FINANCIAL ANALYSIS

A. Introduction

1. The Majuro Advanced Metering Infrastructure (AMI) Project will finance 500 new smart meters, which would enable determining load patterns, and reduce power losses (both technical and non-technical) and ultimately thermal generation; and an advanced metering infrastructure center (AMIC) or control center, where the data from the smart meters can be analyzed and relayed to decision makers at Marshalls Energy Company (MEC), the electricity utility in Majuro.

2. Majuro, the capital of the Republic of the Marshall Islands (RMI), is the largest user of electricity in the island nation, with an annual demand of 53.7 GWh and peak demand of 8MW. Since Majuro's power generation is almost entirely thermal-based and therefore dependent on importation of fuel, the project benefits will be *reduced* generation to meet the required demand and therefore savings of fuel. The MEC is a government-owned, vertically integrated electricity utility that is the sole provider of electricity in Majuro. It will implement the project through the provision of labor in the installation of the smart meters, and in the subsequent data analysis and action to reduce losses. The smart meters will be procured under a turnkey contract and installed on all distribution transformers in Majuro. The financial analysis has been carried out in accordance with the *Financial Management and Analysis of Projects of the Asian Development Bank* (ADB).[1]

B. Methodology and major assumptions

3. All financial costs and benefits have been expressed in mid-2017 price levels. The project is analyzed over a 15-year period (excluding construction) with no residual value at the end of its economic lifetime. A without project and with project stream of cashflow was developed and the resultant incremental cashflow was discounted to its present value, and the Financial Internal Rate of Return (FIRR) and Financial Net Present Value (FNPV) are estimated to gauge the net benefit that MEC, as project owner, will derive from the project. In developing the without project cashflow it is assumed that (i) the average tariff will remain unchanged in constant prices at the 2016 level of $0.38/kWh, (ii) fuel consumption will remain at an average of 2012-2016 levels of 0.2502 kWh/litre and that fuel prices will change in accordance with the World Bank Commodity Price Forecast[2], and (iii) other costs of electricity production will remain unchanged from 2016 levels since these are fixed costs. In developing with the project cashflow, it is assumed that: (i) non-technical losses will reduce by 1% thereby adding an equivalent revenue from sales to the with project cashflow adjusted for bad debt of 5% thereon; (ii) technical losses will reduce by 3% equivalent to an annual saving in thermal generation of 1,780 MWh; and (iii) other costs of electricity production will increase by the O&M cost of the investment which is at 1% of its cost. The Weighted Average Cost of Capital (WACC) is determined based on the source and cost of financing, and is used as a benchmark to compare with FIRR and FNPV.

C. Financial Cost Benefits Analysis

I. Project Costs

4. The capital costs of the project totals $2.2 million, including the base cost (covering the AMI and AMIC, training, installation and commissioning services and consultancy services for supervision) and physical contingencies. Since the financial analysis is in constant prices, price

[1] ADB. 2005. *Financial Management and Analysis of Projects*. Manila.

[2] World Bank Commodity Price Forecast, April 2017

contingencies have been excluded. Cost of asset replacements have been factored into an annual operations & maintenance (O&M) cost, which is estimated at 1% of initial capital cost per annum.

II. Project Benefits

5. The project benefit would be reduced thermal generation due to the reduction of technical losses and additional sales revenue due to reduction of non-technical losses. The fuel savings from reduced technical losses will be a cash inflow to the project owner, MEC. In the absence of the project and the fuel savings that it generates, the MEC would continue to endure a cash outflow. The total electricity losses in the Majuro distribution are estimated at about 20%, of which some 7% are generation losses and the balance transmission and distribution losses, both technical and non-technical. It is assumed that the project will contribute to reducing technical losses by 3% and non-technical losses by 1%, for a total of 4%. The AMI could reduce technical losses by relaying data on distribution transformer loads, and where transformers need to be replaced or reconfigured. Non-technical losses could be reduced by measuring the electricity to customers in each distribution transformer and comparing it to customer meter readings. The financial benefit due to non-technical loss reduction has been valued using the average tariff in 2016 of $0.38/kWh. The financial benefit due to technical loss reduction has been valued using the cost of fuel in thermal generation, which is a function of the average fuel consumption and the cost of fuel. The average fuel consumption from 2012–2016 was 0.2502 kWh/litre and the cost of fuel was $0.43/L in 2016. It is assumed that the average fuel consumption will remain unchanged. The World Bank projects crude oil prices to increase from $45.7 per barrel (bbl) to $62.2/bbl by 2020, $64.2/bbl by 2025 and $66.0/bbl by 2030. It is assumed that prices will remain at this level after 2030. Based on these assumptions, annual fuel savings valued at approximately $240,000 based on an annual technical loss reduction of 1,780 MWh will accrue as a benefit to MEC. The annual benefit from non-technical loss reduction is $165,000.

III. Weighted Average Cost of Capital (WACC)

6. WACC of 1.0% has been calculated in real terms for the project (Table 1). Although the project is financed by ADB grant funds which are zero cost, ADB methodology requires that the project WACC should reflect the opportunity cost of funds. This has been estimated using the U.S. 20-year treasury rates since there is no bond market in the RMI. 85% of the project is funded by the ADB grant/TA and the balance through in-kind labor contributions by the RMI government/MEC. ADB forecasts 2.1% long term annual local inflation rate and 1.6% foreign inflation.[3]

Table 1: WACC

		ADB Grant	Government / MEC	Total
A.	Amount (USD million)	2.0	0.2	2.2
B.	Weighting (%)	89%	11%	100%
C.	Nominal cost (%)	2.65%	2.65%	
D.	Tax rate	0%	0%	
E.	Tax-adjusted nominal cost [C*(1-D)]	2.7%	2.7%	
F.	Inflation rate (%)	1.6%	2.1%	
G.	Real Cost [(1+E)/(1+F)-1)]	1.0%	0.5%	
H.	Weighted component of WACC	0.9%	0.1%	
Weighted Average Cost of Capital (Real)				**1.0%**

a. Nominal cost for grant from ADB and Government/MEC is based on a 20-year U.S. treasury yield (Source https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data)

[3] ADB cost escalation factors as of 2 June 2017.

b. Domestic and Foreign inflation rates in line with escalation rates published by the ADB Asian Development Outlook 2017.

IV. Financial Internal Rate of Return

7. The FIRR for the project is 15.2% and the FNPV, when discounted at the WACC, is $3.3 million (Table 2). This demonstrates that the project is financially viable to its developer/owner, MEC.

Table 2: Incremental Financial Analysis (2017 Constant USD 000's)

Year	Capital Cost	Cash Inflow	Cash Outflow	Net Cashflow (before tax)	Income Tax	Net Cashflow (after tax)
2017						
2018	(1,369.3)			(1,369,3)		(1,369.3)
2019	(342.3)			(342.3)		(342.3)
2020			(17.1)	(17.1)		(17.1)
2021		404.9	(17.1.)	387.7		387.7
2022		406.4	(17.1)	389.3		389.3
2023		407.9	(17.1)	390.8		390.8
2024		409.5	(17.1)	392.3		392.3
2025		411.4	(17.1)	394.2		394.2
2026		412.7	(17.1)	395.6		395.6
2027		414.1	(17.1)	397.0		397.0
2028		415.5	(17.1)	398.4		398.4
2029		416.9	(17.1)	399.8		399.8
2030		418.3	(17.1)	401.1		401.1
2031		418.3	(17.1)	401.1		401.1
2032		418.3	(17.1)	401.1		401.1
2033		418.3	(17.1)	401.1		401.1
2034		418.3	(17.1)	401.1		401.1
Net Present Value at WACC				USD '000s 3,271.9		
FIRR 15.2%						

8. **Sensitivity analysis**. A sensitivity analysis was carried out to test the robustness of the FIRR to adverse changes. The FIRR is most sensitive to changes the reduction of benefits through fuel savings. In the event that all adverse changes take place concurrently, the FIRR will not fall below the WACC and the project will still be financially viable.

Table 3: Sensitivity Analysis

	FIRR	FNPV ($ million)
Base Case	15.2%	3.3
10% increase in capital cost	13.7%	3.1
10% increase in O&M cost	15.2%	3.2
10% reduction benefits	13.5%	2.8
All of the above	12.0%	2.6