – Grid Modernization for VRE Integration (US\$1 million IDA Credit and US\$10 million from other IFI co-financing).** This component will support grid upgrades and reinforcement to accommodate an increasing volume of renewable energy and BESS, especially for longer duration, in selected grid systems. The current grid systems in many islands are obsolete and insufficient to integrate a high share of solar PV and BESS and optimize grid operation among multiple sources of generation or supply. The existing grids across the Maldives will be assessed for investment requirements, considering a potential growth in electricity demand, renewable energy and electric vehicles (EVs). The main scope will include strengthening network capacity, deploying supervisory control and data acquisition (SCADA) systems and optimizing interactions among renewable energy generation, BESS and existing conventional power plants. As the penetration of solar PV increases, interconnection among islands will be also considered to improve system balancing and flexibility, which helps integration of solar PV. Charging stations can be also supported to promote the adoption of EVs and electric scooters and help efficiently manage their additional electricity load. The Bank is in discussion with other international financial institutions (IFIs) to provide loans to co-finance this Component.

25. **Component 4 – Technical Assistance (US\$3 million CTF Grant).** This component will focus on technical assistance (TA) support for (i) institutional capacity building for planning, implementing, operating, and monitoring power systems that can absorb increasing amounts of renewable energy and deploying BESS with appropriate risk management; (ii) development of pipeline that would cover identification of appropriate subproject sites, resource assessment, pre-feasibility work, aggregation of opportunities into saleable subproject bundles; (iii) technical assistance on supporting the development of sustainable energy sector, including but not limited to feasibility assessment of investment in EV charging stations and associated infrastructure, potential energy efficiency policies and engagement, and improving financial sustainability of the power sector; and (iv) project management cost.

Legal Operational Policies	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Areas OP 7.60	No

Summary of Screening of Environmental and Social Risks and Impacts

The proposed project activities include the conversion to solar energy to produce electricity via the establishment of floating, land and roof top solar energy generation systems, which will reduce the fossil fuel-based energy production dependency in the Maldives. The energy storage systems and grid upgradation work to the existing grid, can provide social and environmental benefits through the improvements of energy resilience and efficiency. They will also promote the increased use of clean electricity from renewable sources. Although specific information on subprojects such as the exact locations are unknown at this concept stage, the proposed subprojects are not likely to be complex. The footprint size of



proposed subprojects is expected to be small to medium in scale. Project sites including those to be selected for land based solar installation, BESS system installation and power houses and grid infrastructure will be on inhabited islands and in areas where anthropogenic activities have taken place already. Areas such as harbors, jetty areas and docks, are being explored as sites for the establishment of floating solar systems to ensure they are located away from sensitive lagoon and marine areas and other environmentally sensitive locations. Negative environmental impacts that have moderate risks are associated with the solar energy generation system investments. The grid upgradation works are expected to be localized in nature and arise only during the construction/upgradation stage and future decommissioning of the solar energy systems at the end of their lifetime. These impacts would be in the form of civil works related environmental impacts such as localized dust, noise and minor worker and public health and safety issues as well as waste generation. While the proposed Battery Energy Storage System (BESS) are not complex and are small in installation footprint, the environmental risks associated with this activity will be moderate in nature. In particular, potential fire and explosion risks and environmental hazards related to the disposal of used batteries containing hazardous waste will be mitigated via risk management measures that will include product specifications and “cradle to grave” provisions in the contracts of supplier for batteries used in the BESS and solar cells in accordance with International best practice. Due to these reasons the overall environmental risks and impacts have been assessed as moderate at the project concept stage.

The project is expected to have positive social impacts through the promotion and use of renewable energy technology which has been identified as the best solution in terms of cost-benefits and socio-environmental needs of the country. Risks associated with land acquisition and involuntary resettlement are not expected under the project but installation of solar panels in port areas, residential and commercial areas, poses risks in terms of disturbances to commercial activities, restriction on access to land or use of other resources. Other social risks such as exclusion of vulnerable groups from consultations and decision-making processes, insufficient coordination and engagement with different stakeholders, influx of labor, particular migrant workers and the concomitant issues of GBV, social tensions, burden on community resources and public utilities, are also important considerations for the project. At this stage, since the exact nature and location of the sub-projects is not known, the precise risks and impacts will be known only after the environment and social screening is carried out, as per the due diligence procedure mentioned in Section B.1.

The Ministry of Environment (ME) has demonstrated good capacity and experiences for successfully implementing World Bank safeguards and WBG ESHS Guidelines for over a decade. Sector specific E&S risks have also been successfully managed under the ASPIRE project. Further capacity is required on E&S due diligence, in line with the ESF, and associated supervision, via the project intervention with a specific focus on BESS system management which is being piloted via this operation.

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APPROVAL

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