

## FINANCIAL ANALYSIS

### A. General

1. This paper describes the results and assumptions used in the financial analysis of the Qinghai Delingha Concentrated Solar Thermal Power Project. The financial analysis was prepared in accordance with the Asian Development Bank (ADB) *Financial Management and Analysis of Projects*.<sup>1</sup> All costs and prices are expressed in real 2013 prices for the calculation of the financial internal rate of return (FIRR) and the financial net present value (FNPV). Cost estimates are based on the assessment carried out under ADB project preparatory technical assistance in May 2012.<sup>2</sup> The economic life of the project is estimated at 25 years, with no residual value assumed for the civil works and land-use right.

### B. Revenues and Costs

2. The project will generate revenue from the sale of electricity generated by the power plant, based on projected yearly net generation of 36.02 gigawatt-hours (GWh) in 2016 and 197.27 GWh from 2017 onwards, with a gross tariff of CNY1.15 per kilowatt-hour (kWh), including 17% value-added tax (VAT)—equal to a net tariff, excluding VAT, of CNY0.98kWh. It is expected that this tariff will be inflation indexed. As the lifetime of a concentrated solar thermal power (CSP) plant is 25 years, under good feed-in tariff legislation, annual tariff payments are adjusted for inflation.<sup>3</sup> This tariff for the project is assumed in the feasibility study report approved in February 2013. Although a feed-in tariff for CSP has not yet been announced, a feed-in tariff for solar photovoltaic technology of CNY1.0/kWh was approved in December 2011. Based on international experience with solar feed-in tariffs, such as in Spain and the United States, the feed-in tariff for CSP is expected to be 30%–50% higher than that for solar photovoltaic, and is likely to be announced in 2014.

3. The cash inflow for the first years of operations, 2016–2021, includes the estimated VAT refund to the company for its procured equipment.

4. The capital cost includes physical contingencies, but excludes price contingencies and financial charges during development. Operation and maintenance costs include personnel salaries and welfare costs, plant and equipment maintenance costs, administration, insurance, taxes, and other expenses.

5. Operating costs include (i) annual fixed costs, including personnel, insurance, external services, preventive and major maintenance, spare parts, consumables, supplies, and other costs; (ii) the annual variable operating cost for general maintenance, spare parts, and consumables; (iii) costs for parasitic power consumption, which will be taken from the grid; and (iv) gas and water consumption costs. The FIRR calculation excludes VAT on utilities.

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<sup>1</sup> ADB. 2005. *Financial Management and Analysis of Projects*. Manila.

<sup>2</sup> ADB. 2012. *Technical Assistance to the People's Republic of China for Preparing the Qinghai Delingha Concentrated Solar Thermal Plant Project*. Manila

<sup>3</sup> See also M. Mendonca, D. Jacobs, and B. Sovacool. 2010. *Powering the Green Economy: The Feed-In Tariff Handbook*. London and Washington, DC.

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

6. The FIRR and FNPV of the project were calculated in real terms (Table 1). The FIRR is 4.82%, higher than the weighted average cost of capital (WACC) estimated at 1.97%, and the FNPV is CNY581.69 million at this WACC. Thus, the project is considered financially feasible.

**Table 1: Projected Cash Flow**  
(CNY million)

Period Start	Period End	Cash Outflow	CAPEX	OPEX	Tax	VAT refund	Revenues <sup>a</sup>	Net Cash Flow
01 Jan 13	31 Dec 13	(5.00)	(5.00)	0	0	0	0	(5.00)
01 Jan 14	31 Dec 14	(540.58)	(540.58)	0	0	0	0	(540.58)
01 Jan 15	31 Dec 15	(683.51)	(683.51)	0	0	0	0	(683.51)
01 Jan 16	31 Dec 16	(236.00)	(227.05)	(8.95)	0	5.24	30.81	(199.95)
01 Jan 17	31 Dec 17	(389.42)	(329.13)	(60.28)	0	32.96	193.91	(162.55)
01 Jan 18	31 Dec 18	(60.28)	0	(60.28)	0	32.96	193.91	166.59
01 Jan 19	31 Dec 19	(57.76)	0	(55.48)	(2.28)	32.96	193.91	169.11
01 Jan 20	31 Dec 20	(73.91)	0	(67.88)	(6.03)	32.96	193.91	152.96
01 Jan 21	31 Dec 21	(62.11)	0	(55.48)	(6.63)	29.50	193.91	161.30
01 Jan 22	31 Dec 22	(66.91)	0	(55.48)	(11.42)	0	193.91	127.00
01 Jan 23	31 Dec 23	(72.48)	0	(55.48)	(17.00)	0	193.91	121.43
01 Jan 24	31 Dec 24	(78.02)	0	(59.82)	(18.20)	0	193.91	115.88
01 Jan 25	31 Dec 25	(74.79)	0	(55.48)	(19.31)	0	193.91	119.11
01 Jan 26	31 Dec 26	(75.91)	0	(55.48)	(20.43)	0	193.91	117.99
01 Jan 27	31 Dec 27	(76.98)	0	(55.48)	(21.50)	0	193.91	116.92
01 Jan 28	31 Dec 28	(90.40)	0	(67.88)	(22.52)	0	193.91	103.50
01 Jan 29	31 Dec 29	(78.79)	0	(55.48)	(23.31)	0	193.91	115.12
01 Jan 30	31 Dec 30	(79.73)	0	(55.48)	(24.25)	0	193.91	114.17
01 Jan 31	31 Dec 31	(80.64)	0	(55.48)	(25.16)	0	193.91	113.27
01 Jan 32	31 Dec 32	(96.31)	0	(70.36)	(25.94)	0	193.91	97.60
01 Jan 33	31 Dec 33	(81.73)	0	(55.48)	(26.24)	0	193.91	112.18
01 Jan 34	31 Dec 34	(82.26)	0	(55.48)	(26.77)	0	193.91	111.65
01 Jan 35	31 Dec 35	(82.77)	0	(55.48)	(27.28)	0	193.91	111.14
01 Jan 36	31 Dec 36	(97.68)	0	(67.88)	(29.80)	0	193.91	96.22
01 Jan 37	31 Dec 37	(94.80)	0	(55.48)	(39.31)	0	193.91	99.11
01 Jan 38	31 Dec 38	(94.93)	0	(55.48)	(39.45)	0	193.91	98.97
01 Jan 39	31 Dec 39	(95.02)	0	(55.48)	(39.53)	0	193.91	98.89
01 Jan 40	31 Dec 40	(99.42)	0	(59.82)	(39.59)	0	193.91	94.49
01 Jan 41	31 Dec 41	(79.83)	0	(46.53)	(33.29)	0	163.09	83.27

FIRR (post-tax) = 4.82%

FNPV (post-tax) = CNY581.69 million

( ) = negative, CAPEX = capital expenditures, FIRR = financial internal rate of return, FNPV = financial net present value, OPEX = operating expenditures, VAT = value-added tax.

<sup>a</sup> No Clean Development Mechanism revenues were assumed when modeling the project.

Source: Asian Development Bank estimates.

7. Sensitivity analysis was performed to test the FIRR's sensitivity to certain changes in parameters. The sensitivity analysis focused on four variables: (i) project costs increase by 10%; (ii) operation and maintenance costs increase by 10%; (iii) revenue decreases by 10%; and (iv) the project implementation is delayed 1 year. The analysis shows that the project remains financially viable under these adverse conditions as the FIRRs are greater than the WACCs. The results of the sensitivity analyses are in Table 2.

**Table 2: Sensitivity Analysis of Financial Internal Rate of Return**

<b>Cases</b>	<b>Change</b>	<b>FIRR After Tax</b>
<b>A. Base case</b>		<b>4.82%</b>
<b>B. Sensitivity cases</b>		
(i) Capital cost overrun	10%	4.05%
(ii) Higher operating costs	10%	4.57%
(iii) Lower benefits	(10%)	3.54%
(iv) Implementation delay	1 year	3.38%
<b>WACC</b>	<b>1.97%</b>	

( ) = negative, FIRR = financial internal rate of return, WACC = weighted average cost of capital.

Source: Asian Development Bank estimates.

#### **D. Weighted Average Cost of Capital**

8. As shown in Table 3, the WACC was calculated after tax, in real terms, using an assumed capital mix and costs of funds, in accordance with the methodology in the guidelines (footnote 1). Actual interest rates of loan funds were considered, while the cost of equity was assumed to be 8%, a standard applied in the China General Nuclear Power Corporation.<sup>4</sup> The effective income tax rate is 20.1%. Annual inflation rates were assumed at 1.8% international and 3% domestic, based on forecasts of ADB's Economic Research Department.<sup>5</sup>

**Table 3: Calculation of the Weighted Average Cost of Capital**

<b>Source of Funding</b>	<b>ADB</b>	<b>Domestic Loan</b>	<b>Equity</b>
Weighting	47%	24%	30%
Amount (CNY million)	930	470	600
Nominal cost	1.94%	6.55%	8.00%
Income tax rate	20.10%	20.10%	
Tax-adjusted nominal rate	1.55%	5.23%	8.00%
Inflation rate	1.80%	3.00%	3.00%
Inflation adjusted rate	0.00%	2.17%	4.85%
Weighted	0.00%	0.51%	1.56%
WACC (inflation-adjusted)	1.97%		

ADB = Asian Development Bank, WACC = weighted average cost of capital.

Source: Asian Development Bank estimates.

<sup>4</sup> The administrative charge to be levied by the Export-Import Bank of China for onlending the ADB loan has been factored into the nominal cost for the ADB loan.

<sup>5</sup> As the inflation-adjusted rate for the ADB loan would have been negative, the rate has been set equal to zero.