



Report Number: ICRR0023040

1. Project Data

Project ID

P148599

Project Name

Hebei Clean Heating Project

Country

China

Practice Area(Lead)

Energy & Extractives

L/C/TF Number(s)

IBRD-85660

Closing Date (Original)

30-Jun-2021

Total Project Cost (USD)

94,589,268.33

Bank Approval Date

19-Jan-2016

Closing Date (Actual)

30-Jun-2021

IBRD/IDA (USD)
Grants (USD)

Original Commitment

100,000,000.00

0.00

Revised Commitment

94,589,268.33

0.00

Actual

94,589,268.33

0.00

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2. Project Objectives and Components

a. Objectives

According to both the Loan Agreement (p. 5) dated March 24, 2016 and the Project Appraisal Document (PAD, p. 4) dated December 17, 2015, the project objective was “to improve the efficiency and environmental performance of heating systems in selected areas within participating municipalities/counties of Hebei Province.”



This review will assess the project objective as defined in the loan agreement. The objective will be parsed into two:

Objective 1: To improve the efficiency of heating systems in selected areas within participating municipalities/counties of Hebei Province.

Objective 2: To improve the environmental performance of heating systems in selected areas within participating municipalities/counties of Hebei Province.

b. Were the project objectives/key associated outcome targets revised during implementation?

No

c. Will a split evaluation be undertaken?

No

d. Components

The project consisted of two components with multiple sub-components:

Component 1: District Heating Subcomponents (estimated cost at appraisal: US\$217.06 million, of which US\$89.67 million IBRD financing; actual cost: US\$191.07 million, of which US\$92.48 million IBRD financing). This component was intended to finance the construction and rehabilitation of DH facilities in the four project cities/counties (four Subcomponents) with a total heating area of 38.7 million m², including 13.5 million m² of new buildings. Component 1 had four Subcomponents:

Subcomponent 1.1: Chengde District Heating and Energy Efficiency Subcomponent: This Subcomponent was designed to (a) rehabilitate DH facilities that serve the existing DH area of about 12.3 million m² in Shuangqiao (old town) District of Chengde and (b) expand DH to an additional 2.5 million m². The specific investments comprised (a) extension of a DH primary network by about 5 km, (b) renovation of about 3 km of the primary network and 57 km of the secondary network, and (c) construction of 20 group substations and 114 BLS. The implementing entity was the Chengde Heating Group Company Ltd. (Chengde DH company), a state-owned enterprise and the largest DH company in Chengde.

Subcomponent 1.2: Zhangjiakou District Heating Subcomponent: This Subcomponent aimed to (a) rehabilitate DH facilities that serve the existing DH area of about 3.5 million m² in Qiaodong District of Zhangjiakou and (b) expand DH to an additional 5 million m². The specific investments included (a) extension of a DH primary network by about 20 km, (b) construction of 58 group substations and 17 BLS, (c) conversion of two coal-fired boilers (2 × 64 MW) to natural gas (2 × 70 MW) for peak load supply and backup capacity, (d) construction of a pressure isolation stations, and (e) installation of heat meters and a SCADA system. The implementing entity was the Zhangjiakou Dongyuan Heating Company (Zhangjiakou DH company), a state-owned enterprise and a subsidiary of the Qiaodong Urban Construction and Investment Company.

Subcomponent 1.3: Pingshan (County) District Heating and Energy Efficiency Subcomponents: This Subcomponent was designed to (a) rehabilitate DH facilities that serve the existing DH area of about 4.5 million m² in the urban area of Pingshan County and (b) expand DH to an additional 3 million m² of new buildings. The specific investments comprised (a) extension of a DH primary network by about 6 km, (b)



renovation of about 4 km of the primary network, (c) installation of 27 group substations and 9 BLS and rehabilitation/expansion of 5 group substations to 8 group substations, (d) installation of heat meters for 1.9 million m² of the residential heating area and about 0.27 million m² of public buildings, (e) automatic control systems for 46 existing substations, (f) rehabilitation of two water treatment stations, and (g) installation of a SCADA and central monitoring and control system for the DH system. The implementing entity is the Pingshan County Urban and Township Heating Co. Ltd. (Pingshan DH company), a state-owned enterprise under the Pingshan County Heating Supply Office.

Subcomponent 1.4: Xingtai Industrial Waste Heat District Heating Subcomponents: This Subcomponent was designed to construct DH facilities in the northwest urban area of Xingtai Municipality (one of the most polluted cities in the province) to serve about 8 million m², including about 2.3 million m² of existing and approximately 5.7 million m² of new buildings. Industrial waste heat from nearby industrial (coking) facilities will be used as heating source. The project investments were split in two phases. Phase I (2015–2016), funded by counterpart funds, was already under implementation and comprised construction of a waste heat water network of about 12 km within the coking plant area, approximately 24 km of the primary DH network outside the plant, a primary station, and 27 group substations to provide DH to an existing heating area. Phase II (2016–2019), to be financed under this Subcomponent, included construction of additional 5 km of network within the plant, 28 km of the primary DH network outside the plant, 103 group substations, 14 BLS, and installation of a SCADA system. The implementing entity is the RISUN Anneng Heating Company Ltd. (Xingtai DH company), a new joint venture established for this Subcomponent.

Component 2: Institutional Capacity Building and Project Management Support (estimated cost at appraisal: US\$2.5 million, of which US\$2.5 million IBRD financing; actual cost: US\$2.11 million, of which US\$2.11 million IBRD financing). This component was designed to hire a management consulting company to provide (a) project management support to the Hebei Provincial Management Office (HPMO) and the four heating companies; (b) capacity-building support to the heating companies in DH management, operation and maintenance (O&M), and World Bank project implementation procedures; (c) training, workshops, and study tours to exchange and learn good practices in the DH sector; and (d) technical assistance tailored to the needs of project companies.

Revised Components

Although no project restructuring was required, there were minor changes (according to the Implementation Missions Aide Memoire and MTR report dated June 2019) to Component 1: (i) accommodating new DH related activities using funds from loan savings in various cities and (ii) Zhangjiakou dropping the activity to replace a coal-fired peak boiler with a gas-fired boiler. Additionally, based on updated plans, Component 1 financing for construction and rehabilitation of DH facilities in four project areas decreased to a total of 16.52 million m² from 18.52 million m² as designated in the PAD (p. 21).

Additionally, for intermediate results indicator 4 (building-level substation installed), the original target value at closing was 154 while that target was revised down to 99 at MTR.

e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project Cost: The total project was originally estimated at US\$248.33 million (according to Financing table on p. 2 of the ICR and the PAD p. 7, although p. 44 of the ICR states that the total was US\$248.28). In June



2021, the project closed with a total cost of US \$200.66 million. The decrease in the projects costs was primarily due to a slowdown in real estate development and also one study tour being canceled due to COVID-19, but only a few details on the decreased costs were provided in the ICR (see Revised Components above).

Financing: At appraisal, World Bank financing was estimated at US\$100 million. At project closing in June 2021, the project had disbursed US\$94.59 million.

Borrower contribution: At appraisal, the borrower's contribution was estimated at US\$148.33 million. At project closing, the borrower's actual contribution was US\$106.07 million.

Dates: The project was approved on January 19, 2016. A midterm review was conducted in June 2019. The project closes on June 30, 2021, the original closing date. There were no extensions or project restructuring.

3. Relevance of Objectives

Rationale

China has been experiencing rapid urbanization for more than three decades aligning with its rapid growth, which has also led to increased pollution and environmental issues. At appraisal in 2015, China's urbanization rate was 48.1% and was expected to reach 58% by 2020. At appraisal, China continued to face major challenges to address negative environmental impact and regional income disparities that were associated with its rapid economic growth. As an example, the Hebei Province has been a center for energy-intensive industries and is in the cooler climate of northern China in a major airshed surrounding Beijing and Tianjin municipalities, together known as the Jing-Jin-Ji region. Hebei was the sixth most populous province (population 73 million) but only eighteenth in average per capita GDP (¥39,984). In the Hebei Province, chronic, severe air pollution, including greenhouse gas emissions, came predominantly from coal combustion for energy. Air pollution was particularly severe during winter where heating sources included inefficient coal-fired boilers. Rapid urbanization accompanied by sustained economic growth added demand for new heating sources as real estate developed in the Province.

At the time of appraisal, PDOs were highly relevant and aligned to China's priorities of greener growth and promoting more inclusive development as identified in the FY2013-FY2016 Country Partnership Strategy (CPS) (pp. 13, 18, 35). Specifically, the PDOs were consistent with China's priorities supported in the CPS pillar "Supporting greener growth by helping China shift to a more sustainable energy path; enhancing urban environmental services and demonstrating pollution management." The project also supported the World Bank's corporate objective of ending extreme poverty and boosting shared prosperity with sustainability. The project also aligned with China's 12th Five-Year Plan (FYP) (2011–2015) which called for alleviating environmental pollution and promoting efficient use of resources through investments in smart infrastructures.

Project development objectives (PDOs) were highly relevant to the country context at project closing in June 2021. At completion in June 2021, project objectives remained highly relevant to and consistent with the World Bank Group Country Partnership Framework (CPF) for China (Report 117875-CN) (FY2020–2025) engagement area 2: "Promoting greener growth by facilitating the transition to a lower-carbon energy



path and by reducing air pollution.” The project is also in line with a key pillar in the 2018 China Systematic Country Diagnostic (Report 113092-CN), which was “to make fuller use of market mechanisms to promote green growth and more efficient, sustainable use of natural resources.”

At project completion, the PDOs also remained aligned with Hebei’s 13th FYP (2016–2020), which was to reduce ambient PM2.5 concentrations by 40 percent relative to 2013 levels and called for scale-up of clean district heating (DH). In 2020, the Jing-Jin-Ji region emitted a total of 1.6 million tons of primary PM2.5 with 1.3 million tons from Hebei Province alone, as Hebei relied on coal to meet more than 90 percent of its energy needs. Additionally, the PDOs at completion are in line with China’s 14th FYP outline (2021–2025) which sets an 18 percent reduction target for CO2 intensity.

Overall, the relevance of objectives at the time of project closure and appraisal was high.

Rating

High

4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective

To improve the efficiency of heating systems in selected areas within participating municipalities/counties of Hebei Province.

Rationale

The first project objective was to improve the efficiency of heating systems in selected areas within four participating municipalities/counties of Hebei Province (three municipalities: Chengde, Zhangjiakou, and Xingtai) and the county of Pingshan). The key outcome indicator that was used to assess this outcome was projected lifetime energy savings (MWh). The ICR noted that the baseline case without the project was how much energy (i.e., coal) would need to be used to achieve the same level of heating services for the same amount of floor area in the same region. This was a valid counterfactual that was used in measuring the project outcomes as well as in devising the theory of change. Additionally, the ICR noted that the baseline energy consumption was to be a function of a number of factors including population and economic growth—two key features aligned with China’s current status.

According to the ICR and PAD, the achievement of Objective 1 (efficiency) would come through two sources: (a) switching to more energy-efficient heating sources and (b) reducing heat loss in DH networks and the net result of efficiency gain would be less energy consumption per floor area heated (both measured in MWh).

At closing, the cumulative lifetime energy savings due to improved efficiency of DH systems aggregated across four Subcomponents reached 5,665,401 MWh, exceeding the target of 4,974,014 MWh at appraisal by 14 percent. It should be noted, however, that the actual figure stated in Table 1 (p. 12 of the ICR) is 5,227,039



and not 5,665,401. The attribution of outcomes (both first and second outcomes in para. 24 in this section) to project results is demonstrated by several output indicators and other efficiency metrics.

Achievement on key intermediate results indicators as of June 30, 2021 can be found in Annex 1B-1 of the ICR. As these indicators show, the achievement of outcome indicators can be attributed to the area connected, all of which benefited from efficiency gains. As a result, DH efficiency has been improved from 2018 to 2021 in the four selected municipalities/county, as shown in table 2. It is interesting to note that Xingtai municipality has by far the lowest unit area energy consumption compared to other three cities at end of the Project (during 2020-2021 heating season) and the fastest improvement. This is in part because in Xingtai, the heating access areas are all newly connected (mainly new commercial housing communities), and the thermal insulation coefficient of buildings is much better than that of the other three cities.

The ICR states that other contributing factors to achievement of the outcomes included i) the SCADA system that was operationalized in later stage of the Project; and ii) the operation and management capacity of Xingtai DH company has been significantly improved through capacity-building provided by the Project. However, no evidence was provided in the ICR to support these statements or how they were measured and what specific capacity building was provided.

Overall, the causal pathways from inputs to outcomes were valid and direct, and the outcomes achieved could be attributed to the project's intervention.

Outputs (from ICR Annex 1B-1 Key Outputs by Component pp. 38-39)

- Area connected to DH (million m²). The targets at appraisal were as follows: Zhngjikaou (5), Chengde (2.46), Pingshan (2.84) and Xingtai (8.02), for a cumulative target of 18.32. Overall, the final results were 18.18 million m² of areas were connected to DH, which nearly achieved the target. It was noted that the change in targets (Updated at the MTR) were due to real estate development slowdown.
- Length of pipeline installed (KM). According to the PAD (p. 21) the cumulative target was 164.4 KM. The project achieved 198.47 km of pipelines installed, which exceeded the target.
- Group substations (non-BLS) constructed or rehabilitated (#). Cumulatively, 330 group substations were constructed or rehabilitated, which exceed the target of 243 in the PAD (p. 21).
- BLS installed. Cumulatively, 116 BLS were installed, while the actual target from the PAD (p. 21) was 154 (however, p. 39 of the ICR states that the original target at appraisal was 191), which was revised in the MTR to 99. The total of 116 BS installed exceeded the revised target of 99. [Besides the revision of measurement of indicator, the target was also reduced from 154 (in PAD) to 99 (MTR) to reflect slowdown in real estate development in the Hebei province. However, the final value at closing is 116, up by 117% relative to the target set at MTR.]

Outcomes

- Projected lifetime energy savings (MWh). The Year 5 target for Objective 1 (projected lifetime energy savings) was 4,974,014 MWh, and the actual lifetime energy savings at Year 5 was 5,227,039—a 14% increase above the target goals, according to Table 1 (p. 12) of the ICR; however, p. 40 of the ICR states that there was 5,665,401 MWh of projected lifetime energy savings.
- Number of people (beneficiaries) provided with improved urban living conditions. The original target was 714,896 beneficiaries and the actual achieved at completion was 781,876. For the % of



beneficiaries that are female, the target in the PAS (Annex 1, p. 20) was 49% and this was also the actual % achieved at completion.

Rating
High

OBJECTIVE 2

Objective

To improve the environmental performance of heating systems in selected areas within participating municipalities/counties of Hebei Province.

Rationale

Theory of Change.

Given the close relationship between the project activities related to efficiency and environmental improvements, and the synergies between Objectives 1 and 2, the Theory of Change for Objective 2 is similar to Objective 1.

The Theory of Change in Figure 1 of the ICR (p. 7) has clear and relevant activities, outputs, outcomes, and impacts related to the key project objectives. Overall, the causal relationships asserted in the results chain are well laid out and relevant to and representative of the project's objectives. It should be noted, however, that assumption "(b) promotion of the system efficiency by adopting new technology, such as BLS and advanced billing system of CBB based on municipal development plans and the projected urbanization rate at appraisal" as described on p. 6 of the ICR, was not included in the Theory of Change in Figure 1.

- Beneficiaries who feel project investments reflected their needs (%). The ICR reported that 99 percent of beneficiaries who feel project investments reflected their needs.
- Grievances registered related to delivery of project benefits that are actually addressed (%). The ICR reported that 100% of grievances registered related to delivery of project benefits that are addressed. [It should be noted that this indicator is unclear. The ICR refers to "delivery of project benefits", but it is assumed that there should not be grievances related to the project's benefits, but perhaps these would be related to the project's shortcomings instead.]
- Heating connection and service subsidy policies assisted low-income households. A survey conducted by the consulting firm hired by the PMO stated that approximately 781,876 of residents in Hebei Province benefitted from improved urban living conditions at project completion, which exceed the target of 714,896 at appraisal. The percentage of females benefitting from the project at completion (383,119) exceed the target set at appraisal (361,591).

It should be noted, however, that there was not adequate information on how the survey was designed and implemented (and by whom) for the responses to these two output indicators. Having this additional information would help to validate the responses.



Outcomes

- Project-level aggregated avoided CO2 emissions (tons). At project completion, total avoided CO2 emissions aggregated across the four Subcomponents amounted to 1,913,986 tons, surpassing the target of 1,722,632 tons at appraisal by 11 percent.
- Project-level aggregated avoided total suspended particles (TSP) emissions (tons). The four Subcomponents also resulted in approximately 12,805 tons of avoided TSP emissions, exceeding the target of 11,243 tons at appraisal by 14 percent.

Rating
High

OVERALL EFFICACY

Rationale

The project achieved its two objectives. As detailed in the ICR Table 1 and the results framework in Annex 1, all key PDO indicator targets were exceeded. The PDO-level indicators were relevant to the PDO and sufficiently captured the project's scope of improving efficiency and environmental performance of heating systems in the project areas. Although the ICR states that the achievement of the PDOs is highly attributable to the project, it is not clear that other similar donor projects were not being implemented during the same timeframe as this project.

Overall Efficacy Rating

High

5. Efficiency

Economic Analysis (see Annex 4)

The assumptions of the ICR and the PAD are comparable and valid. Economic and financial analyses were completed at both appraisal and completion. This was a very a good effort by the ICR team.

Cost-benefit analysis was used at appraisal to determine the economic viability of the project. This analysis estimated the EIRR of the project compared to the without project alternative. Additionally, the economic analysis included environment externalities (associated with SO2, NOx, RSP, and CO2). At appraisal, the overall EIRR was estimated at 29.3% in real terms (using environmental externalities). This rate exceeded the 10% benchmark discount rates used in Chinese feasibility study guidelines for public infrastructure projects. At ICR, the EIRR increased to 29.5%. The project also used updated values for social values of CO2 emissions



based on the last World Bank guidelines (US \$31.4 per tCO₂e), which estimated the EIRR at the ICR stage to reach 30.9% in the low social value scenario and further up to 44.1% in the high social value scenario.

The major benefits from rehabilitation and expansion of DH systems consisted of: (a) actual and projected fuel efficiency improvements generated by connecting existing and new building areas to more efficient and cleaner heating sources: CHPs (in Chengde, Zhangjiakou, and Pingshan) and industrial waste heat (in Xingtai); (b) reduced heat losses stemming from improving existing networks and substations and installed BLS; (c) cost savings in operation, maintenance, and repair for both alternatives; and (d) environmental benefits of reduced TSP, SO₂, CO₂, and NO_x emissions through avoided local and global emissions as a result of the project. The assumptions for the baseline emissions included the use of current boilers for the existing buildings and new boilers with emission reduction equipment for the new (planned) heating areas.

Financial Analysis

The FIRR was compared with the estimated corporate-level and project-level Weighted Average Cost of Capital (WACC) for the company carrying out the Subcomponent. The consolidated WACC for the project was estimated to be 2.5% at appraisal and 2.73% in the ICR. At appraisal, the FIRR was calculated at 13.2%; at ICR the FIRR was 13.54%, exceeding the benchmark of 2.73%. The ICR states that “the primary reason [for the minimal increase in FIRR] is that the heating area served and sold is larger than the estimate at appraisal with exception of Xingtai subproject.” (pp. 48-49). Two reasons were given for this: 1) the delayed development of real estate in the new district due to the government’s policies and 2) the percentage of actual heating area served is only about 55% of the heating area connected due to low occupation rate of new communities in the first 2-3 years but is forecasted to rise to 85% after the transitional period.

There were no noted implementation issues affecting efficiency that were mentioned in the ICR.

Efficiency Rating

High

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal	✓	29.30	0 ☑ Not Applicable
ICR Estimate	✓	29.50	0 ☑ Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome



The relevance of the of the project objectives is rated high. The project's overall efficacy and efficiency in achieving the project objectives are both rated high. Overall, the outcome rating is highly satisfactory.

a. Outcome Rating

Highly Satisfactory

7. Risk to Development Outcome

The overall risk to development outcome is low to moderate. The following main risks were identified in the ICR:

- Sustainability of project investments
- Risk of scale-up of BLS in the heating sector
- Risk of scale-up of CBB application in the heating sector
- Sustainability of use of SCADA system in the participating DH companies
- Sustainability of clean air policy environment in Hebei Province.

The project team should be commended for reducing the inherent risks due to COVID-19, which are detailed on p. 16 of the ICR. For example, even though there was a hike in commodity prices, this had negligible effects of the project since all contracts were already signed, and prices were secured and fixed before the pandemic. This was credit in large part to the good work of the HPMO. Additionally, the HPMO was able to avoid any COVID infections for employers, contractors, and supervision engineers by “working closely with the project management consulting firm, communicating with each implementing DH company (Project Implementation Unit) to assess the impact of the pandemic on all aspects of the project implementation and identified associated risks.”

8. Assessment of Bank Performance

a. Quality-at-Entry

At project entry, the goal of promoting energy efficiency and environmental performance of heating systems was of high priority because of China's dependence on fossil fuels and the environmental pollution caused by these systems. Experience gained in previous projects was reflected in the project's design and approach. For example, the project benefitted from lessons learned from district heating projects in Europe and Central Asia. These lessons included familiarizing DH companies with the application of BLS, CCB, and SCADA systems in DH networks as well as technical assistance activities for institutional development of DH companies. One of the key lessons learned that was reflected in the project design at entry was having a central Project Management Office, which is critical to success for projects with multiple subprojects (PAD, p. 8). Therefore, the Hebei Clean Heating Project selected the Hebei Provincial Management Office (HPMO) which the World Bank had previously worked with and was



well respected for their strong supervision work. The project benefitted from the experience of HPMO as the central managing entity for this project.

Economic and financial analyses were sound and adequately conducted in accordance with Bank requirements. All project implementation entities had sufficient administrative and financial management capacity. As noted in the PAD (p. 15), the Bank's assessment of the FM arrangements identified the principal risk to be the lack of experience for the four companies in implementing Bank-financed projects. To reduce this risk, for example, further risk management measures were taken, including preparation and issuance of a Financial Management Manual acceptable to the Bank to standardize the project's FM procedures. Further, the entry-level financial analysis showed that the principal financial indicators for the four companies were projected to remain at satisfactory levels during implementation (PAD, p. 13). It was also noteworthy that no subcomponents were cancelled throughout the lifetime of the project.

The overall risk assessment was realistic and mitigation measures were put in place. Project implementation arrangements were adequate. Fiduciary aspects of the project were clearly defined, and internal controls were well designed. The M&E design had some shortcomings in that there were few qualitative outcomes of the technical assistance support and a lack of explanation of how the survey was designed and utilized to get beneficiary input on the projects (see Section 9, M&E Design, Implementation, and Utilization below).

Quality-at-Entry Rating Highly Satisfactory

b. Quality of supervision

Twelve supervision missions were held: one approximately every six months, including regular field trips to all project sites site visits. The supervision missions included all the specialists required to assess project progress and resolve issues during the project implementation. There was consistency in leadership in that the four Task Team Leaders who supervised the project were in place throughout its lifetime. Close working relationships between Bank staff, clients, the HPMO, and the consulting firm helped to maintain good supervision of the project. Errors in the data from appraisal and activity adjustments during implementation were accounted for through in-depth reviews of the underlying calculations and methodology, which helped to ensure integrity of results. Gender was accounted for in the DH companies and a dedicated country office staff helped to oversee project implementation.

Trainings were provided to project implementing DH companies on fiduciary and safeguards during implementation. Support missions provided timely guidance and advice for project issues, including procurement inquiries.

Notably, over 50% of the total contracts were signed with contract prices secured and fixed during the first year of implementation. This helped to avoid price escalations due to the COVID-19 pandemic.

Quality of Supervision Rating



Highly Satisfactory

Overall Bank Performance Rating

Highly Satisfactory

9. M&E Design, Implementation, & Utilization

a. M&E Design

Overall, the M&E design was sound, and findings were reported regularly. The theory of change showing how the key activities and outputs were to lead to the outcomes was sound. The objective-level indicators were designed to measure the preparation and issuance of national guidelines and methodologies. The intermediate results indicators were mostly adequate to capture the implementation of the project activities. Technical assistance support given to PMOs was not captured by the theory of change on p. 7 of the ICR, nor was the assumption of “promotion of the system efficiency by adopting new technology, such as BLS and advanced billing system of CBB based on municipal development plans and the projected urbanization rate at appraisal.” (p. 6 of ICR). The indicators were mostly specific, achievable, and time-bound. The team made a good effort to have sufficient number of indicators to capture project’s achievements, although there were only 2 outcome indicators. The M&E arrangements were sufficiently embedded institutionally, and the project implementation entities had the capacity to monitor and evaluate project progress.

b. M&E Implementation

Twelve implementation support missions and monthly regular monthly meetings were held during the life of the project. Project implementing DH companies regularly reported to the HPMO for monitoring activities and it regularly reviewed the quality and consistency of inputs from the companies. The task team also received HPMO, implementing agencies, and the consulting firm quarterly progress and FM reports, and annual audits of project accounts. The results framework was also revised during the MTR for the Intermediate Results indicator “Number of BLS installed [besides the revision of measurement of indicator, the target was also reduced from 154 (in PAD) to 99 (MTR) to reflect slowdown in real estate development in the Hebei province. However, the final value at closing is 116, up by 117% relative to the target set at MTR], which was improved to count the number of heat exchanger loops--a more refined measure of project achievements. In addition, definition of intermediate results indicator 5 (beneficiaries who feel project investments reflected their needs) was clarified at the MTR, but the ICR does not explain how beneficiary feedback was obtained and by whom.

Twelve Indicators included in the results framework were regularly measured and reported. The use of Project Monitoring and Implementation System ensured the accuracy of information. All project documents were electronically recorded into the system, which was accessible to project evaluation teams and the Bank’s supervision mission teams.

The focus of M&E remained at the output level, however, but still adequately captured the progress of implementation.



c. M&E Utilization

The task team utilized the results to monitor project progress, alignment with the PDO, and identify any implementation issues. The M&E findings were successfully used to make necessary changes to project activities. For example, when energy consumption per heating floor area in Pingshan County showed a 10 percent increase in the 2018–2019 heating season relative to that in the 2017–2018 heating season—this was a notable sign of deteriorating performance that contrasted with the project design. Using recommendations from the investigations and diagnostic, Pingshan DH company implemented investments to reduce energy consumption by rehabilitating its primary network and associated equipment. This resulted in decreasing energy consumption per heating floor area during the 2019–2020 and 2020–2021 heating seasons.

The M&E findings were reported regularly to stakeholders at the national and municipal levels and also to the Bank. The project had a complex design consisting of many project implementation entities and numerous contracts. The M&E data were used to provide evidence of application of inputs and achievement of outputs. The focus on the achievement of outcomes was correct, but more outcome indicators could have been tracked and reported on.

M&E Quality Rating

Substantial

10. Other Issues

a. Safeguards

At appraisal, the project was classified as Category A under Environmental Assessment (OP/BP 4.01). The safeguards policy on Safety of Dams (OP/BP 4.37) was also triggered by the project.

Environmental Assessment (OP/BP 4.01): OP/BP 4.01 was triggered from the start since the project directly supported the new construction and rehabilitation of heating facilities (ICR, p. 24). The project was classified as Category A because of potentially linked facilities (heating sources), the scope of the project, the displacement of workers, and the potential operating safety risks during the operation phase. These impacts were expected to be localized, limited and managed with accepted measures of good environmental codes of practice (ECOP) and site-specific mitigation measures for potential adverse impacts during construction and operation (PAD, p. 18).

Safety of Dams (OP/BP 4.37): The Xingtai RISUN Group, which supplies industrial waste heat under the Xingtai subproject, is using cooling water from the Yangwuowam Reservoir upstream of the RISUN Group. An operations manual and emergency preparedness plan were prepared and the EMP included an annual review of the operations and maintenance of the dam and its appurtenances by a dam safety expert satisfactory to the Bank (PAD, p. 19). It should be noted that this safeguard was not mentioned in the ICR.

b. Fiduciary Compliance



At appraisal, the project implementation entities prepared and adopted the Financial Management Manuals. Trainings were provided to the project financial staff before and during project implementation. The Bank loan proceeds, including overseeing the designed account, was managed by the HPFB, which had previous experience with Bank disbursement and financial management-related requirements (PAD, p. 15)

Financial management of the project was conducted as planned and carried out satisfactorily in accordance with Bank's financial management requirements. All project accounting and financial reporting aligned with the regulations from the Ministry of Finance (MOF) and the requirements specified in the Loan Agreement. There were no significant FM issues were during project implementation. The loan proceeds were disbursed on time.

c. Unintended impacts (Positive or Negative)

Heating connection and service subsidy policies assisted low-income households. A survey conducted by the consulting firm hired by the PMO stated that approximately 781,876 of residents in Hebei Province benefitted from improved urban living conditions at project completion, which exceed the target of 714,896 at appraisal. The percentage of females benefitting from the project at completion (383,119) exceed the target set at appraisal (361,591).

d. Other

None.

11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Highly Satisfactory	Highly Satisfactory	
Bank Performance	Highly Satisfactory	Highly Satisfactory	
Quality of M&E	Substantial	Substantial	
Quality of ICR	---	Substantial	

12. Lessons

The task team offered 4 lessons and recommendations. Of those, the following have high value for broad applicability and replicability for future Bank clean energy projects:

Wider deployment of BLS is more likely to be realized in commercial and public buildings than in residential buildings. The pilot projects revealed that owners of commercial buildings in the



BLS pilot benefited from sizable energy savings due to use of BLS, and space occupied by BLS in commercial buildings seems trivial to the building owners. Thus, cost-effectiveness of BLS significantly increases from the perspective of owners of commercial and public buildings and they are more likely to embrace this technology.

Avoiding cancellation of subcomponents typical to DH projects requires three layers of safeguards. First, there should be an appropriate and manageable number of subprojects across several participating cities, which is more practical and instrumental to avoid the cancellation of subprojects. Second, a careful evaluation of Subcomponents is required before deciding whether to include it in a DH project. Third, detailed designs of Subcomponents require thorough technical due diligence for optimal performance. A lesson learned here is that there was an unmanageable number of subprojects and inclusion of subcomponents that did not go through adequate due diligence and prior evaluation as they should have.

13. Assessment Recommended?

No

14. Comments on Quality of ICR

Overall, the ICR provides a detailed overview of the project, with a candid narrative to support most of its findings. There is sufficient clarity in the report's message. It is internally consistent. The Annex 1, Results Framework and Key Outputs provides detailed information about the project's activities and outputs. The report is mostly evaluative and consistent with the Bank guidance. There is a logical linking and integration of the various parts of the report.

The theory of change is well presented, and the report emphasizes how activities informed outputs and outcomes, but there could have been more focus on outcomes. The achievement of the project outcomes and objectives are assessed by the achievement of the target values of the indicators, which did not fully encompass the project outcomes. This shortcoming is partially addressed by additional evidence from the ICRs of the project implementation entities and anecdotal evidence. The ICR's lessons are mostly useful and based on evidence outlined in the report. The M&E Quality is rated high in the text, but the narrative in that section supports a substantial rating. In the key ratings sections of ICR Data Sheet, the task team mistakenly listed both outcome and bank performance as highly unsatisfactory but intended to rate them as highly satisfactory instead. Additionally, no mention of the safeguard (OP 4.37 - Safety of Dams) was included in the ICR, although it was included in the PAD (pp. 18-19). [This may have been due to project restructuring, but this fact is not verified in the ICR]. The ICR is substantially longer (55 pages) than recommended in the Bank guidance (15-20 pages).

a. Quality of ICR Rating

Substantial

