

FINANCIAL ANALYSIS

A. Introduction

1. The Upscaling Renewable Energy Sector Project comprises three outputs: (i) output 1: distributed renewable energy system developed, (ii) output 2: shallow-ground heat pump system developed, and (iii) output 3: institutional framework strengthened and organizational capacity enhanced. The Ministry of Energy (MOE) is the executing agency, and the Altai–Uliastai Energy System State-Owned Joint Stock Company (AUES), National Renewable Energy Center (NREC), and Western Region Energy System State-Owned Joint Stock Company (WRES) are the implementing agencies responsible for the day-to-day management of different project activities. The financial analysis was performed in accordance with the guidelines on financial management and analysis of projects of the Asian Development Bank (ADB).¹ Cost estimates are based on the results of ADB’s project preparatory technical assistance assessment done in April 2018.

2. The financial internal rate of return (FIRR) for each output (except output 3) and for the whole project was derived using incremental annual cash flows over the 25-year useful life for the distributed renewable energy system developed under output 1, and the 15-year useful life for the shallow-ground heat pump system developed under output 2. The FIRR was computed on an after-tax basis, in real terms, by converting nominal cost estimates and financial cash flows to real terms, and removing the impacts of inflation and potential currency fluctuation. The financial analysis model compared the project’s FIRR with the weighted average cost of capital (WACC). Sensitivity analyses were conducted to assess the impact of various adverse conditions on the project’s financial sustainability.

B. Key Assumptions

3. The whole project implementation period is 5 years. The project will be implemented under ADB’s sector loan modality, which enables time- and geographic-slicing for flexible project implementation. Output 1 will be implemented in two batches: (i) the first batch (2018–2021) for 25.5 megawatts (MW) of capacity, and (ii) the second batch (2019–2022) for 15 MW of capacity. Output 2 will be implemented in three batches: 100 kilowatts (kW) of capacity in Hovd (2019–2020), followed by a rollout of 400 kW of capacity in four *aimag* (province) centers in the western Mongolia.

4. The project will supply clean electricity in the remote and less-developed western and Altai–Uliastai regions of the country. Upon successful completion of the project, it will generate 98,769 MW-hours of clean electricity annually, thereby avoiding 87,968 tons of annual carbon dioxide emissions. The financial benefit of the project will be from the renewable power generation revenue of each subproject, valued at the projected end user tariff in real terms to meet full cost recovery targets of the government.² Power generation is assumed to decline annually by 0.2% because of the decline in the conversion efficiency of solar photovoltaic cells and the degradation of wind turbine efficiency over the entire life of the project.

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

² The tariff for electricity and heat is set by the Energy Regulatory Commission. In July 2015, the Energy Regulatory Commission commenced tariff reform, which aims to gradually increase tariffs on a full cost-recovery basis. In 2015, the government issued the State Policy on Energy, 2015–2030, which targets to achieve 0% net profit margin of state-owned utilities by 2023 and 5% by 2030.

5. Capital costs are based on investment costs estimated in the project feasibility study report and include costs for civil works, equipment and materials, installation, and other related expenses (e.g., design and technical services). In particular, these cover the (i) base cost, including the investment cost of solar panels, wind turbines, and heat pumps; (ii) line and substation extension costs; (iii) installation costs of the secondary battery storage and energy management system; (iv) other associated costs, including consulting services and project administration costs; (v) physical contingencies of 5%; and (vi) a value-added tax of 10% directly associated with the purchased equipment and services. Operation and maintenance costs include minor and major maintenance costs necessary to ensure reliable electricity supply. Major maintenance costs include replacement costs for battery packs after 15 years of full operation.

6. The total estimated project cost of \$66.22 million is assumed to be financed by an ADB sovereign loan of \$40.00 million (60.4% of total project cost), a grant of \$14.60 million (22.0%) to be provided by the Strategic Climate Fund,³ a grant of \$6.00 million (9.1%) to be provided by the Japan Fund for the Joint Crediting Mechanism, and the Government of Mongolia's contribution of \$5.63 million (8.5%).

7. The cost of the ADB loan is based on the current London-interbank offered rate on a 5-year fixed-rate swap plus the contractual ADB loan spread of 0.50% per annum, a maturity-based premium of 0.10% per annum, and a commitment fee of 0.15%. The loan maturity period is assumed to be 25 years, including a grace period of 5 years and a repayment period of 20 years, with equal principal payments. The cost of the equity contribution from the Government of Mongolia for financing tax and duties (para. 5) is assumed to be 14.00% per annum based upon the government's domestic 3-year togrog-denominated bond issued in 2017. The cost of equity for the United States dollar-denominated Scaling Up Renewable Energy Program in Low-Income Countries and the Japan Fund for the Joint Crediting Mechanism grant funding (para. 5) is assumed to be 5.63% per annum, which is based on the yield-to-maturity of the United States dollar-denominated international 5-year bond issued by the government in 2017. Since the financing structure differs in each subproject, the WACC was separately calculated for each subproject (Table 1).

Table 1: Projected Weighted Average Cost of Capital
(%)

	Whole Project	Umunogovi Wind	Altai Solar PV	Altai Soum (County) Hybrid	Uliastai Solar PV/Battery	Telmen Wind	Moron Solar PV	SGHP
WACC	4.77	4.89	4.89	3.76	4.81	3.76	3.76	5.90

PV = photovoltaic, SGHP = shallow-ground heat pump, WACC = weighted average cost of capital.

Source: Asian Development Bank estimates.

C. Financial Internal Rate of Return and Financial Net Present Value

8. The whole project's FIRR is 7.42%, which is higher than the estimated whole project WACC of 4.77% (Table 2). The financial net present value of the project was calculated using the estimated WACC as the discount rate, and results in MNT39,250 million. All subprojects are also financially viable compared to their respective WACCs (Table 3).

³ Under the Scaling Up Renewable Energy Program in Low-Income Countries. Administered by ADB.

**Table 2: Financial Analysis for the Whole Project
(MNT)**

Year	Capital Expenditure	Operational Outflow	Operational Inflow	Corporate Tax	Net Cash Flow
2018	137,543,089	-	-	-	(137,543,089)
2019	77,710,816,843	58,005,532	110,645,682	-	(77,658,176,693)
2020	62,230,333,128	78,494,451	231,190,053	-	(62,077,637,526)
2021	14,422,077,064	1,362,088,570	12,591,205,618	(70,814,745)	(3,122,145,270)
2022	429,285,311	2,150,645,686	20,404,203,967	1,191,093,034	16,633,179,935
2023	143,095,104	2,150,645,686	20,352,008,753	1,210,676,664	16,847,591,299
2041	-	2,067,029,006	15,599,786,470	777,204,961	12,755,552,503
2042	-	2,067,029,006	15,569,073,774	774,133,692	12,727,911,077
2043	-	2,067,029,006	15,538,422,503	771,068,565	12,700,324,933
2044	-	2,067,029,006	15,507,832,535	768,009,568	12,672,793,961
2045	-	2,067,029,006	15,604,844,482	777,710,762	12,760,104,714
2046	-	788,557,117	5,331,433,470	228,041,856	4,314,834,497
FIRR					7.42%
FNPV					39,250,913,681

() = negative, FIRR = financial internal rate of return, FNPV = financial net present value.

Source: Asian Development Bank estimates.

9. Sensitivity analyses were performed to test project financial viability to certain changes in parameters. The analyses showed that the whole project remains financially viable, with FIRRs exceeding the WACC under the following adverse conditions: (i) an increase in project capital costs by 10%, (ii) an increase in operation and maintenance costs by 10%, and (iii) a decrease in revenue by 10% (Table 3). Solar photovoltaic subprojects are sensitive to capital cost increases and energy yield declines.

**Table 3: Sensitivity Analysis of the Financial Internal Rate of Return
(%)**

Component	WACC	Base Case	10% CAPEX Increase	10% OPEX Increase	10% Energy Yield Decline
Whole project	4.77	7.42	6.37	7.25	6.01
Umunogovi wind power	4.89	10.03	8.87	9.99	8.61
Altai solar PV	4.89	6.22	5.17	5.91	4.67
Altai <i>soum</i> (county) solar PV-wind hybrid	3.76	4.00	3.14	3.33	2.29
Uliastai solar PV	4.81	6.03	4.99	5.75	4.52
Telmen wind power	3.76	7.83	6.82	7.77	6.58
Moron solar PV	3.76	4.99	4.10	4.72	3.67
Shallow-ground heat pumps	5.90	14.87	12.91	14.37	12.11

CAPEX = capital expenditures, OPEX = operating expenditures, PV = photovoltaic, WACC = weighted average cost of capital.

Source: Asian Development Bank estimates.

D. Financial Indicators of the Implementing Agencies

10. The financial sustainability of the implementing agencies—WRES, AUES, and NREC—using key financial indicators, both historical and projected, is detailed in tables 4–6.⁴

11. WRES and AUES have sufficient liquidity and low levels of debt, but gross and net profit margins have been negative because of the low level of the end user tariff. In 2015, the Parliament approved the State Policy on Energy, 2015–2030, which targets a 0% net profit margin of state-owned utilities by 2023, and 5% by 2030 (footnote 2). The financial projection for WRES and AUES assumes (i) annual electricity load demand growth is estimated at 5% up to 2030. The additional load demand by 2030, which cannot be met by the existing domestic capacity and the capacity addition resulting from the project, is assumed to be covered by electricity imports from the Russian Federation, (ii) current cost of (a) electricity generated from the existing domestic hydropower plants, (b) transmission and distribution, and (c) imported electricity from the Russian Federation are escalated using 8% of annual domestic inflation rate. Based upon these assumptions, gradual tariff increase schedules for the WRES and AUES were estimated to achieve the net profit margin targets in 2023 and 2030. The financial operations of the WRES and AUES are assumed to improve toward 2030 while meeting ADB's financial covenants.

12. NREC is a state-owned research institute for renewable energy-related research and development. It is the implementing agency for output 2, which is fully funded by a grant under the Scaling Up Renewable Energy Program in Low-Income Countries. Although the NREC has not attracted any long-term debt financing, it has a high share of short-term debt financing and has experienced a decline in total shareholders' equity caused by negative retained profits during 2012–2016 because of a reduced subsidy from the government. In early 2017, on top of the renewable energy-related research and development function of the NERC, the Ministry of Energy officially designated the NERC as the agent to carry out technical inspections and commissioning tests for all renewable energy power plants. This will become a major source of the NREC's operating income, since about 400 MW of new renewable energy projects are expected to start commercial operation before 2023. NREC's income and expenses from its core business up to 2030 have been modeled based on its 2018 business plan.

Table 4: Summary of Financial Performance and Projections
—Western Region Energy System State-Owned Joint Stock Company (MNT Billion)

Item	Actual					Forecast			
	2012	2013	2014	2015	2016	2017	2020	2023	2030
Income Statement									
Revenue and gains	11.79	13.08	14.72	19.25	20.11	17.31	32.26	43.91	84.01
Expenses and losses	12.68	16.65	18.57	19.70	21.32	22.10	34.64	43.87	80.36
Net Income	-0.89	-3.56	-3.86	-0.44	-1.21	-4.79	-2.37	0.04	3.65
Cash Flow Statement									
From operating activities	-6.33	-0.48	-1.54	0.31	2.95	-35.36	1.47	7.05	11.16
From investing activities	0.00	-0.03	-0.05	-0.04	-0.26	-0.08	-24.05	-0.12	-0.21
From financing activities	6.48	0.12	-0.02	0.00	-0.18	41.13	22.75	-1.89	-6.21
Ending cash balances	2.24	1.86	0.25	0.52	3.04	8.73	5.68	17.82	41.61
Balance Sheet									
Total current asset	5.81	4.17	2.70	3.99	6.26	11.10	9.44	24.22	54.41
Assets	81.05	80.17	73.71	82.22	82.00	83.89	173.90	170.31	157.81
Total current liability	1.25	1.54	1.94	0.91	1.08	4.10	6.23	9.23	16.17
Liabilities	45.45	45.64	37.90	36.86	36.85	36.45	78.78	85.77	78.28
Equities	35.61	34.52	35.81	45.36	45.15	47.44	40.00	36.15	47.28

⁴ Financial Management Assessment and Financial Performance and Projections (accessible from the list of linked documents in Appendix 2 of the report and recommendation of the President).

Item	Actual						Forecast		
	2012	2013	2014	2015	2016	2017	2020	2023	2030
Financial Ratios									
Net profit margin	-0.18	-0.62	-0.51	-0.04	-0.10	-0.55	-0.14	0.00	0.05
Current Ratio	4.64	2.71	1.39	4.39	5.82	2.71	1.51	2.62	3.37
Cash operating ratio	0.40	0.78	0.41	0.58	0.95	0.88	1.13	1.32	1.23
Debt to Total Capital	0.55	0.55	0.49	0.44	0.44	0.41	0.43	0.48	0.44
Debt service coverage ratio	-120.62	-220.82	-678.60	-225.98	-26.63	-6.79	1.02	2.16	1.86

Note: Actual financial data for 2012–2016 are based on audited financial statements.

Source: Asian Development Bank estimates.

Table 5: Summary of Financial Performance and Projections
—Altai–Uliastai Region Energy System State-Owned Joint Stock Company (MNT Billion)

Item	Actual						Forecast		
	2012	2013	2014	2015	2016	2017	2020	2023	2030
Income Statement									
Revenue and gains	9.11	4.22	12.30	9.96	9.92	7.07	14.30	29.80	45.31
Expenses and losses	10.90	10.00	16.47	13.71	12.46	9.19	17.41	29.79	43.04
Net Income	-1.79	-5.78	-4.18	-3.75	-2.53	-2.12	-3.11	0.01	2.27
Cash Flow Statement									
From operating activities	-1.19	-1.61	-0.16	0.13	0.66	-45.14	3.25	12.80	15.38
From investing activities	0.00	-0.45	-0.11	0.00	0.00	-0.21	-28.49	-0.31	-0.54
From financing activities	1.93	0.50	-0.35	-0.18	0.00	43.47	25.04	-5.37	-11.40
Ending cash balances	2.26	0.70	0.09	0.05	0.71	-1.17	1.53	25.99	51.75
Balance Sheet									
Total current asset	3.93	3.19	4.30	3.20	3.32	2.84	5.13	32.13	60.67
Assets	105.11	99.61	108.76	107.09	104.64	103.85	196.19	209.84	186.24
Total current liability	0.20	0.79	0.95	0.62	0.55	4.98	4.80	10.78	15.72
Liabilities	43.67	44.26	44.43	44.09	44.02	45.35	111.66	129.85	106.94
Equities	61.44	55.35	64.33	63.00	60.62	58.50	57.30	55.06	62.12
Financial Ratios									
Net profit margin	-0.18	-0.62	-0.51	-0.04	-0.10	-0.30	-0.27	0.00	0.05
Current Ratio	19.68	4.06	4.51	5.20	6.06	0.57	1.07	2.98	3.86
Cash operating ratio	0.23	0.67	0.29	0.43	0.81	1.38	1.82	2.93	2.02
Debt to Total Capital	0.41	0.44	0.40	0.41	0.42	0.41	0.56	0.60	0.53
Debt service coverage ratio	-543.87	-125.85	-32.46	-42.31	-19.19	3.46	1.05	1.44	1.34

Note: Actual financial data for 2012–2016 are based on audited financial statements.

Source: Asian Development Bank estimates.

Table 6: Summary of Financial Performance and Projections
—National Renewable Energy Center (MNT Billion)

Item	Actual						Forecast		
	2012	2013	2014	2015	2016	2017	2020	2023	2030
Income Statement									
Revenue and gains	1.002	1.115	1.631	0.337	0.314	0.878	1.375	1.880	2.866
Expenses and losses	0.875	1.108	1.581	0.657	0.503	0.560	1.158	1.640	2.679
Net Income	0.127	0.007	0.050	-0.320	-0.189	0.318	0.217	0.240	0.187
Cash Flow Statement									
From operating activities	-0.005	-0.173	-0.270	-0.207	-0.001	0.169	0.279	0.420	0.556
From investing activities	-0.027	0.005	0.002	0.000	0.000	0.000	-1.217	-0.653	-0.439
From financing activities	0.186	0.000	0.388	0.077	0.000	0.000	1.015	0.248	-0.065
Ending cash balances	0.180	0.012	0.132	0.002	0.001	0.170	0.441	0.580	0.679
Balance Sheet									
Total current asset	0.627	0.306	0.545	0.325	0.229	0.452	0.783	0.995	1.256
Assets	1.081	0.741	0.947	0.710	0.598	0.595	3.364	4.964	4.914
Total current liability	0.238	0.001	0.157	0.239	0.362	0.041	0.132	0.197	0.315
Liabilities	0.238	0.001	0.157	0.239	0.362	0.041	0.474	0.963	1.033
Equities	0.843	0.740	0.790	0.471	0.236	0.554	1.186	1.898	3.099
Financial Ratios									
Net profit margin	0.164	0.007	0.033	-1.142	-0.616	0.366	0.176	0.143	0.070
Current Ratio	2.636	218.920	3.461	1.360	0.633	10.967	5.920	5.059	3.987
Cash operating ratio	0.975	0.950	0.993	0.452	0.641	1.692	1.316	1.379	1.290
Debt to Total Capital	0.000	0.000	0.000	0.000	0.000	0.000	0.106	0.161	0.156
Debt service coverage ratio	-20.499	n/a	-2.416	-322.025	n/a	0.000	44.205	9.048	8.204

Note: Actual financial data for 2012–2016 are based on audited financial statements.

Source: Asian Development Bank estimates.