

FINANCIAL ANALYSIS

A. Introduction

1. The financial evaluation of the proposed investment was carried out in accordance with the Asian Development Bank (ADB) Guidelines for Financial Management and Analysis of Projects.¹ The evaluation covers the three components of the investment: (i) augmentation of transmission substation capacity for supply to the Kathmandu Valley; (ii) reconstruction and upgrade of medium-voltage and low-voltage distribution networks in the Kathmandu Valley (starting with the Ratnapark and Maharagunj distribution centers); and (iii) introduction of smart grid elements in the Kathmandu Valley and capacity building within the Nepal Electricity Authority (NEA) in relation to these technologies. The evaluation excludes the Japan Fund for Poverty Reduction (JFPR) grant to support gender inclusiveness.

B. Methodology and Major Assumptions

2. The overall objective of the project is to enhance the quantity and quality of power that NEA supplies to its customers in Kathmandu Valley. With this objective in mind and because of the inherent interconnectedness of each investment component, the financial evaluation was carried out for the project as a whole. This was done by comparing the project's financial internal rate of return (FIRR) against the investment's weighted average cost of capital (WACC). The sensitivity of the FIRR to adverse changes in the underlying assumptions was also assessed.

3. NEA's overall average revenue realization in fiscal year (FY) 2016 was NRs8.6 per kilowatt-hour (kWh). Average realization is significantly higher in Kathmandu Valley (NRs10.1 per kWh in FY2016) as a consequence of the generally higher levels of consumption and more favorable customer mix in Kathmandu compared with the rest of the country. An average 19% tariff increase granted by the Electricity Tariff Fixation Committee (ETFC) at the start of FY2017, the first increase for 4 years (and only the second in the last 16 years), will significantly improve realization.² The ETFC has stated that it intends to introduce an inflation-indexed automatic tariff adjustment formula in FY2018, and in this context (and to reflect the assumption adopted in the financial projections developed for NEA) tariffs are assumed to be constant in real terms from FY2018 onward. Sensitivity to this assumption was tested.

4. NEA does not produce a separate demand forecast for the Kathmandu Valley. In lieu of a specific demand forecast, an average growth rate of 9% was adopted to reflect NEA's expectation of faster demand growth in Kathmandu than in the rest of the country. This rate of growth appears reasonable given the high levels of suppressed demand as a consequence of years of significant load shedding imposed by NEA on its customers.³ Using conservative assumptions and in recognition of other investments that will be required to meet demand, cumulative load growth in the Kathmandu Valley was capped at 300% over the estimated base-year load of 400 megawatt (MW) for modeling purposes. Sensitivity to the demand growth rate was also tested.

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

² Because consumers in Kathmandu effectively cross-subsidize consumers in the rest of the country and given the nature of the tariff increase granted by the ETFC, the average tariff uplift in Kathmandu is likely to be significantly higher than 19%. However, for the purposes of this analysis an average increase of 19% was assumed.

³ Load shedding had historically been required because of supply-side constraints, but in recent years constraints on transmission and distribution networks also required load shedding from time to time.

5. The proposed project will add 270 megavolt-amperes (MVA) of primary substation capacity to the Kathmandu Valley (a 36% increase over the existing installed transformer capacity of primary substations). However, NEA will not be able to utilize all of this incremental capacity until corresponding downstream investments are made to increase the capacity of the distribution network in Kathmandu Valley. The proposed project includes reconstruction of two of NEA's 10 Kathmandu distribution centers (albeit two serving a number of high-value commercial customers).⁴ Based on the intended capacity of the upgraded medium-voltage circuits in these two distribution centers and on an assessment of spare distribution capacity elsewhere in the Kathmandu Valley, it is estimated that the project will allow NEA to meet an additional 90 MVA of demand in the valley. This translates to incremental annual electricity sales of approximately 600 gigawatt-hours (GWh) by 2030 (which represents 16% of NEA's total electricity sales in FY2016).

6. Further benefits accrue from the expected improvement in the quality of supply that the investment will bring, and in particular a reduction in the frequency and duration of medium-voltage and low-voltage outages in the two distribution centers to be rebuilt. At present, faults and overloads occur frequently as a consequence of poor network condition and inadequate capacity, resulting in prolonged outages for NEA's customers. To value this benefit, the estimated average outage frequency and duration on medium-voltage feeders was derived from raw data provided by NEA, and an 80% reduction was then assumed as a result of the investment (resulting in incremental electricity sales for NEA).

7. Loss reduction is expected to be significant in the two distribution centers included in the investment. Based on technical analysis undertaken over a 25-year span, a 25% reduction in technical losses is expected (i.e., a reduction from around 8% to 6%). With the adoption of underground cables and aerial bundled conductors for medium-voltage and low-voltage networks and the introduction of smart metering technology enabled for remote reading, commercial losses are also expected to decrease significantly—a 75% reduction is assumed, half of which is converted to sales (and the other half reducing NEA's electricity purchases).⁵

8. Cost streams used to determine the FIRR included land acquisition and development, civil works, equipment, incremental operational and maintenance costs, engineering consulting and project management costs, taxes and duties, and physical contingencies. Price contingencies and financial charges during construction were excluded. NEA has not paid corporate tax in recent years and is unlikely to do so for the foreseeable future. For this reason, corporate tax was excluded from the analysis and tax shields were ignored. Electricity supply costs were estimated, on a seasonal basis, using contracted power purchase rates from independent power producers (IPPs) and from the 456 MW Upper Tamakoshi project that is expected to be commissioned within the next 18 months (and is designed to provide dry-season peak energy and capacity to Kathmandu). Even though almost all IPPs' offtake rates are designed to decline in real terms over time, to take a conservative approach, rates were assumed to be constant in real terms from FY2021 (on the basis that other, more expensive generating plants will need to be progressively commissioned).

⁴ The rest of the Kathmandu Valley distribution network will be upgraded under future loans, and the rest of the primary transformation capacity will be taken up at that stage.

⁵ Under this project, NEA intends to procure a quantity of smart meters and distribution transformers beyond the requirements of the two distribution centers to be rebuilt under this loan (Maharajanj and Ratnapark). Because other network investments are expected to be necessary to fully capture their benefits, only the costs of these additional smart meters and transformers are included in this analysis.

C. Weighted Average Cost of Capital

9. The WACC was calculated for the overall investment in real terms. The government is expected to relend to NEA on a back-to-back basis, with the foreign exchange risk passed on to NEA.⁶ The government adds a 0.25% service charge to the interest rate of the final loan (but not to the rate used to calculate interest during construction). A cost of equity of 11.75% was adopted for the 2014 South Asia Subregional Economic Cooperation Power System Expansion Project loan, calculated by adding issuing costs (1.50%) and a risk premium (2.50%) to the rate at which NEA issued its 2008 domestic bond (7.75%).⁷ Recent government development bonds have been issued at very low interest rates—4.94% for 15-year maturity issued in April/May 2016. Treasury bills have recently been trading at rates as low as 0.779% (July 2016). These rates reflect excessive liquidity; given that domestic inflation is in excess of 7%, real rates are negative. In this context, a conservative approach was taken to estimate the cost of equity; a nominal risk-free cost of 7.5% was assumed (almost 0% in real terms) plus a 4.0% premium to cover risks and issuing costs (as assumed in 2014) giving a nominal cost of equity 11.5%.

10. Table 1 shows the WACC calculation.

Table 1: Weighted Average Cost of Capital

Item	Amount (\$ million)	Weight (%)	Pre-Tax Nominal Cost (%)	Tax Rate (%)	Post-Tax Real Cost (%)	Weighted Cost (%)
ADB concessional OCR loan	150.0	79.4	1.8	0.0	0.3	0.2
Equity	34.0	20.6	11.5	0.0	1.5	0.3
Total	154.0	100.0				0.5

OCR = ordinary capital resources, WACC = weighted average cost of capital.

Source: Asian Development Bank estimates.

D. Financial Internal Rate of Return

11. Incremental cash flows attributable to the investment were estimated based on the assumptions outlined above. The aggregate cash flow, shown in Table 2, yields an FIRR of 7.9%, which is above the WACC of 0.5%, suggesting that the investment is financially viable.

Table 2: Aggregate Financial Internal Rate of Return Calculation

(NRs million)

Year ^a	Benefits		Costs		Net Cash Flow
	Incremental Revenue	Capital	O & M	Electricity Purchases	
2017	0	2,319	0	0	(2,319)
2018	0	3,520	0	0	(3,520)
2019	0	5,681	0	0	(5,681)
2020	5	6,042	205	(25)	(6,216)
2021	299	1,625	313	88	(1,726)
2014	6,681	0	342	2,465	3,857
				Terminal value	1,343
				FIRR (post-tax real)	7.9%
				FPNV	34,481

() = negative, FIRR = financial internal rate of return, FNPV = financial net present value, O&M = operation and maintenance

^a Selected years shown for brevity.

Source: Asian Development Bank estimates.

⁶ NEA repays in local currency at the prevailing exchange rate of the day (NEA is not allowed to deal in foreign currency).

⁷ This bond was never traded on the secondary market and was redeemed in full in 2013.

E. Sensitivity Analysis

12. The investment's financial performance is sensitive to the assumed electricity tariff path. Historically, NEA's financial performance has been hindered by electricity tariffs set well below cost-recovery levels. Since 2012, the average tariff has risen by 43% through a 20% increase introduced in FY2013 and a 19% increase in FY2017. However, because the tariff had not been raised for 12 years prior to FY2013 and in the context of domestic inflation in the range of 6%–10%, real tariffs are still too low (and have declined in real terms over the past 15 years). As noted above, guidance from the ETFC is that an automatic inflation-indexed tariff adjustment mechanism will be introduced from FY2018, but that may not happen. Therefore, analysis was undertaken to test the impact of a lower tariff trajectory. Analyses were also carried out to examine the sensitivity of the FIRR to changes in the assumed values of capital and incremental operation and maintenance expenditure (10% increases were tested), a 1-year delay in implementation, and lower demand growth than expected. Electricity purchase costs could also vary significantly from the rates assumed in the base case, particularly if delays in commissioning domestic hydropower plants require ongoing bulk importation from India to continue to bridge supply deficits (and in this context, a 50% average increase in supply costs was tested). Table 3 shows the results of the sensitivity analysis. The project's FIRR exceeds the WACC in the base case and under most sensitivities test. Tariff remains a material risk to project viability.

Table 3: Sensitivity Analysis

Sensitivity Parameter	Variation	FIRR (%)	FNPV (NRs m)	FIRR SV (%)
Base case		7.9	34,481	
1. Annual tariff increases lower than expected	(50%) ^a	(1.8)	(5,003)	(38.6)
2. Project capital costs higher than expected	+10%	7.0	31,891	85.5
3. Electricity purchase costs higher than expected	+50%	4.8	17,165	122.1
4. O&M costs higher than expected	+10%	7.7	33,787	541.5
5. Delay in commissioning	1 year	5.5	22,300	
6. Demand growth lower than expected	(25%) ^b	5.1	21,337	(66.7)

() = negative, FIRR = financial internal rate of return, FNPV = financial internal rate of return, m = million, O&M = operation and maintenance, SV = switching value

^a The base case assumed annual increases equal to the rate of domestic inflation, approximately 7% per annum. For this sensitivity, annual increases at 50% of the rate of domestic inflation were tested.

^b The base case assumed demand growth of 9% per annum. Demand growth of 75% of 9% (6.75%) was tested here. Source: Asian Development Bank estimates.

F. Conclusions

13. The financial analysis demonstrates the relatively high financial value to NEA of improving electricity supply to the Kathmandu Valley (as a result of the higher load densities and revenue yields in Kathmandu compared with the rest of the country). Tariff trajectory remains a risk, however, and in this context ongoing dialogue with the ETFC and the government is required to ensure that recent positive signals with respect to electricity price regulation are translated into action.

G. Financial Performance and Projections of Nepal Electricity Authority

14. NEA continues to incur accounting losses and does not generate sufficient cash flow to meet its self-financing and investment requirements, nor is it able to meet interest costs on long-term borrowing from the government. NEA's balance sheet contains long-term debt that is

unlikely to ever be repaid, and equity capital that is overstated in value, financing overvalued fixed assets against which a commercial return is unlikely to ever be earned (and the depreciation of which is unlikely to be recovered through consumer tariffs).

15. Ten-year financial projections were developed for NEA and are summarized in Table 4. Even with an assumption of annual tariff increases (and the one-off increase of 19% in FY2017 that has already been implemented), the government's equity position in NEA is forecast to continue to erode as losses accumulate. The forecast net equity position by FY2026 is NRs22 billion, despite an assumption of new equity injections of NRs63 billion over the forecast period. As concluded in previous assessments, significant balance sheet restructuring is required—a write-off of long-term debt and interest arrears, conversion of some long-term debt to equity, and a write-down (impairment) of the carrying value of fixed assets to reflect their condition (particularly in the case of some hydropower assets) and their revenue-earning potential.

Table 4: Summarized Financial Projections for Nepal Electricity Authority, fiscal years 2017–2026

Item	FY2017	FY2018	FY2019	FY2020	...FY2026
	Forecast ^a				
Commercial					
Electricity sales (GWh)	4,174	4,977	6,192	6,712	7,850
Average revenue per unit sold (NRs/kWh)	10.0	10.7	11.4	12.2	18.3
Average cost per unit sold ^b (NRs/kWh)	14.2	13.4	11.8	12.2	16.2
Financial					
Revenue (NRs m)	44,568	56,282	73,895	85,117	146,634
Operating expenses (NRs m)	51,135	57,190	61,563	68,716	107,406
Operating profit (NRs m)	(6,567)	(908)	12,332	16,401	39,228
Overheads (NRs m)	4,184	4,100	4,422	4,782	7,187
Depreciation (NRs m)	4,082	5,602	7,141	8,667	12,863
Finance costs including FX (NRs m)	3,774	5,347	7,255	9,137	17,930
Net profit before tax (NRs m)	(18,606)	(15,956)	(6,486)	(6,185)	1,248
Capital expenditure (NRs m)	44,515	45,235	39,692	34,556	0
Operating cash flow (NRs m)	(6,400)	(8,635)	(946)	7,914	17,341
Net cash flow (NRs m)	(5,444)	(6,750)	948	12,814	17,341
Interest and royalty arrears (NRs m)	39,800	45,147	52,182	61,106	61,106
Current assets (NRs m)	28,030	26,982	37,496	56,594	144,083
Current liabilities (NRs m)	87,023	94,444	102,189	113,693	125,699
Fixed assets (NRs m)	215,842	255,476	288,026	313,915	304,204
Long-term liabilities (NRs m)	143,828	178,755	210,489	240,196	300,313
Capital and reserves (NRs m)	13,021	9,259	12,844	16,620	22,276
Return on average net fixed assets ^c	(11%)	(4%)	5%	5%	11%
Debt-service coverage ratio ^d	(1.68)	(0.58)	0.61	0.70	1.28
Debt–equity ratio ^e	68:32	69:31	70:30	70:30	72:28
Receivable days	120	120	120	120	120

() = negative, FX = foreign exchange, GWh = gigawatt-hour, kWh = kilowatt-hour, m = million, NEA = Nepal Electricity Authority.

^a Selected years shown for brevity.

^b Includes cost of sales, operating costs, administration costs, and depreciation. Finance costs are excluded.

^c Calculated as earnings before interest, tax, and depreciation divided by closing net fixed assets.

^d Calculated as earnings before interest, tax, and depreciation divided by interest and principal payments due.

^e Long-term debt divided by equity net of accumulated profits/losses.

Note: "FY" denotes the fiscal year ending on 15 July of the calendar year indicated.

Source: Asian Development Bank staff estimates.