



1. Project Data

Project ID P133531	Project Name Shanxi Gas Utilization	
Country China	Practice Area(Lead) Energy & Extractives	
L/C/TF Number(s) IBRD-83480	Closing Date (Original) 30-Jun-2020	Total Project Cost (USD) 97,950,891.20
Bank Approval Date 28-Mar-2014	Closing Date (Actual) 30-Apr-2021	
	IBRD/IDA (USD)	Grants (USD)
Original Commitment	100,000,000.00	0.00
Revised Commitment	97,950,891.20	0.00
Actual	97,950,891.20	0.00

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2. Project Objectives and Components

a. Objectives

The project's development objective, as cited on p.5 of the Loan Agreement, as well as on p.3 of the PAD, was "to increase gas utilization to reduce greenhouse gas emissions in selected counties in Shanxi Province".

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



Yes

Did the Board approve the revised objectives/key associated outcome targets?

No

c. Will a split evaluation be undertaken?

No

d. Components

Component 1: Distributed Gas-fired Combined Heat-and-Power (CHP) plants (**Estimated cost as appraisal:** US\$260.29 million, of which \$79 million from IBRD; **Actual cost at closing:** IDA US\$268.59 million). The component included two investment sub-projects of uniform capacity (3x42 MW), and affiliated facilities. Both sub-projects were green-field plants, to be built for heating supply and power generation to the adjacent county-level cities of Baode and Xiyang. The gas source was the provincial gas network, operated by Shanxi Natural Gas Company (SNGC), which had been extended to both cities. Annual gas consumption was an estimated 285 million cubic meters for both projects combined, with total electricity generation estimated to reach around 1,160 GWh per annum, to be delivered to the provincial power grid, to meet the electricity demand in the province. A total thermal capacity for heating of about 120 MW was expected to meet the expanded heating demand of the two county cities for a floor area of 2.37 million square meters. Although SNGC had intended to start construction of the CHP sub-projects in April 2014 and complete construction in October 2015, actual construction of both plants only commenced in April 2016 and January 2017 respectively, and was completed in December 2019.

Component 2: Expansion of the Gas Distribution Network (**Estimated cost as appraisal:** US\$32.35 million, of which US\$18 million from IBRD; **Actual cost at closing:** IDA US\$31.67 million). This component included investment in sub-projects in four country cities, in Xiangyuan, Changzhi, Tunliu, and Qingxu counties. The projects involved the installation of pipelines and pressure regulating stations to expand the gas distribution network to residential, industrial and commercial consumers, along with Supervisory Control and Data Acquisition (SCADA) systems to monitor the operation of each network. The gas source was the provincial gas network, operated by SNGC, except for the Changzhi sub-project, which was supplied by a local Coal Bed Methane (CBM) developer who was connected to the provincial network. These sub-projects were expected to meet the expanded demand for gas in the four cities by 2020, from an estimated 136,700 households and 21 industrial consumers, calling for an increased gas supply 244.15 of million cubic meters. Construction of these sub-projects was expected to commence in October 2014 and be completed by December 2019, In fact, construction commenced only in November 2016, but was nevertheless completed by December 2019.

Component 3: Technical Assistance (**Estimated cost at appraisal:** US\$2.75 million, entirely from IBRD; **Actual cost at closing:** US\$4.35 million). The aim of the component was to help mitigate the risks related to project design and management, through capacity building and technical support to implementing agencies, as well as activities to upgrade the provincial gas network system.

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

Project Cost and Financing



Of the initial US\$ 295.39 million cost of the project, IBRD financing amounted to US\$100 million, with the balance to be provided by the Government and local financing sources. Actual costs at project closing amounted to US\$304.61 million, with US\$97.95 million (i.e. 98 percent) disbursed from the World Bank loan. Minor changes were made in loan allocation to allow for an expansion in scope of Component 2, as suggested during the Mid-Term Review (2017). By adding an investment in a new sub-project in Yangcheng, it was hoped to make up for a reduction in gas demand in Changzhi, Tunliu and Xiangyuan cities that had occurred, as a result of a slow-down of the Chinese economy. A minor saving in costs of US\$2.3 million of the IBRD loan from Component 1, arising at the time, was reallocated to Components 2 and 3.

Borrower contribution

At appraisal, the Borrower contribution was expected to be of the order of US\$92.39 million, with a further US\$103 million coming from local financing sources. These expectations were met, by and large, with actual borrower contribution at project closing amounting to US\$90.08 million, and the contribution of local financing sources amounting to a higher-than-expected US\$116.58 million.

Dates

The project was approved on March 28, 2014, becoming effective on July 30, 2014. A Mid-Term Review was held on May 26, 2017. The project was originally set to close on June 30, 2020. However, on account of the impact of the Covid-19 pandemic on construction of both CHP plants, the project's closing was extended to April 30, 2021.

3. Relevance of Objectives

Rationale

Country and Sector Context

Though China's rapid economic development over the previous three decades had rested heavily on coal consumption, the resultant severe pollution has driven the country to address its environmental challenges. Smoggy weather in over 15 cities in Northern China, and serious nationwide air, land and water pollution, have encouraged a shift towards clean energy and a less coal-dominated economy. Gas has been one of the most important sources to support this clean energy development in the country.

Gas consumption represented a still relatively small share of China's overall energy mix. In 2011, gas accounted for only about 5 percent of total energy consumption, well below the global average (about 24 percent). Domestic exploitation had however confirmed a total of about 3.78 trillion cubic meters of technically recoverable natural gas at the time, equivalent to 40 times the actual production in 2010. Based on this, the Government had set up an ambitious plan to accelerate gas development, aiming to increase the share of gas consumption in primary energy to 7.5 percent by 2015. As a result of this, the access of the population to gas would increase from 188 million people (14 percent of the national total) in 2010 to 250 million (18 percent of the national total).



At the time of appraisal, the government of Shanxi province had launched a provincial gasification program to shift its economic structure away from coal-dominated industries through clean energy development. Shanxi province was at the time the second largest coal producing province in China, producing about 25 percent of the national total in 2011. Economic development in the province had relied heavily on coal, but this had created serious environmental problems, prompting the authorities to promote gas usage as a way to transform its economy along a greener path.

The government of Shanxi's Gasification Program, introduced in late 2010, aimed to increase gas utilization within the province from about 0.7 billion cu. meters per annum (bcma) in 2008 to 9.0 bcma in 2015 and 28.0 bcma by 2020. Total gas supply from Shanxi was estimated to be about 12.0 bcma by 2015 and 36.0 bcma by 2020, when the gas export to other provinces was taken into account. The main sources of gas in the province were domestic coal bed methane (CBM), imported natural gas, coke gas, and local coal converted gas. Shanxi had abundant CBM resources (equal to about a third of national total reserves) and five main natural gas trunk pipelines passed through the province, operated by PetroChina and SinoPec, providing imported natural gas. The main markets targeted for gas utilization were city gas, industrial, chemical and power generation, and transportation (both compressed natural gas (CNG) and liquefied natural gas (LNG) fueled vehicles). At the time of appraisal, these players relied on coal, coal gas, LPG or diesel as their main fuels. Key market players included both national and provincial state-owned enterprises (SOEs) engaged in this sector, as well as private local and foreign companies. Upstream developers included PetroChina, SinoPec, China CBM (a national SOE), Jincheng Mining Group (a provincial SOE) and other international energy enterprises. Shanxi Guoxin Energy Development Group (GXED) led the construction of the gas pipelines and associated infrastructure, in participation with other provincial SOEs, building some 3,000 km of main gas transmission network across the province, covering 94 of its 119 counties. Downstream gas utilization was diversified, with GXED's subsidiaries providing the gas distribution services in most counties.

In 2014, the Government of China launched the "Energy Revolution" to ensure a transition to a sustainable energy system, effectively superseding the Provincial Gasification program. However, in September 2017, in response to a proposal by Shanxi province, the State Council endorsed Shanxi as a pioneer province to implement the 2016-2030 "Energy Revolution".

Implementation of the provincial gasification program was not without its problems. There was an absence of gas regulation at the national level, distorted pricing in gas markets and use of a quota system to allocate gas. To achieve the targets of the provincial gasification program, the government of Shanxi province worked closely with the central government to establish enabling gas policies and a regulatory framework to guide the development of the sector. A reform of gas pricing was initiated by the central government to link gas prices to other competitive fuels – first piloted in two provinces and subsequently implemented nationwide during the project implementation period. However, electricity tariff reforms did not take place on schedule. Despite an agreement that an increase in the local electricity tariff would be implemented by end-2016, the electricity tariff was approved only in 2020, but subsequently lowered to boost the Covid-19 economic recovery. The actual tariff for heating was also much lower than required. These factors ultimately put significant pressure on the financial viability of the CHP plants that were constructed under the project.

Alignment with Country Strategies

The Project's development objectives were consistent with those of the World Bank Group (WBG)'s Country Partnership Strategy (CPS), FY2013-16, at appraisal, remaining so at project closing. The



developmental objectives of the project addressed the CPS themes of “Supporting Green Growth and More Efficient Use of Natural Resources”, and of “Promoting More Inclusive Development”. It was expected that the operation would, improve the living standards of gas consumers through use of cleaner energy, while the community at large would benefit from reduced Greenhouse Gas (GHG) emissions, which contributed to global climate change. At project closing the development objectives of the operation were consistent with the objectives of the World Bank’s Country Partnership Framework (CPF), FY2020-25, for the pillar on “Promoting Greener Growth”, especially under engagement area # 2.1: Facilitating the Transition to a Lower-Carbon Energy Path, through a reduction in coal consumption and scale-up of natural gas, renewable energy and energy efficiency. It was also broadly consistent with the objectives of engagement area #2.2: Reducing air, soil, water, and marine plastic pollution.

The project’s PDO remained relevant to the evolving energy strategy in Shanxi, as well as China. Under the new energy strategy, Shanxi province continued to promote clean energy development, but this included not only the provincial gasification program but also the usage of renewable energy (RE). This meant that while gas distribution network sub-projects under Component 2 were still the main government-promoted investment to replace coal combustion for residential and industrial users, the operation of gas-fired CHP plants was affected significantly. Gas-fired CHP plants had to be operated principally as peaking plants to improve RE integration in Shanxi’s power grid, which meant that annual hours of operation of the gas-fired plants were reduced considerably (which also meant that project indicators relating to Component 1 could no longer be achieved).

Based on the above, Relevance is rated Substantial.

Rating

Substantial

4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective

“To increase gas utilization in selected counties in Shanxi Province”

Rationale

Theory of Change (TOC)

The project represented an effort to increase gas utilization to reduce GHG emissions in selected counties in Shanxi province, as part of the provincial gasification program. The project’s activities consisted of (a) investments in distributed CHP gas-fired plants in Baode and Xiyang cities, (b) expansion of gas distribution networks in four counties (Xiangyuan, Changzhi, Tunliu and Qingxu) in the province, (c) provision of technical assistance for capacity building and project monitoring. Outputs produced by these activities included electricity, heating and gas supply to the project areas, replacing coal power and coal use in households. These led directly to PDO-level outcomes, contributing to improved sustainability of heating/gas supply



service and an improvement in air quality in Shanxi and northern China. Higher-level outcomes arising from the project included potential climate change mitigation, jobs in clean energy industry, and innovation and knowledge with global benefits.

Indicators used to measure the achievement of objectives were consistent with the above results chain. Achievement of project outcome was measured by indicators relating to annual gas utilization (in cu. meters) and avoided carbon emissions (tons of CO₂ equivalent) in the county cities and CHP plants supported by the project. Intermediate indicators included installed capacity (in MW) and annual power supply (in GWh), annual heating supply (in gigajoules) from the two distributed gas-fired CHP plants and number of households and other gas users.

Indicators were adjusted (downwards) at the time of the Mid-Term Review in 2017, to reflect the drop in gas demand under a slowing economy (no restructuring was required). Targets of the Outcome and intermediary indicators were further adjusted in June 2020, with a formal restructuring in order to adapt the project to the evolving provincial energy strategy.

Outputs

- By close of project, electricity generation capacity of 288 MW had been installed in the form of the two gas-fired CHP plants, exceeding the target of 252 MW. The higher-than-targeted capacity was the result of improvements made in technical design during construction (without impact on the cost).
- The number of households and industrial users connected to gas supply reached a total of 53,639 by close of project, significantly higher than the target of 43,000 (reduced from the original target of 45,000). This higher-than-targeted achievement was largely due to the newly-added sub-project in Yangcheng city.

Outcomes

Despite the higher-than-planned achievement in generation capacity installed and gas connections made, actual utilization of gas – at 160 million cu meters fell far short of target. The target had itself been reduced from 365 million m³ to 255 million m³ to reflect the decision that the CHP plants were to be run to provide peaking capacity in non-heating season, to improve RE integration in the province. The decline in gas utilization was on account of a drastic reduction in actual generation of electricity and heat in both gas-fired CHP plants, reflecting constraints arising from the electricity tariff, and gas supply and prices. Actual electricity sales achieved only 39 percent of target, the approved electricity tariff of 0.56 Y/KWh, equivalent to a gas price of 2.35 Y/m³, being lower than the tariff required to cover costs at both plants, at their actual purchased price of gas of 2.59 and 2.66 Y/KWh respectively at the two CHP plants. As a result, the implementing group, Huaxin Gas Group (HXGG), had no financial incentive to generate more. Also, on account of a shortage of gas supply in winter (in both Shanxi and in the country), one of the two CHP plants (at Baode) was required to stop generation in early December 2020, and the generation of the other plant was reduced.

Rating
Modest



OBJECTIVE 2

Objective

“To reduce greenhouse gas emissions in selected counties in Shanxi Province”

Rationale

The performance of the project in meeting the objective of reducing GHG emissions in the project areas was measured by a single PDO indicator and two intermediate indicators.

Outputs

The first full year of operation of the two CHP gas-fired plants covered the full heating season, November 1, 2021 to March 31, 2022. Against this background,

(i) The supply of heating by the CHP plants, at 204.4 million mega joules (MJ) by close of project, exceeded its target of 150 million MJ by a substantial margin.

(ii) Annual supply of electricity by the CHP plants was only of the order of 250.06 GWh by close of project, against a target of 700 GWh (revised downwards in 2020, from the original target of 1,100 GWh). This substantial under performance was because of reasons mentioned earlier – that on account of the high prevailing price of gas and low electricity tariff, the owners of both CHP plants had no financial incentive to generate power.

It may be mentioned that some movement on electricity pricing reform has taken place since the close of the project in 2021, with the NDRC initiating a policy on capacity payments for peaking power plants like gas-fired plants, so that owners would have the financial incentive to run the plants for peaking, with reduced hours of operation. Also, an increase in price margins for cost pass-through from generators to consumers was announced in late 2021. However, this came too late to affect the achievement of the project’s objectives..

Outcomes

The only indicator used to measure the achievement of this objective was the level of annual avoided CO2 emissions. The target for this was 535,320 tons, revised downwards at restructuring from the original target of 820,290 tons. Actual achievement, based on the (low) quantum of electricity generated and heating supplied by the gas-fired plants, was only 334,400 tons, or 62.4 percent of the revised target. Based on this partial achievement, efficacy for this objective is rated Modest.

Rating

Modest

OVERALL EFFICACY

Rationale



Project efficacy for PDOs 1 and 2 were rated Modest on account of a failure to achieve their targets. To no small extent this was due to a change in the government’s priorities away from accelerated gas utilization, towards the development of renewable energy, which led to a slower increase in gas utilization and corresponding reduction in GHG emissions from the project. These outcomes were in part also due to delays in implementation of tariff reform, which negatively impacted incentives to generate electricity at the two gas-fired CHP plants. Based on this, overall efficacy is rated Modest.

Overall Efficacy Rating
Modest

Primary Reason

5. Efficiency

Economic and Financial efficiency

The economic internal rate of return (EIRR) at appraisal was estimated, on the basis of cost-benefit analysis, separately for the individual investment sub-projects. Costs taken into account included the investment and operation costs of each sub-project; benefits were based on economic values of electricity, heating and gas supply, plus the global environmental benefits of the replacement of coal by gas consumption. On this basis, EIRR for the two gas-fired CHP plants were estimated at 17.5 and 14.0 percent respectively, and for the four sub-projects in the gas distribution network ranging between 21.4 and 47.4 percent. EIRR at project completion were estimated on the basis of the same methodology, but with up-dated social values for carbon emission (\$71 to \$143 per ton CO₂e). As such, EIRR for the two CHP plants were estimated at 12.1 and 12.0 percent respectively. For the gas distribution sub-projects, using the low carbon valuation, they ranged between -11.6 percent and 51.6 percent (for the Yangchen sub-project), for a weighted average of 16.5 percent. Using the high carbon valuation, they ranged from 17.8 and 19.0 percent for the CHP plants, and from -9.3 to 66.2 percent for gas distribution (weighted average, 21.6 percent).

Financial analysis conducted for the same sub-projects produced financial rates of return (FIRR) of 6.9 to 3.2 percent at appraisal for the CHP units, and a range of between 9.6 to 11.1 percent for the gas distribution sub-projects. FIRR conducted on completion of the project, based on actual expenditures and revenues to 2021 and estimated expenditures and revenues thereafter, worked out to 2.7 percent and 3.2 percent respectively for the two CHP plants (weighted average 2.9 percent), and to range of between -13.8 and 36.2 percent for the gas distribution sub-projects (weighted average 11.8 percent).

Operational/Administrative Efficiency

The project underwent a ten-month extension to the closing date. At closing, total costs were marginally higher than estimated at appraisal (by 3.1 percent). Overall, project administration was effective (ICR, para 43), the Project Management Office (PMO) being efficient in financial management, procurement of the main works contracts and construction management. However, changes in the structure of the project, arising out of the evolving energy strategy of Shanxi province, together with delays in approving the electricity tariff, significantly undermined its overall performance.



Based on the above, the efficiency of the project is rated Modest. The project did not deliver its full expected benefits, and both economic and financial rates of return at completion were mostly lower than anticipated at appraisal.

Efficiency Rating

Modest

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		0	0 <input type="checkbox"/> Not Applicable
ICR Estimate		0	0 <input type="checkbox"/> Not Applicable

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

6. Outcome

The project's development objectives were substantially relevant to the World bank's Country Partnership Framework and the evolving energy strategy for Shanxi province. Project efficacy was rated modest for both development objectives, on account of a failure to achieve targets. Project efficiency was also rated Modest. On this basis, the project's overall outcome is rated Moderately Unsatisfactory.

a. Outcome Rating

Moderately Unsatisfactory

7. Risk to Development Outcome

A variety of risks to the project's development outcome exist, as follows:

Operational Risk: The technical performance risk for the CHPs is limited, since the operation and efficiency of their plant and equipment has been tested quite thoroughly. No significant risks have been identified regarding the operation of the gas networks, though gas prices remain unpredictable. However, the uncertainties regarding the load factor of the CHP plants constitutes a major risk, going forward, as it depends on the priority and dispatch given to RE plants. Uncertainty persists whether the events of 2017, when the dispatch of the CHP plants was severely curtailed by the provincial government, could be repeated. Also, if the demand for the CHP, which produce heat as well as power, moves fully to peaking power mode,



as it is currently, it could produce a non-optimal combination of heat and power during certain periods, with a loss of efficiency. According to the ICR (para 94), the operational risk is rated High.

Competitiveness Risk: The cost of electricity produced by the project CHPs might be uncompetitive under the new price and dispatch situation compared to other electricity sources. In the absence of electricity tariff reforms, the possible entry of new low-cost RE technologies in the future could further exacerbate the situation, making the project relatively less competitive. As such, the competitiveness risk is rated High (ICR, para 95).

Financial Risk: Reduction in the plants' energy production could affect the financial sustainability of the project, and will call for special adjustments in the tariff to make sure that the fixed costs of the units continue to be covered. A shift to a capacity payment for the CHPs, as is envisaged, would mitigate this risk. Meanwhile, the financial risk is rated High (ICR, para 97).

Environmental and Social Risk: This risk is considered to be Moderate (ICR, para 98). All social and environmental issues have been managed during project implementation. The operation of the CHPs had a positive environmental impact, and all pending social issues (mostly including compensation for land acquisition) were addressed.

8. Assessment of Bank Performance

a. Quality-at-Entry

The project design was relatively limited in its flexibility and was unable to adapt to changes in priorities and energy policies of the central and provincial governments. Preparation of the project was fairly sound, the Bank team (mostly field-based) having worked closely with counterpart agencies, to ensure full compliance with domestic and Bank requirements on fiduciary and safeguards considerations (ICR, paras 86-87). Key operational risks, especially relating to environmental and safety aspects, were identified and mitigation measures introduced. An important condition of the sustainability of the operation was reform of the gas and electricity tariffs; however, though this was covenanted in the project, mitigation measures were weak. This risk did materialize and ended up jeopardizing the financial viability of the project.

On the basis of the above, the project's quality at entry is rated Moderately Satisfactory.

Quality-at-Entry Rating
Moderately Satisfactory

b. Quality of supervision

According to the ICR (para 88), the Bank team provided proactive and effective implementation support to the project through regular missions and field visits. Some 15 bi-annual supervision missions were conducted over a seven-year period, manned by technical, fiduciary and safeguard specialists, to conduct



a comprehensive review of implementation progress and to provide on-going guidance as necessary. This included oversight and guidance on environmental risk management for the construction of the CHP plants, extension of the gas network and land resettlement aspects of the project. The Bank closely monitored the satisfactory implementation of the Environmental Management Plan. The team also conducted a Mid-Term Review in 2017, at which time appropriate changes were made to the project, as they were also at the time of the restructuring in June 2020.

For the most part, the Bank team was relatively stable during the implementation period. The task team leader (TTL) did not change after approval, was country office-based and maintained a strong relationship and dialogue with counterparts. The Bank fiduciary and safeguards specialists also remained stable through most of the implementation period.

That said, as pointed out by the ICR (para 92), the project could have benefited from a more substantive restructuring once the team realized the impact of the tariff policy delays and changes in energy strategy on the operation of the CHP plants. The restructuring could have considered changes to project design or even to the PDO, as well as to the outcome indicators, to ensure the successful implementation of the operation.

Based on this, quality of supervision is rated Moderately Satisfactory.

Quality of Supervision Rating

Moderately Satisfactory

Overall Bank Performance Rating

Moderately Satisfactory

9. M&E Design, Implementation, & Utilization

a. M&E Design

The project's Theory of Change (ToC) was fairly clear and straightforward. Indicators in the results chain were generally relevant and consistent with the PDOs, while also being specific and measurable. The two PDO outcome indicators were based on tons of avoided CO₂ emissions in the province, and cubic meters of gas consumption respectively, and could be measured on the basis of hours of operation of the CHPs and number of connections for the gas network – both of which were easy to evaluate on a real time basis. Intermediate indicators, measuring installed capacities (in MW), annual power supplies (in GWH), annual supplies of heating (in gigajoules) and numbers of households and other gas users, were similarly suitable for the purpose and correctly represented the project's outputs.

M&E design included appropriate arrangements for data collection, compilation, analysis and reporting (ICR, para 71).



b. M&E Implementation

M&E indicators remained unchanged during the project's implementation period. The PMO carried out the data collection and provided clear reports on the progress of the project to the Bank on a regular basis. According to the ICXR (para 71), these data were generally reliable and produced on time. The M&E system was reported to have been particularly effective in monitoring the safeguards aspects of the project. Additionally, survey reports were required and completed at appraisal and completion, regarding the quality of social services (gas and heating supply) in the relevant cities, to provide information on project impacts.

c. M&E Utilization

Data on performance and results progress were used by HXGG and the World Bank to inform project management and facilitate decision-making, including restructuring of the project. Data collected by the M&E system facilitated monitoring of progress, and helped in the identification of emerging issues in project implementation. The results of the M&E system were shared with the provincial authorities to improve their policy making (ICR, para 73).

M&E Quality Rating

Substantial

10. Other Issues

a. Safeguards

The project was classified as Category A, per OP 4.01 at appraisal stage, due to the risk of fire and explosion in the operation phase. The following safeguards policies were triggered: Environmental Assessment, OP/BP 4.01, Physical & Cultural Resources, OP/BP 4.11; and Involuntary Resettlement OP/BP 4.12.

Environmental Safeguards: In terms of compliance, sound and comprehensive environmental assessment documentation was prepared, including an Environmental Assessment (EA), an Environmental Impact Assessment (EIA) and an Environmental Management Plan (EMP), by the Borrower, to clarify the potential environmental impacts and ensure that appropriate mitigation measures were developed and agreed upon. Mitigation measures to be adopted by the client were reported in the EMP. During restructuring, an EIA report, an updated EMP and an EA summary report were prepared by the PMO for the new component to be implemented in Yangchen County.

A Risk Assessment report was also prepared by a certified institute, in line with international practice, and incorporated into the EIA. Critical sources of risk were identified in the report, and mitigation measures and a monitoring plan developed. During implementation, the Borrower showed strong commitment to implementing the EMP and providing monitoring reports in timely manner. A Physical Cultural Resources Management Plan was also prepared as part of the EIA/EMP, which included mitigation measures, institutional strengthening, monitoring plan and Chance Find procedures to be applied during the construction stage of the project. The monitoring reports were provided by the PMO on timely basis, and



these showed that mitigation measures were satisfactorily implemented and that impacts on physical cultural resources were negligible.

There were no outstanding safeguards issues after project closing. The grievance redress mechanism (GRM) was established and operated at site by the PMO.

Social safeguards: The Involuntary Resettlement safeguards (OP/BP 4.12) was triggered on account of the land acquisition and associated affected households. A Resettlement Action Plan (RAP) and Resettlement Policy Framework (RPF) were prepared and disclosed during project preparation, and were duly implemented. A social consultant, recruited to monitor the compliance of social safeguards during the project period, prepared regular monitoring reports as well as a social survey report in 2021, regarding the gas and heating supply service covered by the project. The survey report, which was submitted to the Bank prior to project closing, did not identify any pending issues (ICR, para 82).

According to the ICR, all required environmental and safeguards issues had been addressed satisfactorily over the implementation period.

b. Fiduciary Compliance

According to the ICR (para 85), the financial management (FM) arrangements in place provided assurance that the Bank loan was being used for its intended purposes. All audit reports were submitted on time and with unqualified (clean) opinions. Any FM-related issues identified by auditors in audit reports were dealt with by project agencies in timely manner. Interim Financial Reports (IFRs) were of acceptable quality. The project's overall FM performance was deemed to be satisfactory.

The procurement system was similarly considered adequate for project implementation. According to the ICR (para 84), contracts financed by the loan were procured in accordance with the rules and procedures laid out in the Loan Agreement. Variations in contract duration, if any, were examined and changes processed in compliance with the terms and conditions of the contracts. Procurement performance was rated by the ICR as satisfactory.

c. Unintended impacts (Positive or Negative)

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d. Other

Institutional Strengthening: The project had an institutional strengthening impact, arising out of investments made under Component 3 – which included 6 sub-components supporting the reinforcement of the social and environmental assessment and monitoring capacity of HXGG and improvement in occupational safety. Beyond supporting the implementation of the project, the capacity building activities contributed to an enhancement in competency of staff of HXGG. A SCADA sub-component to the project was added to



Component 2 to improve efficiency of operation of the provincial gas network, including the five counties covered by the gas distribution component of the project.

11. Ratings

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

12. Lessons

IEG derives the following lessons drawn from the ICR:

- 1. When a project outcome is contingent on Government policies, reforms and regulations, that need to take place to enable project implementation, there is a need to manage the risk that these reforms may not take place in time, or be modified by changing priorities and circumstances.** In the case of the project in question, the change in central and provincial energy strategy, which resulted in the CHP plants being used for peaking purposes only, undermined their commercial viability, and hence the outcome of the project.
- 2. Covenants should be used if the commitment of the client is confirmed and the Bank has the capacity to act in the event of non-compliance.** For the project in question, a revision of electricity tariffs was essential to the success of the operation. However, the upfront commitment of the Government was less definite that appeared at the outset. When the tariff covenant was breached, the Bank had no real recourse and had to accept the non-compliance despite the negative impact on the project's outcome.
- 3. Given the complexity of energy transition, the Mid-Term Review can play a critical role in providing the opportunity for a restructuring to adjust the design:** In the case of the project in question, country and sector priorities changed, necessitating a more fundamental restructuring of the operation – in terms of design and objectives - than actually took place, for the project to produce a satisfactory outcome.
- 4. Clarity is needed on the role of gas in the overall energy strategy of a country, when financing a project based on gas utilization.** Usage of gas in the power sector of countries previously dependent on coal has seen challenges as a result of volatility in price of gas, at a time when reduced costs of renewable energy and battery storage. This has made gas power less viable as base load for power plants, resulting in gas power being utilized only as peaking units to stabilize the grid. Against this background, there is an urgent need for both the provincial and central



governments in China to review and clarify their energy sector strategic priorities as regards the use of gas, going forward.

13. Assessment Recommended?

No

14. Comments on Quality of ICR

The ICR is generally well written, evidence-based and internally consistent, and provides a fair amount of detail on the changes that took place during implementation of the project, as well as on safeguards and fiduciary aspects. The achievement of objectives is adequately analyzed, as is the Risk to Development Outcomes and Monitoring & Evaluation. The overall lessons arising from the performance of the project appear to be relevant, but could however have been more comprehensive in their scope.

a. Quality of ICR Rating Substantial