

# PROJECT INFORMATION DOCUMENT (PID) CONCEPT STAGE

Report No.: PIDC17608

<b>Project Name</b>	Hebei Clean Heating Project (P148599)
<b>Region</b>	EAST ASIA AND PACIFIC
<b>Country</b>	China
<b>Sector(s)</b>	Energy efficiency in Heat and Power (100%)
<b>Theme(s)</b>	Pollution management and environmental health (40%), Climate change (10%), Other urban development (50%)
<b>Lending Instrument</b>	Investment Project Financing
<b>Project ID</b>	P148599
<b>Borrower(s)</b>	PEOPLE'S REPUBLIC OF CHINA
<b>Implementing Agency</b>	Foreign Debt Management Center, Hebei Provincial Department of Finance
<b>Environmental Category</b>	A-Full Assessment
<b>Date PID Prepared/ Updated</b>	05-Jan-2015
<b>Date PID Approved/ Disclosed</b>	08-Jan-2015
<b>Estimated Date of Appraisal Completion</b>	16-Nov-2015
<b>Estimated Date of Board Approval</b>	25-Feb-2016
<b>Concept Review Decision</b>	Track II - The review did authorize the preparation to continue

## I. Introduction and Context

### Country Context

China's energy sector faces three main challenges: energy security, environmental sustainability, and sector efficiency. China is expected to import 75 percent of its oil and 50 percent of its gas demand, and become the largest oil importer in the world by 2030. The country is dependent on fossil fuels, with coal accounting for about 70 percent of primary energy consumption. As a result, 85 percent of CO<sub>2</sub> emissions come from energy. The 12th FYP (2011-2015) aims to reduce energy intensity by a further 16 percent. For the first time, it also set a target to reduce carbon intensity by 17 percent, intended to contribute to an initial overarching goal of reducing carbon intensity in the economy by 40 to 45 percent from 2005 to 2020. China also announced on November 12, 2014 a target to peak greenhouse gas (GHG) emissions by around 2030 and increase the share of non-fossil fuels in primary energy consumption to around 20% by 2030 compared to 9.8% in 2013.

Associated with these challenges is the need for China to develop greener urbanization approaches for its cities that keep expanding at a very rapid pace. By 2030 China's cities are projected to add about 45 percent more residents (about 300 million) and about 60 percent more buildings (in square meters of floor area) compared with 2010. Energy needs of these citizens will need to be met through a series of coordinated actions – reducing demand as much as possible, using local clean energy sources where feasible, importing cleaner energy from outside city boundaries and cleaning up coal use as much as possible if it cannot be avoided (see *Urban-China: Toward Efficient, Inclusive and Sustainable Urbanization*, World Bank and State Council Development Research Center, 2014).

Hebei Province (population 73 million, ranking 6th in population and 16th in GDP/capita in 2013) is facing a major challenge in mitigating the environmental impacts of its economic growth. Hebei Province is a key center for manufacturing, including energy intensive heavy industry, and is a key source for fine particulates which have major impacts on public health. It is located in the airshed including major provinces of Beijing, Tianjin and Hebei, known collectively as the Jing-Jin-Ji region. Hebei accounts for about 80 percent of total primary fine Particulate Matter (PM2.5) in the region. In 2010, the region emitted a total of 1.6 million tons of primary PM2.5, with 1.3 million tons from Hebei Province only. Industrial processes and the residential sector are the main sources of primary PM2.5 in the region, accounting for 54% and 29% of the pollution, respectively. Moreover, the power sector, heating, industrial boiler and the transportation sector represent the other 4%, 3%, 6% and 4% of the primary PM2.5 emissions. Sulfur dioxide (SO2) and nitrogen oxide (NOx) are also major atmospheric emissions. Industrial boilers, industrial processes, the power sector, the residential sector, and the heating sector contribute 39%, 19%, 17%, 15%, and 8% of SO2 emissions, respectively. The transportation sector, industrial boilers, the power sector, heating and industrial processes are the main sources of NOx emissions, accounting for 28%, 27%, 24%, 10% and 7%, respectively.

### **Sectoral and Institutional Context**

In line with its industrial development, Hebei Province is rapidly urbanizing. It is currently 48.1% (including migrants) urbanized and is expected to reach a 58% urban share of the population by 2020. Part of the urbanization is expected to be from growth of smaller county towns, which would find their primary source of population growth from rural – urban migration. While there is high uncertainty as the pace and location of this migration, some county towns are expected to grow and present an alternative to larger cities, where the cost of living may be unaffordable for lower income groups.

The heating sector offers some of the most direct opportunities for improving environmental quality in northern cities, including in Hebei, but also faces major challenges in central heating supply sector reform. In more than 300 cities where centralized heating in the winters is legally required, over 90 percent of the heat supply is fueled with coal. While the sector consumes only about 7.5 percent of coal, it does so in a short period of time during a heating season (between 4-5 months), contributing to the carbon intensity of energy use in China's cold climate northern provinces. In early stages of urbanization, cities invested in small, coal fired boilers to provide space heating to new urban areas. Over time, these dispersed systems were replaced with larger district heating systems supplied with larger coal fired heat only boilers with improved emissions controls. As urban areas continued to expand, boilers were surrounded by the city, with some smoke stacks barely clearing apartment building rooftops. Old district heating systems in northern cities are often highly inefficient and have historically had poor pollution controls. As a result, ambient PM2.5

concentrations of cities north of the Huai River were estimated to be about 55 percent higher between 1981 and 2000, and to have reduced average life expectancy by about 5.5 years, compared with cities where heating is not legally required (Chen and others 2013).

Recently, district heating supplied with Combined Heat and Power (CHP) Plants with stricter emissions standards are promoted as energy efficient and less polluting alternatives. Several thermal power plants are now being converted to CHP for this purpose. Very few cities have secured sufficient gas to fully replace coal for heating. More advanced cities are starting to optimize the energy mix for district heating systems by (a) using CHP to provide based load and gas boilers, where gas is available, to provide peak load heating in integrated systems; (b) using low temperature waste heat and water cooling systems from industry; (c) identifying distributed solutions, combining gas/renewable where feasible (i.e. using thermal collectors for hot water preparation) and (d) strengthening demand side measures through building energy management and consumption based billing. However, consumers and heat suppliers are largely unable to respond to market based energy costs because heating, unlike water and electricity, is largely billed according to the floor area rather than the meter.

As part of its “Implementation Plan of the Action Plan for the Prevention of Air Pollution in Hebei” (September 2013), Hebei Province has banned construction of coal fired heat only boilers for district heating. This proposed project offers an opportunity to demonstrate approaches to develop feasible alternatives. Many cities and towns are unfamiliar and inexperienced with cleaner alternatives and there are few clear alternatives that ensure heating security. Hebei Province currently does not have a provincial-level support mechanism to help counties develop feasible alternatives. Without this guidance, cities, especially county towns, are facing a major challenge in finding technically and economically feasible alternatives. Use of natural gas presents a cleaner alternative to coal both from a global and local environmental perspective, but it remains expensive and there are supply constraints. There is a lack of experience in larger towns to design and operate integrated systems with multiple heat sources, which can offer opportunities to prudently introduce gas, for instance during coldest winter most to supply peak load. Some small cities have constructed gas systems, for instance, only to be cut off at peak load periods when heating is most needed. Many new and densifying urban areas in county towns also have no experience in developing district heating networks because they did not need them before. Some have turned to local industries to supply and finance waste-heat based systems, for instance, but the local industries also lack experience in designing and operating district heating networks.

### **Relationship to CAS**

The proposed project is consistent with the Country Partnership Strategy (CPS, FY2013-2016) with China, which includes greener growth as one of its three strategic themes and shifting to a sustainable energy path as one of the supporting pillars under the theme. The project contributes to the World Bank corporate objective of ending poverty and boosting shared prosperity. Energy demand in Hebei is rising, driven by industry-led economic growth and aspirations of an improved quality of life through urbanization. Urbanization is also driving up needs for urban services, including heating demand. The project avoids incremental emissions from this increased demand or directly reduces emissions by the elimination of the use of small boilers. This contributes to the province’s goal of reducing harmful local air pollution, improving public health for all citizens, avoiding lower productivity caused by pollution related negative health impacts. While the project does not specifically target extreme poor, a wide range of beneficiaries will live, work and study in buildings heated by more efficient district heating services. By supporting investments that help

avoid construction of coal fired heat only boilers, the project contributes to saved energy resources that help underpin sustainable local economic development and can contribute to avoided fiscal outlays for higher cost and less well designed systems, freeing up resources for other socio-economic development.

## II. Proposed Development Objective(s)

### Proposed Development Objective(s) (From PCN)

9. The proposed project development objective (PDO) is to improve the efficiency and environmental performance of heating services in project areas of selected municipalities of Hebei Province.

### Key Results (From PCN)

10. The proposed key results indicators to measure success of the project are:

- projected lifetime energy savings (MWh)
- number of people that gained access to more efficient heating facilities
- Avoided CO2 emissions per connected floor area
- Avoided TSP emissions per connected floor area

## III. Preliminary Description

### Concept Description

The proposed project consists of two components: (A) District Heating Subprojects and (B) Project Management Support and Technical Assistance. Currently, Component A includes physical investments in four subcomponents. The total estimated project costs are RMB 1.160 billion (US \$188.7 million equivalent). The proposed indicative financing plan includes an IBRD loan of US \$91 million, about 48% of total currently estimated project costs, and counterpart funds comprising corporate loans and connection fees from new construction. As standard practice, the proposed IBRD loan will be onlent by the Ministry of Finance to Hebei Province, which will sign a Project Agreement with the Bank, taking primary responsibility for overall project implementation. The IBRD loan will be onlent by the Provincial Finance Bureau to the final administrative unit (i.e. county town) responsible for the project areas. The final administrative unit will onlend the proceeds to the final sub-borrowers, the heating companies, who will be responsible for implementing their subprojects.

Component A: District Heating Subprojects

Subproject A1: Chengde District Heating Subproject (estimated cost RMB 282 million; indicative Bank financing \$20 million, RMB 123 million equivalent)

Chengde, a prefecture level city located northwest of Beijing and home of Qing dynasty's summer palace – a UNESCO world heritage site - plans to improve district heating services in the old downtown area, the Shuangqiao District. The DH system is supplied by a coal fired 2x330MW Combined Heat and Power (CHP) plant for base load heating and a 2x58MW coal fired peak load boiler. The municipality is contemplating construction of a gas fired boiler supplied by a syngas plant in Inner Mongolia. This new peak load boiler is to be connected to the network but it is not part of this subproject's scope. Based on information provided, the subproject area can be supplied with current heating sources. The project proposes to finance (a) DH network extension of about

6.7 km (channel length) new pipeline; (b) 23 group substations, and 153 building level substations; and (c) DH primary network and secondary network rehabilitation, replacement of 4.4 km primary and 57 km secondary pipelines, installation of 64 high quality valves in primary network and 753 balancing valves in secondary network. The investments will extend the district heating network by 2.9 million m<sup>2</sup>, including replacing small boilers that supply about 87,000 m<sup>2</sup> of heating area. The total project heating area is 15.25 million m<sup>2</sup>. The proposed sub-borrower is the Chengde Heating Group Company, Ltd., a state-owned enterprise and the only major district heating company in Chengde.

Subproject A2. Zhangjiakou Qiaodong District Heating Subproject (estimated cost RMB 342 million; indicative IBRD financing US\$ 28 million, RMB 172 million equivalent)

Zhangjiakou, a prefecture level city that is located northwest of Beijing plans to improve the environmental performance and energy efficiency of heating services in the Qiaodong District in the city center. The project heating area is supplied by one large 4x64MWth heat-only boiler (HOB) plant (3.5 million m<sup>2</sup> heating area) and 99 small dispersed heating boilers (2.6 million m<sup>2</sup>). The project will replace use of these heating sources located in the city center with a district heating network supplied by the Datang Zhangjiakou coal fired Combined Heat and Power Plant located 15 km away from the project area. It was previously a thermal power plant and has completed converting 2x300MW units into CHP (capable of supplying 24 million m<sup>2</sup>) and plans to convert its remaining 6x300MW units in future to supply other urban areas. The Dongyuan Heating Company plans to lease capacity from an existing transmission pipeline (about 12 km in channel length from the CHP) owned by another heating company. The subproject is proposed to include: (a) a pressure isolation station; (b) about 18 km additional primary network construction; (c) installation of about 59 heat exchange substations (HEX), of which about 41 are to be installed in the existing boiler house areas; and (e) installation of a SCADA system in the pressure isolation station. The proposed sub-borrower is the Zhangjiakou Dongyuan Heating Company, a state owned enterprise.

In addition, conversion of the 4x64MW coal fired peak load boiler to gas might also be feasible as the gas pipeline from Ordos to Beijing will run through Hebei near Zhangjiakou and will be completed by 2016. Zhangjiakou has not yet decided on whether to pursue the gas boiler conversion as it is awaiting for assured gas supply

Subproject A3. Xingtai Xian (County) Heating Subproject (estimated cost RMB 390 million; indicative IBRD financing US\$ 31 million, RMB 190 million equivalent)

Xingtai, one of the most polluted counties in China, is a heavy industrial center (with significant iron, steel, and chemical industries). The purpose of the subproject is to meet significantly expanding heating demand by optimizing the energy mix for heating through expanded use of industrial waste heat for district heating. The heat sources will be supplied by China RISUN Coal Chemicals Group (RISUN). Based on its website, RISUN is the world's largest independent coke and coking chemicals producer (in terms of coke production volume). The optimization will reduce primary energy consumption, avoid or reduce related emissions and reduce the cost of delivered heating in the subproject area. The subproject would use industrial waste heat recovery from cooling water systems in RISUN and construct (a) about 8.5 km channel length of pipelines connecting four cooling water systems (1 main source and 3 backup) to the primary station in RISUN; (b) a primary station including a steam-driven absorption heat pump for heat recovery from industrial cooling water; (c) about 44 km channel length of primary district heating network; (d) 72

heat exchanger substations; (e) central automation and control system. The network is expected to be completed by 2017. The proposed sub-borrower is the RISUN Anneng Heating Company, Ltd, a new joint venture (JV) company, established for this project. The JV is privately owned. 50% is owned by Shijiazhuang Anneng Co., Ltd. and 50% is owned by China (Zhongmei) RISUN Xuyang Coking Company, Ltd..

Subproject A4. Pingshan Xian (County) (estimated cost RMB 146 million; indicative IBRD financing US\$ 12 million, RMB 74 million equivalent)

Pingshan County, located some 30 km west of Shijiazhuang, the capital of Hebei Province, is also expanding its existing urban area to create opportunities for higher living standards and services for the surrounding rural population. The project heating area is 6.95 million m<sup>2</sup>, including 3 million m<sup>2</sup> of new buildings. The heating supply is provided by the Xibaipo Thermal Power Plant (4x330 MWp and 2x600MWp) which has converted 2x330MW units to CHP with supply capacity of about 7.2 million m<sup>2</sup>. The subproject proposes to finance: (a) extension of primary network by 4 km channel length; (b) renovation of existing primary network of 3.2 km channel length (to improve reliability to allow the pipes to handle the increased pressure and temperature, eliminate corroded pipes); (c) installation of about 32 new consumer substations, including five BLS, (d) renovation and expansion of five existing substations, (e) heat metering for 1.92 million m<sup>2</sup>, (f) automatic control systems for existing substations (controls, frequency converters, meters, and data communication); and (g) installation of a SCADA and central monitoring and control system for the whole DH system. The proposed sub-borrower is Pingshan Heating Company, an existing state owned district heating company.

Component B: Project Management Support and Technical Assistance (indicative IBRD financing to be determined)

The details and cost of the Project Management Support and Technical Assistance Component would be discussed during preparation as the Hebei Province is cautious in borrowing for technical assistance. Some initial ideas for the component discussed at identification include: (a) Project Management Consultant: Project management support to the Provincial PMO with the implementation and monitoring of the project by hiring a Project Management Consultant. Hiring a Project Management Consultant to support procurement, contract management and other related operational functions is a common practice, especially for similar projects with many subprojects and entities with weak capacity or lack of experience with foreign capital utilization projects. The Provincial PMO confirmed interest in a Project Management Consultant to strengthen its capacity to supervise the proposed Project. (b) Provincial Long-Term Support Mechanism for Clean Heating: The ban on the construction of new coal fired boilers creates a need for well-planned and prepared alternative heating supply. This may be beyond the abilities of many municipalities and towns (such as some in the proposed Project) which have little or no experience with such work. The Province could consider establishing a technical unit to advise cities, especially smaller ones, on developing appropriate clean heating solutions. The provincial-level technical team could review proposals from counties and guide preparation of feasibility studies to ensure good quality results. The unit could be established during project preparation to gain experience and test the viability of such a service, so that other cities outside the project can benefit. c. Local Project Management and Operations Assistance: The project companies could consider using the loan for TA support to build capacity in operating and maintaining the subproject heating systems. Training in O&M of networks and possible workshops and study tours for the four project heating companies may also

be considered. d. Accounting and Billing System Improvement: This could include provision of technical assistance, equipment and software to integrate accounting and billing systems to help further automate billing, track payments and make accounting entries smoothly.

#### IV. Safeguard Policies that might apply

Safeguard Policies Triggered by the Project	Yes	No	TBD
Environmental Assessment OP/BP 4.01	x		
Natural Habitats OP/BP 4.04			x
Forests OP/BP 4.36		x	
Pest Management OP 4.09		x	
Physical Cultural Resources OP/BP 4.11			x
Indigenous Peoples OP/BP 4.10			x
Involuntary Resettlement OP/BP 4.12	x		
Safety of Dams OP/BP 4.37	x		
Projects on International Waterways OP/BP 7.50		x	
Projects in Disputed Areas OP/BP 7.60		x	

#### V. Financing (in USD Million)

Total Project Cost:	188.70	Total Bank Financing:	91.00
Financing Gap:	0.00		
<b>Financing Source</b>			<b>Amount</b>
Borrower			97.70
International Bank for Reconstruction and Development			91.00
Total			188.70

#### VI. Contact point

##### World Bank

Contact: Gailius J. Draugelis  
 Title: Program Leader  
 Tel: 5788+7753  
 Email: gdraugelis@worldbank.org

##### Borrower/Client/Recipient

Name: PEOPLE'S REPUBLIC OF CHINA  
 Contact: Mr. Yao Licheng  
 Title: Director, International Department, MOF  
 Tel: 86-10-68552064  
 Email: yaolicheng@sina.com

##### Implementing Agencies

Name: Foreign Debt Management Center, Hebei Provincial Department of Finance  
 Contact: Hui He  
 Title: Director

Tel: 0311-66651593  
Email: hehui@vip.163.com

Public Disclosure Copy

**VII. For more information contact:**

The InfoShop  
The World Bank  
1818 H Street, NW  
Washington, D.C. 20433  
Telephone: (202) 458-4500  
Fax: (202) 522-1500  
Web: <http://www.worldbank.org/infoshop>

Public Disclosure Copy