

## FINANCIAL ANALYSIS

1. The financial analysis of the Low-Carbon District Heating Project in Hohhot in Inner Mongolia Autonomous Region (IMAR) was undertaken in accordance with the Asian Development Bank (ADB) guidelines on *Financial Management and Analysis of Projects*.<sup>1</sup> It assesses the project's ability to generate sufficient revenue from operations to recover project costs, including operation and maintenance (O&M) costs, and to provide adequate cash flows for debt service and a reasonable return on investment. Cost estimates are based on the preliminary results of ADB's project preparatory technical assistance assessment done in May 2014. The financial internal rate of return (FIRR) was derived using incremental annual cash flows over the 30-year economically useful life of the project. 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.

### A. Key Assumptions

2. Capital costs are based on investment costs estimated in the feasibility study report of the project, including land acquisition, civil works, equipment and materials, installation, and other related expenses (e.g., design and technical services). Capital costs include costs related to boilers, pipelines, heat exchange stations, supervisory control and data acquisition systems, and other associated costs. Provision for physical contingency is included as appropriate.

3. The project will generate revenue from the sale of heat, and the collection of heating service connecting fees from new customers in the project areas. The Hohhot Chengfa Heating Company (HCHC) is the implementing agency. It will provide district heating services, obtaining heat from different clean energy sources, including an existing combined heat and power plant, and natural gas-based heat-only boilers and wind-powered electric boilers. The project construction period is more than 5 years from 2015 to 2020. It was assumed that by 2019, the project will provide district heating service for up to 60% of the total designed heating area. By 2020, once the project is completed, it will provide district heating services for the entire project heating area of 29.7 million square meters.

4. The heating tariff is determined at the municipal level, and goes through public consultation. In case of price shocks, such as those induced by foreign exchange or interest rate changes, which may result in higher-than-expected investment and/or operating costs, the HCHC may file for an adjustment of the heating tariff. The Government of IMAR—the executing agency—will ensure the HCHC meets financial covenants during project implementation.

5. Operation expenses mainly include purchased fuel, power, heat, water, wastewater treatment, maintenance, repairs, wages, benefits, and other sales and management expenses. Of the total operation expenses, the main cost items are natural gas (81.7%), electricity (6.8%), and heat (5.0%). As the HCHC will not engage additional personnel for the O&M of the new areas, incremental wages and administration costs are mainly related to the connection of new customers. Net cash flows are determined after allowing for corporate income taxes at 25% of pretax profit.

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

6. The Hohhot Municipal Government will partially compensate the HCHC for the significantly higher O&M costs incurred in generating heat from natural gas. In accordance with Hohhot City's Decree No. 142, the municipal government will provide a natural gas subsidy for residential heating. [This information has been removed as it falls within exceptions to disclosure specified in paragraph 97, (v) of ADB's Public Communications Policy (2011)].

7. A letter of agreement was signed by three parties: Datang (Hohhot) New Energy, the wind farm that will supply wind power for heating; the Inner Mongolia Power Grid Company; and Hohhot City Development, Investment, and Operation (better known as Chengfa).<sup>2</sup> [This information has been removed as it falls within exceptions to disclosure specified in paragraph 97, (v) of ADB's Public Communications Policy (2011)].

8. The WACC was calculated after tax in real terms using the actual capital mix and costs of funds. The cost of the ADB loan is based on the current London interbank offered rate on a 5-year fixed-rate swap (1.73% per annum) plus the contractual ADB loan spread of 0.50% per annum and a maturity-based premium of 0.10% per annum. The loan maturity period is assumed to be 25 years, including the grace period of 5 years and the repayment period of 20 years with equal principal payments. The cost of the local commercial loan has been assumed at the regulated interest rate [This information has been removed as it falls within exceptions to disclosure specified in paragraph 97, (v) of ADB's Public Communications Policy (2011)] for long-term investment loans. The cost of equity is assumed to be 8.00% per annum. Table 1 shows the projected WACC.

**Table 1: Projected Weighted Average Cost of Capital**

<b>Source</b>	<b>Amount (CNY million)</b>	<b>Weighting (%)</b>	<b>Nominal Rate (%)</b>	<b>Income Tax (%)</b>	<b>Nominal Rate after Tax (%)</b>	<b>Inflation Rate (%)</b>	<b>Real Interest Rate (%)</b>	<b>Weighted (%)</b>
ADB	914.49	37.37	2.33	25.00	1.75	0.00	1.75	0.65
Domestic Bank <sup>a</sup>	990.00	40.46	6.55	25.00	4.91	3.00	1.86	0.75
Equity finance	542.64	22.17	8.00		8.00	3.00	4.85	1.08
<b>Total</b>	<b>2,447.13</b>	<b>100.00</b>						<b>2.48</b>
<b>Real WACC</b>								<b>2.48</b>

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

<sup>a</sup> China Everbright Bank.

Source: Asian Development Bank estimates.

<sup>2</sup> The HCHC is represented by Chengfa.

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

9. The FIRR is 8.93%—higher than the estimated WACC at 2.48%. The financial net present value of the project was calculated using the estimated WACC as the discount rate. The financial net present value is CNY1,097.71 million at this WACC (Table 2).

**Table 2: Projected Cash Flow for the Project**  
(CNY million)

Year	Cash Flow					
	Capital Costs	O&M Costs	Revenue	Net Cash Flow before tax	Income Tax	Net Cash Flow after tax
2015	298.63	0.00	0.00	(298.63)	0.00	(298.63)
2016	142.95	0.00	0.00	(142.95)	0.00	(142.95)
2017	583.58	0.00	0.00	(583.58)	0.00	(583.58)
2018	711.35	0.00	0.00	(711.35)	0.00	(711.35)
2019	328.30	503.63	1,057.89	225.97	46.27	179.70
2020	62.27	965.00	1,766.81	739.54	28.77	710.77
2021		957.88	1,367.25	409.37	20.97	388.40
2022		934.92	1,099.95	165.04	25.83	139.20
2023		934.08	1,091.56	157.48	26.24	131.24
2024		932.58	1,084.30	151.72	26.98	124.74
2025		930.47	1,077.24	146.77	27.80	118.97
2026		930.45	1,070.37	139.93	28.04	111.89
2027		929.73	1,063.73	134.00	27.71	106.29
2028		928.36	1,057.22	128.86	26.84	102.02
2029		926.34	1,050.98	124.64	26.19	98.45
2030		921.37	1,044.89	123.52	26.29	97.23
2031		915.99	1,038.96	122.97	26.51	96.45
2032		910.23	1,033.27	123.04	26.88	96.17
2033		906.29	1,027.66	121.37	26.79	94.58
2034		901.90	1,022.19	120.29	22.60	97.68
2035		897.09	1,016.89	119.80	15.99	103.81
2036		891.88	1,011.82	119.94	16.63	103.31
2037		888.23	1,006.86	118.63	16.89	101.74
2038		884.13	1,002.00	117.87	17.26	100.62
2039		879.60	997.34	117.74	17.76	99.98
2040		856.95	992.85	135.90	22.73	113.17
2041		834.97	988.43	153.46	27.45	126.02
2042		813.63	984.14	170.50	32.02	138.48
2043		792.92	964.65	171.73	32.64	139.09
2044		713.91	810.23	96.33	14.09	82.24
Net present values:						
	2.48%					1,097.71
	FIRR					<b>8.93%</b>

( ) = negative, CNY = yuan, FIRR = financial internal rate of return, O&M = operation and maintenance.

Source: Asian Development Bank estimates.

10. Sensitivity analyses were performed to test the FIRR's sensitivity to certain changes in parameters. The analyses showed that the project would remain financially viable with FIRRs exceeding the WACC for (i) an increase in project capital costs by 10%, (ii) an increase in O&M costs by 10%, (iii) a decrease in the revenue from heat sale by 10%, and (iv) delay in the project implementation by 1 year. However, in the unlikely scenario of all four adverse cases occurring at the same time, the project would not be financially viable (Table 3).

**Table 3 : Sensitivity Analysis of Financial Internal Rate of Return**

<b>Cases</b>	<b>FIRR Post-Tax (%)</b>
<b>A. Base Case</b>	<b>8.93</b>
<b>B. Sensitivity Cases</b>	
Capital cost overrun of 10%	7.96
Higher operating costs of 10%	2.53
Lower benefits of 10%	3.60
Implementation delay of 1 year	7.65
	<b>WACC</b>
	<b>2.48</b>

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

Source: Asian Development Bank estimates.

11. In addition, the following were assessed: (i) the payback period of the project; (ii) how long the project would require the payment of subsidies to be financially sustainable; and (iii) how much the heating tariff should be increased if no wind and gas subsidies are paid. The results indicate that the project (i) has a payback period of 5 years; (ii) requires the payment of subsidies for 12 years to be financially sustainable; and (iii) would require heating tariff increase of 0.78% for residential customers, and 2.86% for industrial and commercial customers in real terms to maintain financial viability if no wind and gas subsidies are paid.

12. The project is assessed to be financially viable. The financial operation of the HCHC is projected from 2014 to 2044 (see supplementary document 1). The financial projection indicates that the HCHC could maintain a debt service coverage ratio of at least 1.3 and a debt–equity ratio no more than 80:20. ADB’s financial covenants are expected to be complied with throughout the project operation.