China, People's Republic of: Air Quality Improvement in the Greater Beijing–Tianjin–Hebei Region—Shandong Clean Heating and Cooling Project

The proposed project will implement three clean heating and cooling subprojects to accelerate air pollution abatement in Shandong Province. The heating and cooling projects proposed are innovative, as they will combine renewable energy technologies and waste heat recovered from industry and power plants to reduce the energy and carbon intensity of heat production and refrigeration, and thereby reduce air pollution and greenhouse gas emissions, as well as the heat island effect in urban areas. An overview of each subproject is provided below.

Subproject 1: West Jinan Waste Heat Utilization and Clean Energy Subproject. This subproject will provide heating to urban residents, industrial, and business customers. The technologies to be used on the project include: (i) Large temperature difference waste heat exchange technology is adopted for transporting waste heat from the nearby power plants to the city, which will increase the heat transport capacity by more than 50% than using the standard technology, and same time reduce electricity consumption for cycling pumps. The large temperature difference is achieved by lowering the temperature of return water to the primary pipeline. The waste heat will be used to supply heating to about 80 million m² buildings; (ii) Year-round heat supply needs to be provided to an industrial park with industrial and business customers located in west Jinan. A biomass-based combined heating and power plant using biomass briquette made of agriculture waste will supply heating to 1.54 million m² buildings. A feedstock assessment showed that only 12% of the available agriculture waste will be consumed by the biomass plant; (iii) Jinan is endowed with geothermal resources. Deep-well geothermal offers an environmentally friendly alternative to the current practice of using coal-based space heating. Deep-well reinjection technology will be used to extract and exchange heat from the underground water, which will then be filtered and recharged back to the same aquifer; and (iv) For a few newly built resident communities not covered by the heating network and where geothermal resource is not available, distributed gas-fired boilers will be used. This subproject enables Jinan to fully utilize waste heat in the neighboring regions, to form a waste heat-dominated heating system, with distributed energy supply from biomass, geothermal and natural gas as supplementary.

Subproject 2: Shanghe Coal-Free Clean Heating Demonstration Subproject. This subproject covers the urban area of Shanghe County, the semi-urban area of 11 towns and 80,000 rural households where coal-fired stoves or coal-fired boilers are common for space heating. The subproject will use geothermal energy as the main heat source to replace coal-fired heating. Other clean options, such as air-source heat pump, are selected as distributed heating source where the pipeline network is not available. Gas-fired boilers will be an auxiliary heat source. This subproject also plans to retrofit total 660,400 m² of urban buildings and 30,000 rural households to improve their energy efficiency. Based on the available resources, heavily polluting coal-fired stoves in 80,000 rural households will be replaced by air-to-air heat pumps, air-to-water heat pumps, heat-storage radiators, carbon crystal plate radiators and small household gas heaters. This subproject will play an important role in, and have demonstration effect to, other counties in the northern PRC who are also facing similar air quality issues caused by the winter heating.

Subproject 3: East Jinan Low-Emission Combined District Heating and Cooling Subproject. East Jinan is where the central business district located. The large amount of heating and cooling demands in this area requires a low-emission system supplying both heat and cooling. For heating supply, two options will be used: (i) Industrial waste heat through long-distance pipeline will be used to supply heat to 6.2 million m² buildings; and (ii) Electrode boilers with heat storage will use off-peak electricity at night, and then deliver hot water to the households in the day time to heat up to 700,000 m² area. For district cooling, two technologies will be adopted: (i) Ice storage, which uses off-peak electricity during the night and stores the cooling energy in the form of ice. During peak hours in the daytime, ice is melted to provide cooling; and (ii) When the cooling demand is large enough, lithium bromide absorption chiller driven by the waste heat from the power plant will be used to deliver cold water to the consumers through long-distance pipelines. The subproject aims to expand the area of waste heat supply, and at the same time use off-peak electricity to produce and store heating and cooling capacity to improve the waste heat utilization and shift peak load.

Project Rationale and Country/Regional Strategy

The proposed project responds directly to the urgent national, provincial, and municipal government priorities to reduce coal consumption and improve air quality by introducing more efficient methods and advanced technology for heat production, through coal substitution and utilizing cleaner sources of energy such as natural gas and renewable energy, and reducing raw coal burning among households. The proposed project is well aligned with the priorities on managing climate change and environment in ADB's Country Partnership Strategy (2016-2020) and will support the government's priorities in realizing an ecological civilization, articulated in its 13th plan and at the 19th Party Congress for the Central Committee of the Communist Party. It will also support key strategic priorities of tackling climate change, accelerating progress in gender equality and making cities more livable of ADB's Strategy 2030.

Impact

Air pollution reduced and public health in the BTH region improved
Project Outcome

Description of Outcome

Emissions of pollutants and carbon dioxide in Shandong Province reduced

Progress Toward Outcome

Implementation Progress

Description of Project Outputs

West Jinan Waste Heat Utilization and Clean Energy Subproject constructed
Shanghe Coal-Free Clean Heating Demonstration Subproject constructed
East Jinan Low-Emission Combined District Heating and Cooling Subproject constructed
Clean heating awareness and capacity to install and maintain clean heating and cooling systems strengthened

Status of Implementation Progress (Outputs, Activities, and Issues)

Geographical Location

Shandong

Safeguard Categories

Environment A
Involuntary Resettlement C
Indigenous Peoples C

Summary of Environmental and Social Aspects

Environmental Aspects
Involuntary Resettlement
Indigenous Peoples

Stakeholder Communication, Participation, and Consultation

During Project Design

During Project Implementation

Business Opportunities

Procurement
Procurement (including consulting services) to be financed by the proposed project will follow ADB’s Procurement Policy (2017, as amended from time to time) and Procurement Regulations for ADB Borrowers (2017, as amended from time to time).

Responsible ADB Officer

Ogino, Kaoru

Responsible ADB Department

East Asia Department

Responsible ADB Division

EASI

Executing Agencies

Guangdong Finance Trust Company Limited (GFTC)
14th Floor, No. 481, Dongfengzhong Road, Guangzhou., PRC 510045
Jinan Heating Group
No. 36, Jingliju Road, Shizhong District, Jinan City, Shandong Province, PRC
Shandong Provincial Government
People’s Republic of China

Timetable

Concept Clearance 06 Jun 2018
Fact Finding 21 Aug 2018 to 22 Aug 2018
MRM 27 Sep 2018
Approval 13 Dec 2018
Last Review Mission -
Last PDS Update 26 Mar 2019

Loan 3765-PRC

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## TA 9682-PRC

### Milestones

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### Project Page

https://www.adb.org/projects/51418-001/main

### Request for Information

http://www.adb.org/forms/request-information-form?subject=51418-001

### Date Generated

27 June 2019

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