FINANCIAL ANALYSIS

A.   Introduction

1.   The financial analysis of the Sarmarkand Solar Power Project was conducted in accordance with the *Financial Management and Analysis of Projects* (2005) of the Asian Development Bank (ADB). The project was assessed based on a with-project and without-project scenario comparison of the cost of delivering the project revenue. The financial viability was gauged against the weighted average cost of capital (WACC). The levelized energy cost (LEC) was also examined. A sensitivity analysis was carried out to examine financial viability when costs increase as well as when revenue decreases.[1]

2.   The project will construct a 100 megawatt solar photovoltaic power plant. The plant will be located in Samarkand and be connected to Uzbekistan's national power grid. The power plant is expected to be commissioned in 2016; it will be operated and maintained by the turnkey contractor for the first 3 years, after which operation and maintenance (O&M) will be handed over to the project executing agency.

3.   The executing agency is the State Joint-Stock Company Uzbekenergo, a vertically integrated 100% state-owned utility. With an installed power generation capacity of 12,600 megawatts, Uzbekenergo produced 51,980 gigawatt-hours (GWh) of electricity in 2012. The financial analysis was carried out from the perspective of Uzbekenergo.

B.   Method and Assumptions

4.   For the purpose of the financial analysis based on the with-project and without-project scenario comparison, only the incremental cost and revenue (the cost and revenue that are attributed to the project and would not occur if the project were not implemented) have been considered.[2]

5.   The cost and revenue streams are set up as annual cash flows over the project life of 25 years after the project commissioning and are then discounted to their net present value. The base year for discounting is 2013. The cost and revenue are expressed in 2013 constant prices.

6.   The capital outlay of the project extends over 5 years (2015–2019). The financial internal rate of return analysis includes the (i) cost of the solar photovoltaic power plant turnkey contract; (ii) transmission line equipment supply and installation works; (iii) supporting infrastructure, e.g., access roads, fences, telecommunication, water supply; (iv) costs of environmental and social mitigation measures; (v) consulting services; (vi) land acquisition; (vii) recurrent cost; (viii) local taxes; (ix) duties; and (x) physical contingencies. It excludes price contingencies and financial costs such as the interest during construction and the commitment charges.

7.   The O&M costs during the operation period (2016–2040) comprise labor, spare parts, insurance, and other operational expenses (communications, water, office supplies). While exemptions are expected, local taxes (including property tax and land tax) are also calculated.

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[1] This section was prepared during the project fact-finding mission in June 2013, based on supports provided by ADB. 2011. *Technical Assistance to the Republic of Uzbekistan for Solar Energy Development.* Manila.

[2] In the long term, however, under the renewable energy policy that aims to increase the share of renewable power in the generation mix, up to 21% by 2031, the government expects solar energy to play a significant role in substituting natural gas-fired power plants and contributing to fuel saving, which may in turn allow Uzbekistan to export more gas to enhance foreign exchange earnings.

The plant's first 3 years of operation will be managed by the solar photovoltaic turnkey contractor. The contractor will ensure the plant generates the output guaranteed according to the contract and will provide on-the-job training to the Uzbekenergo staff for the smooth transfer and operation of the power plant. The O&M costs are estimated to be $1.7 million during the first 3 years of operation and $1.4 million thereafter.

8.   No variable O&M costs are considered except for the transmission and distribution costs of delivering the electricity produced at the power plant. Considering that the project site is relatively close to the load center (Samarkand) and the transmission loss is thus marginal, the transmission and distribution cost is assumed at $0.018 per kilowatt-hour (kWh) produced or about 30% of end-user tariff.

9.   The project revenue assumes that the power generated from the power plant feeds into the national grid and is sold to the customers as a part of the generation mix. With 1,591 equivalent hours of expected power generation, the un-derated energy is 159 GWh, which will be derated at 0.5% per annum. This comprises 0.3% of the overall 52,800 GWh power generated (2016 forecast). The end-user tariff, estimated at $0.06 per kWh for 2016, is assumed to increase by 0.5% per annum in real terms.[3] System losses and tariff collection losses are taken into consideration to estimate the project revenue stream.[4]

10.   The benefits on carbon reduction and fuel savings are not included in the analysis. Assessing these benefits would require a comparison with an alternative scenario for generating the same amount of power (e.g., using a conventional gas-fired thermal power plant or a combined cycle gas turbine). Moreover, externalities or foreign exchange earnings are not incorporated in the analysis because these will not benefit Uzbekenergo.

C.   Weighted Average Cost of Capital

11.   For the financial analysis, the WACC is estimated as the discount rate. The project is expected to be funded by ADB's Asian Development Fund (ADF) loan, the Uzbekistan Fund for Reconstruction and Development (UFRD), Uzbekenergo's internal sources, and the government. The cost of funding for the ADF loan is assumed to be 2.5% including a margin of 0.5% to be added on relending from the government to Uzbekenergo. UFRD's loan interest rate is 2.5% including a fee for a commercial bank through which the UFRD loan will be administered, matching the ADF relending rate to Uzbekenergo. The corporate tax applied to Uzbekenergo is 9%, and the social infrastructure tax applied to Uzbekenergo is 8%. The cost of funding for both Uzbekenergo and the government is assumed at 12%, which was the prevailing central bank's refinancing rate at the time of fact finding. The cost of funding respectively weighted and adjusted for inflation according to the standard WACC derivation method is 0.7% (Table 1).

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[3] This is a conservative assumption considering the historical average end-user tariff increase for 2004–2012 has been 5% in real terms in US dollars. When the 159 GWh generated from the power plant is added to the national grid, the overall average generation cost is estimated to increase by 0.5%.
[4] The Advanced Electricity Metering Program, supported by ADB and other international financial institutions, is expected to improve both system losses and tariff collection losses to 5% each, from the current 15% and 10%, respectively.

Table 1: Weighted Average Cost of Capital of the Project

	Financing component	ADF	UFRD	UE	GOU	Total
A.	Amount ($ million)	110.00	130.00	26.00	44.00	310.00
B.	Weighting (%)	35.50%	41.90%	8.40%	14.20%	100.00%
C.	Nominal cost (%)	2.50%	2.50%	12.00%	12.00%	
D.	Tax rate (%)	16.30%	16.30%	0.00%	0.00%	
E.	Tax-adjusted nominal cost [C x (1-D)]	2.10%	2.10%	12.00%	12.00%	
F.	Inflation rate (%)	1.90%	1.90%	9.50%	9.50%	
G.	Real cost (%) [(1+E)/(1+F)-1]	0.20%	0.20%	2.28%	2.30%	
H.	Weighted component of WACC (%)	0.07%	0.08%	0.19%	0.32%	0.66%
	WACC (real)					**0.70%**

ADF = Asian Development Fund, GOU = Government of Uzbekistan, UE = Uzbekenergo, UFRD = Fund for Reconstruction and Development of the Republic of Uzbekistan, WACC = weighted average cost of capital.
Source: Asian Development Bank and Technical Assistance consultant estimates.

D.   Results

1.   Levelized Energy Cost

12.   The LEC[5] for the overall project cost is $0.118 per kWh. When taxes that are expected to be exempted are excluded, the LEC is reduced to $0.079 per kWh. The LEC for the solar photovoltaic turnkey contract alone (excluding consulting services, taxes, etc.) is estimated at $0.066 per kWh. The LEC for the project is relatively low for a solar photovoltaic project. This is mainly because the cost of capital for this project is concessional, and the WACC discount rate is low. However, the project financial viability requires the average user tariff, which is assumed at $0.06 per kWh in 2016 and which increases 0.5 % annually thereafter, needs to be higher than the LEC for the overall project cost.

2.   Financial Internal Rate of Return

13.   The financial internal rate of return is calculated at -10.7%, indicating the project is not financially viable. This is not surprising considering that LEC is higher than the average user tariff. The switching value analysis shows the investment cost needs to decrease by 70%, or the revenue needs to increase by 250%, to make the project viable.

3.   The Impact on Cost of Power Generation

14.   The revenue generated out of the energy produced from the power plant is not sufficient by itself to cover the project costs. Tax exemptions and cross subsidies within the generation mix is necessary to ensure the financial viability of Uzbekenergo. Given the small size of the power plant relative to the overall installed capacity and power generation of Uzbekenergo, the cost impact of the project on the financial sustainability of Uzbekenergo is insignificant. Indeed, the project is expected to increase the weighted average cost of power generation (currently estimated at $0.0255 per kWh) by 0.5% or $0.0001125 per kWh. The average user tariff in 2013 is $0.055 per kWh, and the tariff has continued to increase at 5% per annum in real terms, which will ensure the financial viability of Uzbekenergo.[6]

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[5] The LEC is defined as the constant price per unit of energy that causes an investment or a payment stream to just break even, i.e. earn a present discounted value equal to zero.
[6] Also see the supplementary appendix for the financial projection of Uzbekenergo.

E.   Conclusion

15.   The LEC for the overall project is $0.118 per kWh inclusive of taxes and $0.079 per kWh exclusive of taxes.[7] When the 159 GWh[8] generated from the power plant is added to the national grid, the overall average cost of generation increases by 0.5%. Uzbekenergo is able to absorb this increase in the weighted average cost of generation.

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[7] The effective LEC for the solar Engineering-Procurement-Construction contract, excluding taxes that are expected to be exempted, is $0.066 /kWh.

[8] The expected un-derated power generation is 159 GWh. The power plant is expected to be derated by 0.5% per annum, and this is assumed in the model. The power generation forecasted in 2016 in Uzbekistan is 52,800 GWh.