

Project Administration Manual

Project Number: 48003-002
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People's Republic of China: Qingdao Smart Low-
Carbon District Energy Project

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Project Administration Manual Purpose and Process

The project administration manual (PAM) describes the essential administrative and management requirements to implement the project on time, within budget, and in accordance with the Government and Asian Development Bank (ADB) policies and procedures. The PAM should include references to all available templates and instructions either through linkages to relevant URLs or directly incorporated in the PAM.

Qingdao Municipal Government, the executing agency, and Qingdao Energy Group, the implementing agency, are wholly responsible for the implementation of ADB financed projects, as agreed jointly between the borrower and ADB, and in accordance with Government and ADB's policies and procedures. ADB staff is responsible to support the implementation including compliance by the Qingdao municipal government and the Qingdao Energy Group of their obligations and responsibilities for project implementation in accordance with ADB's policies and procedures.

At the Loan Negotiations, the Borrower and ADB have agreed to the PAM and it ensures consistency with the Loan Agreement. Such agreement shall be reflected in the minutes of the Loan Negotiations. In the event of any discrepancy or contradiction between the PAM and the loan agreement, the provisions of the loan agreement shall prevail.

After ADB Board approval of the project's report and recommendations of the President, changes in the implementation arrangements are subject to agreement and approval pursuant to relevant Government and ADB administrative procedures (including the Project Administration Instructions) and upon such approval they will be subsequently incorporated in the PAM.

ABBREVIATIONS

ADB	=	Asian Development Bank
CSEMP	=	construction site environmental management plan
EHS	=	environment, health and safety
EHSU	=	environment, health and safety unit
EIA	=	environmental impact assessment
EMP	=	environmental management plan
EMoP	=	environmental monitoring plan
EPB	=	environment protection bureau
GRM	=	grievance redress mechanism
LIEC	=	loan implementation environment, health and safety consultant
QEG	=	Qingdao Energy Group
QMFB	=	Qingdao Municipal Finance Bureau
QMG	=	Qingdao Municipal Government
IEE	=	initial environment evaluation
PMO	=	project management office
PRC	=	People's Republic of China
SOE	=	statement of expenditure

I. PROJECT DESCRIPTION

A. Background and Rationale

1. The proposed project will develop and demonstrate a low-carbon, energy-efficient district heating, cooling, and power production and distribution system in eight locations in Qingdao city. Instead of coal, the system will use natural gas, solar thermal, shallow-ground geothermal, and waste heat recovered from industrial plants as its energy sources.¹ It will also demonstrate low-temperature district energy distribution network and combine it with a smart energy management system. The cleaner source of energy combined with highly energy-efficient district energy system will reduce emission of greenhouse gases and other air pollutants in Qingdao city.

B. Impact, Outcome, and Output

2. The impacts will be (i) greater energy efficiency in district energy systems, and (ii) a decline in cases of respiratory and heart diseases. The outcome will be the prevention of emissions of carbon and pollutants by district energy systems in Qingdao. The output will be the construction of a smart, distributed district energy system in Qingdao.

3. The project will install (i) low emission natural gas boilers for heating and power generation, (ii) absorption chiller for cooling, (iii) energy-efficient heat exchange stations, (iv) heat storage tank, (v) heat pumps for waste heat recovery, (vi) solar heat collectors, (vii) 180 kilometer (km) of low temperature heating network using plastic pipes, and (viii) a smart energy management system including households based demand-side load management system which covers 250 building with 25,000 households. The components and key features of the project are summarized in Table 1.

Table 1: Key Features of the Project by Location

District Name and System Type	Heating Area (million m ²)	Cooling Area (million m ²)	Power Supply (MWh)	Length of Pipeline (km)	Heat Source and Technology ^b
1. Binhai energy system (N)	6.7	0.8	25.6	0.0 ^a	Waste heat recovery from industry, gas, and sewage source heat pump
2. Houhai energy system (N)	0.7	0.3	59.8	14.0	Gas
3. Licang unit-based heating and cooling system (N)	0.1	0.2	0.0	0.0 ^a	Gas
4. Shibe heat exchange stations (N)	5.0	0.0	0.0	47.2	Gas
5. Jidong energy system	2.1	0.4	22.5	27.4	Gas
6. East Licang heating system (N)	3.1	0.0	0.0	28.2	Gas
7. Shinan unit-based heating and cooling system (N)	0.4	0.0	0.0	0.0 ^a	Gas and absorption heat pump
8. Shibe geothermal and solar heating system (N)	0.1	0.1	0.0	0.0 ^a	Underground source heat pump and solar thermal
Total	18.2	1.8	107.9	116.8	

km = kilometer, MWh = megawatt-hour, m² = square meter, N = new supply area.

¹ Shallow-ground geothermal technology uses the earth as a heat source in the winter and a heat sink in the summer for heating and cooling systems. The project will use waste heat recovered from both industrial plants and municipal sewage plants.

^a Due to a building-based heating and/or cooling system at these locations, a heating distribution network is not required.

^b Renewable energy will contribute about 5.5% to the total heat output.

Source: Asian Development Bank estimates.

4. Support for project management including consulting services, and training will be provided to the executing and implementing agencies to assist them in (i) optimizing the technical design in detailed design stage, and environmental monitoring to ensure successful project implementation; and (ii) knowledge sharing.

II. IMPLEMENTATION PLANS

C. Project Readiness Activities

Indicative Activities	2015								2016					Who is responsible
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
Establishing project management office														QEG
SRM														ADB
FSR approval ^a														QMG
Engaging a tendering agency														QEG
Advance contracting actions														QMG, QEG, ADB
Retroactive financing actions														QMG, QEG, ADB
Submission of FCUP														QMG
Submission of financial evaluation opinion														QMG
Approval of FCUP														NDRC
Submission of loan negotiation application														QMG, MOF, NDRC
Central government approval for loan negotiation														MOF
Loan Negotiation														MOF, ADB
ADB Board consideration														ADB
Loan signing														MOF, ADB

Indicative Activities	2015								2016					Who is responsible
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
Government legal opinion provided														MOF, QMG
Loan effectiveness														MOF, ADB

ADB = Asian Development Bank, FCUP = foreign capital utilization plan, FSR = feasibility study report, MOF = Ministry of Finance, SRM = Staff Review Meeting, NDRC = National Development and Reform Commission, QEG = Qingdao Energy Group, QMG = Qingdao Municipal Government.

^a Feasibility study report can be approved by the Qingdao municipal government within one week after ADB's staff review meeting.

D. Overall Project Implementation Plan

	2015				2016				2017				2018				2019				2020			
	Q1	Q2	Q3	Q4																				
1 Shibe District-Binhai Energy Systems																								
1.1 Preparation of preliminary design and approval		■										■		■			■							
1.2 Construction design			■										■		■			■						
1.3 Bidding				■										■		■			■					
1.4 Construction					■										■			■						
1.5 Test run								■									■		■				■	
1.6 Acceptance									■									■		■			■	
2 Licang District-Houhai Energy Systems																								
2.1 Preparation of preliminary design and approval													■		■			■						
2.2 Construction design														■		■			■					
2.3 Bidding															■		■			■				
2.4 Construction																■		■						
2.5 Test run																	■		■				■	
2.6 Acceptance																		■		■			■	
3 Licang District-Unit-Based Heating and Cooling Systems																								
3.1 Preparation of preliminary design and approval		■															■		■					
3.2 Construction design			■															■		■				
3.3 Bidding				■														■		■				
3.4 Construction					■													■		■				
3.5 Test run								■										■		■			■	
3.6 Acceptance									■										■		■		■	
4 Shibe District-Heat Exchange Stations																								
4.1 Preparation of preliminary design and approval				■											■									
4.2 Construction design					■											■								
4.3 Bidding						■											■							
4.4 Construction							■										■							
4.5 Test run								■										■		■			■	
4.6 Acceptance									■										■		■		■	
5 Jidong Subdistrict-Energy Systems																								
5.1 Preparation of preliminary design and approval		■																■		■				
5.2 Construction design			■																■		■			
5.3 Bidding				■															■		■			
5.4 Construction					■														■		■			
5.5 Test run								■											■		■		■	
5.6 Acceptance									■											■		■	■	
6 East Licang District-Neighborhood Heating Systems																								
6.1 Preparation of preliminary design and approval		■																	■		■			
6.2 Construction design			■																	■		■		
6.3 Bidding				■																■		■		
6.4 Construction					■															■		■		
6.5 Test run								■												■		■	■	
6.6 Acceptance									■												■		■	

	2015				2016				2017				2018				2019				2020			
	Q1	Q2	Q3	Q4																				
7 Shinan District-Unit-Based Heating and Cooling Systems																								
7.1 Preparation of preliminary design and approval																								
7.2 Construction design																								
7.3 Bidding																								
7.4 Construction																								
7.5 Test run																								
7.6 Acceptance																								
8 Shibe District-Geothermal and Solar Heating Systems																								
8.1 Preparation of preliminary design and approval																								
8.2 Construction design																								
8.3 Bidding																								
8.4 Construction																								
8.5 Test run																								
8.6 Acceptance																								
9 Smart Energy Management System																								
9.1 Preparation of preliminary design and approval																								
9.2 Construction design																								
9.3 Bidding																								
9.4 Construction																								
9.5 Test run																								
9.6 Acceptance																								

Source: Qingdao Energy Group and Asian Development Bank estimates.

III. PROJECT MANAGEMENT ARRANGEMENTS

A. Project Implementation Organizations—Roles and Responsibilities

Project implementation organizations	Management Roles and Responsibilities
<p>Executing Agency Qingdao municipal government (QMG), which consists of Qingdao Municipal Finance Bureau and Qingdao Municipal Development and Reform Commission</p>	<ul style="list-style-type: none"> • Provide overall guidance during preparation and implementation. • Ensure counterpart contributions are provided for project implementation on time. • Establish and maintain the imprest account. • Submit withdrawal applications to Asian Development Bank. • Sign onlending agreement with QEG.
<p>Implementation Agency Qingdao Energy Group (QEG) Project Management Office established at QEG</p>	<ul style="list-style-type: none"> • Sign onlending agreement with QMG. • Engage a design institute to complete the preliminary and detailed engineering designs. • Engage a procurement agency. • Engage project management consulting service. • Engage external environmental monitoring stations. • Responsible for project implementation and in-charge of all day-to-day management work during project preparation and implementation period. • Ensure environment and social safeguards compliance. • Ensures the environment monitoring plan is properly implemented. • Prepare quarterly progress reports and submit them to ADB. • Prepare bidding documents, bid evaluation reports and other necessary documentations and submit them to ADB for approval. • Prepare withdrawal applications for Qingdao Municipal Finance Bureau. • Prepare the required annual audit reports and financial statements of project account. • Prepare environmental monitoring reports and submit them to ADB. • Work closely with the design institute to prepare preliminary and detailed engineering designs. • Work closely with the procurement agency and perform procurement. • Work closely with loan implementation consultants. • Organize knowledge dissemination workshops to share the project experience with other district heating companies.
<p>Asian Development Bank (ADB)</p>	<ul style="list-style-type: none"> • Provide overall project administration. • Provide orientation to QMG and QEG including the project management office. • Review draft bidding documents and approve bid evaluation report. • Disburse ADB loan proceeds.

Source: Asian Development Bank estimates.

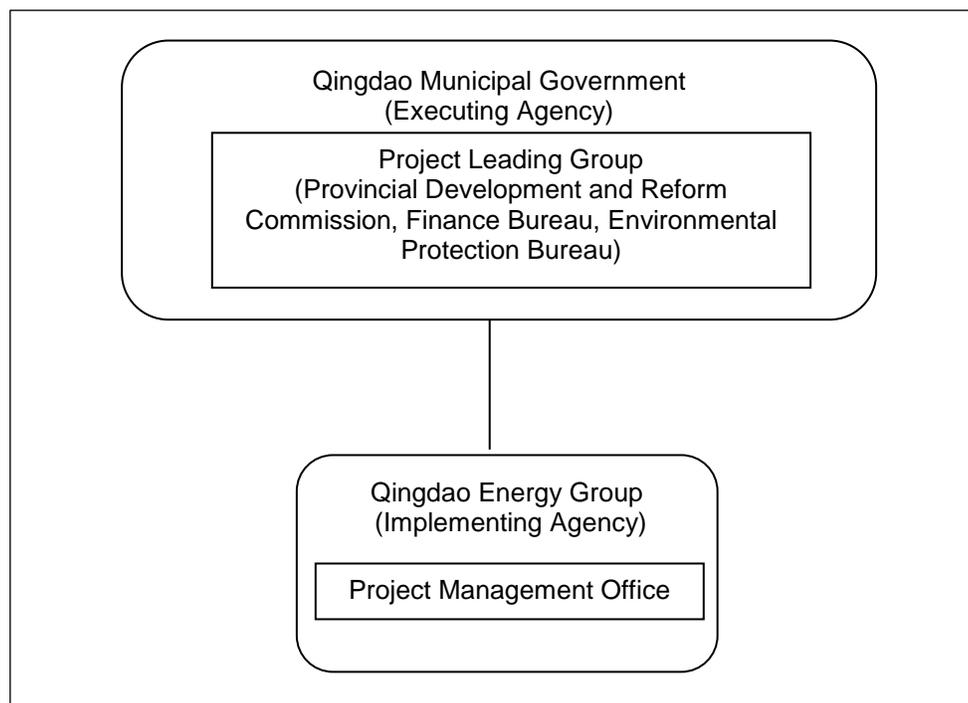
B. Key Persons Involved in Implementation

Institutions	Contact Details
<p>Executing Agency Qingdao Municipal Government</p>	<p>Mr. Dong Hai Deputy Director, Department of Foreign Economic Cooperation and</p>

	Trade, Qingdao Municipal Development and Reform Commission Telephone No.: +86 532 8591 1449 Email address: dong.hai@tom.com Office Address: 11 Xianggangxhong Road, Qingdao, Shandong, People's Republic of China, 266071
Implementing Agency Qingdao Energy Group	Mr. Chunsheng Wang Chairman Qingdao Energy Group Telephone No. :+86 532 86688777 Email address: w_chunsheng@163169.net Office Address: 2 Zhenping One Road, Qingdao, Shandong, People's Republic of China, 266042
Asian Development Bank East Asia Department Energy Division	Mr. Ashok Bhargava Director, Energy Division East Asia Department, Asian Development Bank Telephone No.: +63 2 632 6387 Fax No. +63 2 636 2302 Email address: abhargava@adb.org Office Address: Room 6648, Asian Development Bank, 6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines Mr. Teruhisa Oi Senior Energy Specialist, Energy Division East Asia Department, Asian Development Bank Telephone No.+63 2 632 5706 Fax No. +63 2 636 2302 Email address: teruhisaoi@adb.org Office Address: Room 6635, Asian Development Bank, 6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines

C. Project Organization Structure

Figure 1: Project Organization Structure



Source: Project preparatory technical assistance.

IV. COSTS AND FINANCING

5. The project investment cost is estimated at \$263.6 million, including physical and price contingencies and financial charges during construction (Table 2).

6. The government has requested a loan of \$130 million from ADB's ordinary capital resources to help finance the project. The loan will have a 25-year term, including (i) a grace period of 5 years, (ii) a straight-line repayment method, (iii) an annual interest rate determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility, (iv) a commitment charge of 0.15% per year to be charged on the undisbursed loan amount, and (v) such other terms and conditions set forth in the draft loan and project agreements. The average loan maturity is 15.25 years, and the maturity premium payable to ADB is 0.10% per year. The Qingdao Energy Group (QEG) will finance \$133.6 million through equity contributions.² The summary financing plan is in Table 3.

A. Cost Estimates Preparation and Revisions

7. **Preparation.** The cost estimates were prepared by QEG based on the feasibility study in accordance with ADB's Guide on Preparing and Presenting Cost Estimates for Projects and Programs Financed by ADB.³

8. **Revisions.** During the implementation of the loan, the cost estimates model may be updated when there are major changes in the cost development.

B. Cost Categories

9. Cost categories are as follows:

Category	Description
Goods	Cost includes boilers, generators, chillers, heat exchangers, pumps, heating pipes, solar collectors, computerized automation systems, and attachments.
Consulting Services	Services for project implementation.

C. Assumptions

10. The following key assumptions underpin the cost estimates and financing plan:

- (i) Exchange rate: CNY 6.20340 = \$1.00 (as of 3 July 2015).
- (ii) Price contingencies based on expected cumulative inflation over the implementation period are as follows:

Item	2016	2017	2018	2019	2020	Average
Foreign rate of price inflation (%)	1.50	1.40	1.50	1.50	1.50	1.48
Domestic rate of price inflation (%)	2.30	2.40	2.50	2.50	2.50	2.44

Source: Asian Development Bank estimates.

² Qingdao Energy Group is a state-owned enterprise 100% owned by the QMG. Its core business is investment, construction, operation, and service provision in fuel (compressed natural gas for vehicles) and natural gas supply, heat and electricity supply, and applications of new and renewable energies. It has a staff of about 6,000 staff. In 2014, its total assets were CNY11 billion.

³ ADB. 2014. *Preparing and Presenting Cost Estimates for Projects and Programs Financed by the Asian Development Bank*. Manila.

D. Summary Cost Estimates and Financing Plan

Table 2: Project Investment Plan
(\$ million)

Item	Amount ^a
A. Base Cost^b	
1. Binhai energy system	87.0
2. Houhai energy system	43.1
3. Licang unit-based heating and cooling system	8.6
4. Shibeih heat exchange stations	25.6
5. Jidong energy system	27.1
6. East Licang heating system	10.7
7. Shinan unit-based heating and cooling system	5.5
8. Shibeih geothermal and solar heating system	3.3
9. Smart energy management system	18.3
10. Project implementation consulting services	1.0
Subtotal (A)	230.3
B. Contingencies^c	25.4
C. Financial Charges During Implementation^d	7.9
Total (A+B+C)	263.6

Note: Numbers may not sum precisely because of rounding.

^a Includes taxes and duties of \$22.7 million to be financed from government resources and Asian Development Bank (ADB) loan resources. The amount of taxes and duties (\$11 million) to be financed by ADB is based on the principles that (i) the amount will be within the reasonable threshold identified during the country partnership strategy preparation process, (ii) the amount of taxes and duties financed by the ADB loan does not represent an excessive share of the project, (iii) the taxes and duties apply only to ADB-financed expenditures, and (iv) the financing of taxes and duties is material and relevant to the success of the project. Government financing of taxes and duties will be provided through a cash contribution.

^b In September 2015 prices.

^c Physical contingencies computed at 5.0% of base cost. Price contingencies computed at an average 1.4% on foreign exchange costs and 3.0% on local currency costs; includes provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate.

^d Includes interest and commitment charges. Interest during construction for an ordinary capital resources loan has been computed at the 5-year US dollar fixed swap rate plus an effective contractual spread of 0.5% and maturity premium of 0.1%. Commitment charges for an ordinary capital resources loan are 0.15% per year to be charged on the undisbursed loan amount.

Sources: Asian Development Bank and Qingdao municipal government estimates.

Table 3: Financing Plan

Source	Amount (\$ million)	Share of Total (%)
Asian Development Bank		
Ordinary capital resources (loan)	130.0	49.0
Government		
Qingdao Energy Group	133.6	51.0
Total	263.6	100.0

Sources: Qingdao municipal government and Asian Development Bank estimates.

11. The government is the borrower of the loan and will make the loan available, through Qingdao municipal government (QMG) to QEG on the same terms and conditions as those of ADB loan. QEG will assume the foreign exchange and interest variation risks of the ADB loan. The government, QEG, and QMG have assured ADB that counterpart funding will be provided in a timely manner, including any additional counterpart funding required for any shortfall of funds or cost overruns.

E. Detailed Cost Estimates by Expenditure Category

Item	CNY (million)			USD (million)			% of Total Base Cost
	Foreign Exchange	Local Currency	Total Cost ^a	Foreign Exchange	Local Currency	Total Cost	
A. Investment Cost^b							
1. Civil works	0.0	510.7	510.7	0.0	80.1	80.1	34.8
2. Equipment and materials	822.2	0.0	822.2	129.0	0.0	129.0	56.0
a. Shibeï District-Binghai	290.9	0.0	290.9	45.6	0.0	45.6	19.8
b. Licuang District-Houhai	187.3	0.0	187.3	29.4	0.0	29.4	12.8
c. Shibeï and Licang Districts-natural gas district heating and cooling	31.3	0.0	31.3	4.9	0.0	4.9	2.1
d. Shibeï District-heat exchange station and peaking boilers at 28 subdistricts and Underground heat pump	67.9	0.0	67.9	10.7	0.0	10.7	4.6
e. Jidong district	86.7	0.0	86.7	13.6	0.0	13.6	5.9
f. Licuang District-Tongli	50.7	0.0	50.7	8.0	0.0	8.0	3.5
g. Shinan District-Padahu and Municipal Government	8.3	0.0	8.3	1.3	0.0	1.3	0.6
h. Shibeï District-Underground Heat Pump and Solar Heating	14.6	0.0	14.6	2.3	0.0	2.3	1.0
i. Smart Energy Management System	84.5	0.0	84.5	13.2	0.0	13.2	5.7
3. Other Engineering Cost^c	0.0	128.6	128.6	0.0	20.2	20.2	8.8
4. Consulting Services	6.4	0.0	6.4	1.0	0.0	1.0	0.4
Subtotal (A)	828.6	639.3	1,467.9	130.0	100.3	230.3	100.0
B. Contingencies^d							
a. Physical	0.0	73.4	73.4	0.0	11.5	11.5	5.0
b. Price	0.0	88.6	88.6	0.0	13.9	13.9	6.0
Subtotal (B)	0.0	162.0	162.0	0.0	25.4	25.4	11.0
C. Finance Charges during Construction^e							
a. Interest During construction	0.0	47.0	47.0	0.0	7.4	7.4	3.2
b. Commitment charges	0.0	3.1	3.1	0.0	0.5	0.5	0.2
Subtotal (C)	0.0	50.1	50.1	0.0	7.9	7.9	3.4
Total Project Cost (A+B+C)	828.6	851.4	1,680.0	130.0	133.6	263.6	

Note: Numbers may not sum precisely because of rounding.

^a Includes taxes and duties of \$22.7 million to be financed from government resources and Asian Development Bank (ADB) loan resources. The amount of taxes and duties (\$11 million) to be financed by ADB is based on the principles that (i) the amount will be within the reasonable threshold identified during the country partnership strategy preparation process, (ii) the amount of taxes and duties financed by the ADB loan does not represent an excessive share of the project, (iii) the taxes and duties apply only to ADB-financed expenditures, and (iv) the financing of taxes and duties is material and relevant to the success of the project. Government financing of taxes and duties will be provided through a cash contribution.

^b In September 2015 price.

^c Other engineering cost includes geology and other engineering surveys, engineering design, third party review of detailed designs, construction drawings, as built drawings, site preparation and temporary facilities, engineering insurance, special equipment safety supervision and inspection fee.

^d Physical contingencies computed at 5.0% of base cost. Price contingencies computed at an average 1.4% on foreign exchange costs and 3.0% on local currency costs; includes provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate.

^e Includes interest and commitment charges. Interest during construction for an ordinary capital resources loan has been computed at the 5-year US dollar fixed swap rate plus an effective contractual spread of 0.5% and maturity premium of 0.1%. Commitment charges for an ordinary capital resources loan are 0.15% per year to be charged on the undisbursed loan amount.

Source: Asian Development Bank estimates.

F. Allocation and Withdrawal of Loan Proceeds

Item	Total Amount Allocated for ADB Financing (\$)		Percentage and basis for Withdrawal from the Loan Account^a
	Category	Subcategory	
A. Goods ^b		129,000,000	100% of total expenditure
B. Consulting Services		1,000,000	100% of total expenditure
Total (A+B)		130,000,000	

ADB = Asian Development Bank.

^a Including taxes and duties.

^b Including transportation and insurance costs.

Source: Asian Development Bank estimates.

G. Detailed Cost Estimate by Financiers (\$ million)^a

Item	ADB Loan		Government-QEG		Total	
	Amount	%	Amount	%	Amount	%
A. Investment Cost^b						
1. Civil works	0.0	0.0	80.1	0.0	80.1	30.4
2. Equipment and materials	129.0	100.0	0.0	0.0	129.0	48.9
a. Binhai energy system	45.6	100.0	0.0	0.0	45.6	17.3
b. Houhai energy system	29.4	100.0	0.0	0.0	29.4	11.2
c. Licang unit-based heating and cooling system	4.9	100.0	0.0	0.0	4.9	1.9
d. Shibeil heat exchange stations	10.7	100.0	0.0	0.0	10.7	4.0
e. Jidong energy system	13.6	100.0	0.0	0.0	13.6	5.2
f. East Licang heating system	8.0	100.0	0.0	0.0	8.0	3.0
g. Shinan unit-based heating and cooling system	1.3	100.0	0.0	0.0	1.3	0.5
h. Shibeil geothermal and solar heating system	2.3	100.0	0.0	0.0	2.3	0.9
i. Smart Energy Management System	13.2	100.0	0.0	0.0	13.2	4.9
3. Other Engineering Cost^c	0.0	0.0	20.2	100.0	20.2	7.8
4. Consulting Services	1.0	100.0	0.0	0.0	1.0	0.4
Subtotal (A)	130.0	56.5	100.3	43.5	230.3	87.5
B. Contingencies^d						
a. Physical	0.0	0.0	11.5	100.0	11.5	4.4
b. Price	0.0	0.0	13.9	100.0	13.9	5.2
Subtotal (B)	0.0	0.0	25.4	100.0	25.4	9.6
C. Finance Charges during Construction^e						
a. Interest During construction	0.0	0.0	7.4	100.0	7.4	2.8
b. Commitment charges	0.0	0.0	0.5	100.0	0.5	0.1
Subtotal (C)	0.0	0.0	7.9	100.0	7.9	2.9
Total Project Cost (A+B+C)	130.0	49.3	133.6	50.7	263.6	100.0

Note: Numbers may not sum precisely because of rounding.

^a Includes taxes and duties of \$22.7 million to be financed from government resources and Asian Development Bank (ADB) loan resources. The amount of taxes and duties (\$11 million) to be financed by ADB is based on the principles that (i) the amount will be within the reasonable threshold identified during the country partnership strategy preparation process, (ii) the amount of taxes and duties financed by the ADB loan does not represent an excessive share of the project, (iii) the taxes and duties apply only to ADB-financed expenditures, and (iv) the financing of taxes and duties is material and relevant to the success of the project. Government financing of taxes and duties will be provided through a cash contribution.

^b In September 2015 price.

^c Other engineering cost includes geology and other engineering surveys, engineering design, third party review of detailed designs, construction drawings, as built drawings, site preparation and temporary facilities, engineering insurance, and special equipment safety supervision and inspection fee.

^d Physical contingencies computed at 5.0% of base cost. Price contingencies computed at an average 1.4% on foreign exchange costs and 3.0% on local currency costs; includes provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate.

^e Includes interest and commitment charges. Interest during construction for an ordinary capital resources loan has been computed at the 5-year US dollar fixed swap rate plus an effective contractual spread of 0.5% and maturity premium of 0.1%. Commitment charges for an ordinary capital resources loan are 0.15% per year to be charged on the undisbursed loan amount.

Source: Asian Development Bank estimates.

H. Detailed Cost Estimate by Outputs/Components (\$ million)^a

Item	Total Cost		Shibe District - Binghai		Licuang District - Houhai		Shibe District - Natural gas heating and cooling		Shibe District - Licuang Districts - heating and cooling		Shibe District - Shinan District - Padahu and Municipal Government		Shibe District - Underground Heat Pump and Solar Heating		Smart Energy Management System				
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	
A. Investment Cost^b																			
1. Civil works	82.5	35.3	42.8	10.6	12.8	2.8	3.4	13.4	16.2	11.5	13.9	1.5	1.9	3.6	4.4	0.7	0.8	3.0	3.6
2. Equipment and Materials	126.6	43.2	34.1	29.4	23.2	4.9	3.9	10.7	8.5	13.6	10.7	8.0	6.3	1.2	0.9	2.3	1.8	13.3	10.5
3. Other Engineering Cost ^c	20.2	8.4	41.8	3.1	15.3	0.9	4.5	1.6	7.9	2.0	9.9	1.3	6.4	0.6	3.0	0.3	1.5	2.0	9.9
4. Consulting Services	1.0	0.1	10.0	0.1	10.0	0.1	10.0	0.1	10.0	0.1	10.0	0.1	10.0	0.2	20.0	0.1	10.0	0.1	10.0
Subtotal (A)	230.3	87.0	37.8	43.2	18.8	8.7	3.8	25.8	11.2	27.2	11.8	10.9	4.8	5.6	2.4	3.4	1.5	18.5	8.0
B. Contingencies^d																			
a. Physical	11.5	4.4	38.3	2.2	19.1	0.5	4.3	1.3	11.3	1.4	12.2	0.5	4.3	0.3	2.6	0.2	1.7	0.7	6.1
b. Price	13.9	5.3	38.1	2.6	18.8	0.5	3.6	1.5	10.8	1.6	11.5	0.7	5.0	0.3	2.2	0.2	1.4	1.2	8.6
Subtotal (B)	25.4	9.7	38.2	4.8	18.9	1.0	3.9	2.8	11.0	3.0	11.8	1.2	4.7	0.6	2.4	0.4	1.6	1.9	7.5
C. Finance Charges during Construction^e																			
a. Interest During construction	7.4	2.8	37.8	1.4	18.8	0.3	4.1	0.8	10.8	0.8	10.8	0.3	4.1	0.2	2.7	0.1	1.4	0.7	9.5
b. Commitment charges	0.5	0.1	40.0	0.1	18.8	0.0	0.0	0.1	20.0	0.1	20.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0	7.0
Subtotal (C)	7.9	3.0	38.0	1.5	18.8	0.3	3.8	0.9	11.4	0.9	11.4	0.3	4.1	0.2	2.5	0.1	1.3	0.7	9.4
Total Project Cost (A+B+C)	263.6	99.7	37.8	49.5	18.8	10.0	3.8	29.5	11.2	31.1	11.8	12.5	4.7	6.4	2.4	3.9	1.5	21.0	8.0

Note: Numbers may not sum precisely because of rounding.

^a Includes taxes and duties of \$22.7 million to be financed from government resources and Asian Development Bank (ADB) loan resources. The amount of taxes and duties (\$11 million) to be financed by ADB is based on the principles that (i) the amount will be within the reasonable threshold identified during the country partnership strategy preparation process, (ii) the amount of taxes and duties financed by the ADB loan does not represent an excessive share of the project, (iii) the taxes and duties apply only to ADB-financed expenditures, and (iv) the financing of taxes and duties is material and relevant to the success of the project. Government financing of taxes and duties will be provided through a cash contribution.

^b In September 2015 price.

^c Other engineering cost includes geology and other engineering surveys, engineering design, third party review of detailed designs, construction drawings, as built drawings, site preparation and temporary facilities, engineering insurance, and special equipment safety supervision and inspection fee.

^d Physical contingencies computed at 5.0% of base cost. Price contingencies computed at an average 1.4% on foreign exchange costs and 3.0% on local currency costs; includes provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate.

^e Includes interest and commitment charges. Interest during construction for an ordinary capital resources loan has been computed at the 5-year US dollar fixed swap rate plus an effective contractual spread of 0.5% and maturity premium of 0.1%. Commitment charges for an ordinary capital resources loan are 0.15% per year to be charged on the undisbursed loan amount.

Source: Asian Development Bank estimates.

I. Detailed Cost Estimate by Year (\$ million)^a

Item	Total Cost	2016	2017	2018	2019	2020
A. Investment Cost^b						
1. Civil works	80.1	12.0	16.0	16.0	20.0	16.0
2. Equipment and Materials	129.0	19.3	25.9	25.9	32.2	25.9
a. Binhai energy system	45.6	6.8	9.1	9.1	11.4	9.1
b. Houhai energy system	29.4	4.4	5.9	5.9	7.3	5.9
c. Licang unit-based heating and cooling system	4.9	0.7	1.0	1.0	1.2	1.0
d. Shibeï heat exchange stations	10.7	1.6	2.1	2.1	2.7	2.1
e. Jidong energy system	13.6	2.0	2.7	2.7	3.4	2.7
f. East Licang heating system	8.0	1.2	1.6	1.6	2.0	1.6
g. Shinan unit-based heating and cooling system	1.3	0.2	0.3	0.3	0.3	0.3
h. Shibeï geothermal and solar heating system	2.3	0.3	0.5	0.5	0.6	0.5
i. Smart Energy Management System	13.2	2.1	2.7	2.7	3.3	2.7
3. Other Engineering Cost^c	20.2	3.0	4.0	4.0	5.0	4.0
4. Consulting services	1.0	0.2	0.2	0.2	0.3	0.2
Subtotal (A)	230.3	34.5	46.1	46.1	57.5	46.1
B. Contingencies^d						
a. Physical	11.5	1.7	2.3	2.3	2.9	2.3
b. Price	13.9	2.1	2.8	2.8	3.5	2.8
Subtotal (B)	25.4	3.8	5.1	5.1	6.4	5.1
C. Finance Charges during Construction^e						
a. Interest during construction	7.4	0.1	0.7	1.6	2.3	2.7
b. Commitment charges	0.5	0.1	0.2	0.1	0.0	0.0
Subtotal (C)	7.9	0.2	0.9	1.7	2.3	2.7
Total Project Cost (A+B+C)	263.6	38.5	52.1	52.9	66.2	53.9
% Total Project Cost	100.0	14.6	19.7	20.0	25.1	20.4

Note: Numbers may not sum precisely because of rounding.

^a Includes taxes and duties of \$22.7 million to be financed from government resources and Asian Development Bank (ADB) loan resources. The amount of taxes and duties (\$11 million) to be financed by ADB is based on the principles that (i) the amount will be within the reasonable threshold identified during the country partnership strategy preparation process, (ii) the amount of taxes and duties financed by the ADB loan does not represent an excessive share of the project, (iii) the taxes and duties apply only to ADB-financed expenditures, and (iv) the financing of taxes and duties is material and relevant to the success of the project. Government financing of taxes and duties will be provided through a cash contribution.

^b In September 2015 price.

^c Other engineering cost includes geology and other engineering surveys, engineering design, third party review of detailed designs, construction drawings, as built drawings, site preparation and temporary facilities, engineering insurance, and special equipment safety supervision and inspection fee.

^d Physical contingencies computed at 5.0% of base cost. Price contingencies computed at an average 1.4% on foreign exchange costs and 3.0% on local currency costs; includes provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate.

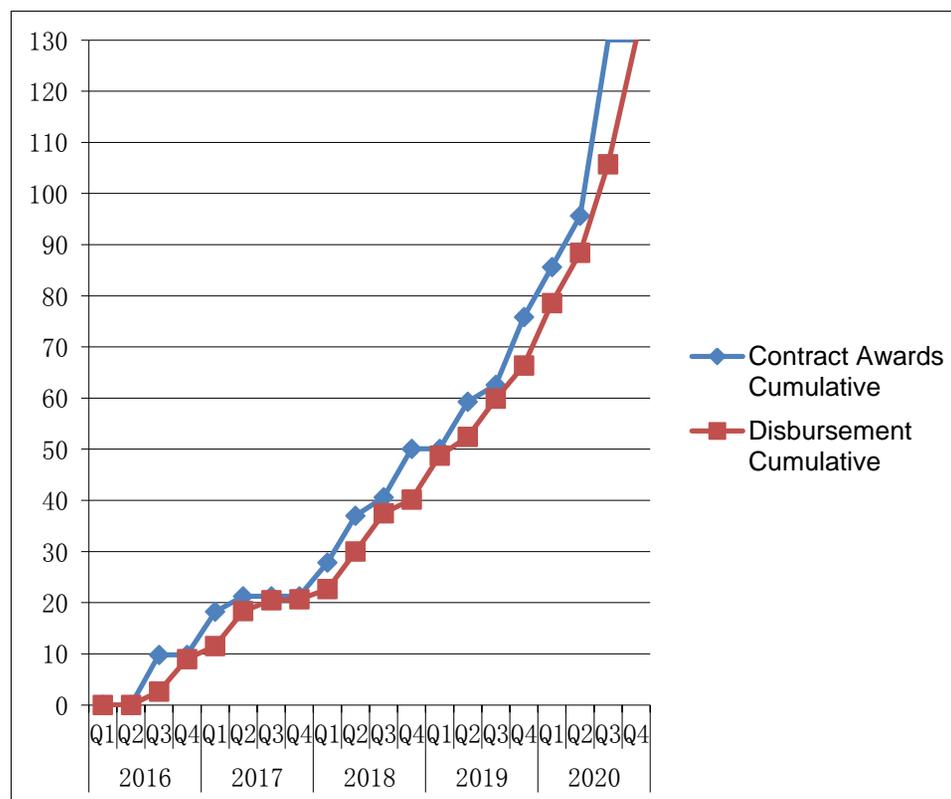
^e Includes interest and commitment charges. Interest during construction for an ordinary capital resources loan has been computed at the 5-year US dollar fixed swap rate plus an effective contractual spread of 0.5% and maturity premium of 0.1%. Commitment charges for an ordinary capital resources loan are 0.15% per year to be charged on the undisbursed loan amount.

Source: Asian Development Bank estimates.

J. Contract and Disbursement S-curves

Year	Quarter	Contract Awards		Disbursement	
		Cumulative	Annual	Cumulative	Annual
2016	Q1	0.0	9.8	0.0	9.0
	Q2	0.0		0.0	
	Q3	9.8		2.6	
	Q4	9.8		9.0	
2017	Q1	18.2	11.5	11.5	11.7
	Q2	21.3		18.3	
	Q3	21.3		20.5	
	Q4	21.3		20.7	
2018	Q1	27.8	28.8	22.6	19.5
	Q2	37.0		30.0	
	Q3	40.6		37.5	
	Q4	50.1		40.2	
2019	Q1	50.1	25.8	48.7	26.2
	Q2	59.3		52.4	
	Q3	62.6		59.9	
	Q4	75.8		66.4	
2020	Q1	85.6	54.2	78.6	63.6
	Q2	95.6		88.4	
	Q3	130.0		105.7	
	Q4	130.0		130.0	

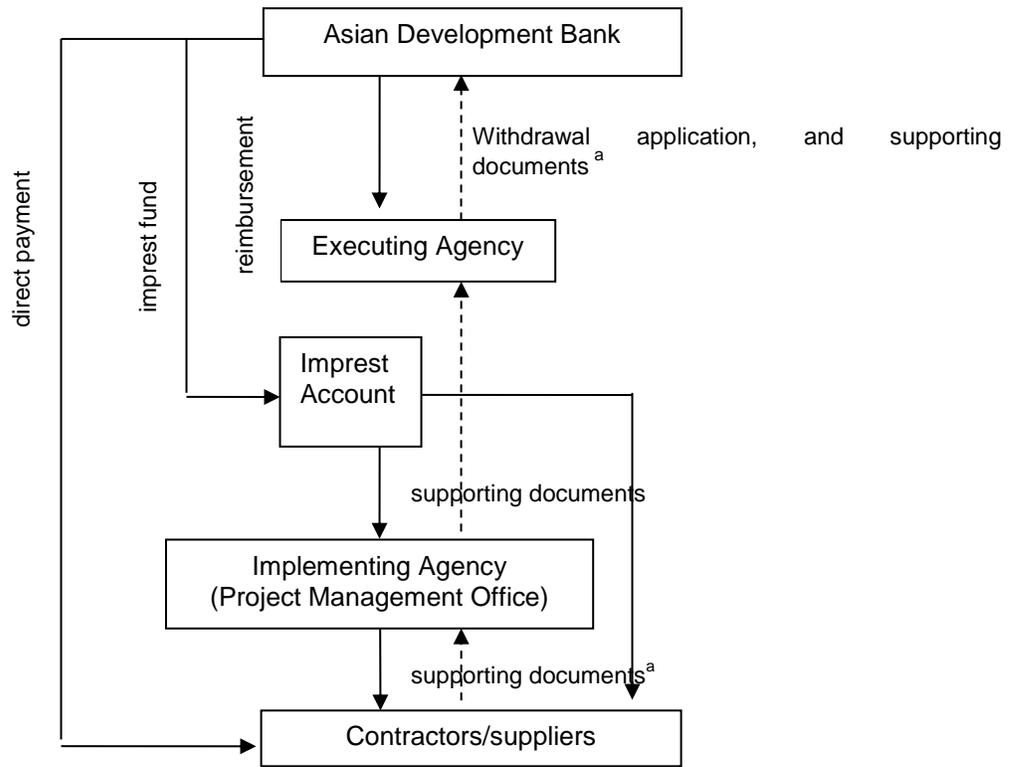
Figure 2: Contract Awards and Disbursement S-Curves



Source: Asian Development Bank estimates.

K. Fund Flow Diagram

Figure 3: Fund Flow Diagram



→ = cash fund flow, - - - -> = documentation flow.

^a Supporting documents required for direct payment procedure include contract and invoice. For imprest fund procedure, statement of expenditure, corresponding bank statement, and reconciliation statement. For reimbursement procedure, summary sheet, contract, invoice, receipt of payment, or statement of expenditure.

Source: Qingdao Municipal Government.

V. FINANCIAL MANAGEMENT

A. Financial Management Assessment

12. The financial management assessment was carried out in accordance with ADB's Guidelines for Financial Management and Analysis of Projects⁴ and Financial Due Diligence: a Methodology Note⁵ to assess the financial capacity of QMG, and QEG.⁶ QMG has sufficient experience in three ADB-financed loan projects. QMG is familiar with ADB project implementation, disbursement, and procurement procedures. Qingdao Municipal Finance Bureau (QMFB) has all the necessary management systems, staff and procedures in place, sufficient experience and capacity to manage an imprest account and a positive track record in delivering ADB projects.

13. The financial management assessment was conducted for QEG. The assessment results show that their financial management systems and procedures are in place to perform proper financial management and reporting. Accounting systems of QEG is also adequate for the purpose of ADB loan implementation. In terms of governance risks, (i) accounting policies and procedures, (ii) staffing, (iii) reporting and monitoring, (iv) information systems, and (v) internal and external auditing were evaluated low or medium.

14. QEG has extensive project implementation experiences and a successful track record in working with international finance organizations. They have successfully delivered district heating project within a planned timeframe and within the estimated cost. QEG has timely completed a district heating project funded by the Government of Finland and is currently implementing two district heating projects funded by KfW, a German government-owned development bank. QEG also has previous ADB-financed project experience in 1992.⁷ A tendering agency, with extensive experience in foreign loans, was engaged on 15 June 2015.⁸ To strengthen their financial management capacity in implementing an ADB project, the staff at the project management office, which has been already established by QEG, has undertaken several trainings on ADB disbursement, procurement, reporting and other procedures during the project processing and will continue undertaking capacity building trainings during project implementation. The overall control risks before mitigation is considered to be moderate.

15. Based on the assessment of financial management of QMG and QEG, the financial management action plan (Table 4) has been created to mitigate the identified risk to be followed by the QMG and QEG.

Table 4: Financial Management Action Plan

Identified Risks	Action for Mitigating Risks	Responsible Unit
1. Lack of familiarity with ADB requirements	Provide training before project implementation	QMG, QEG, and ADB
2. Readiness of accounting	Fully setup the accounting system	QEG

⁴ ADB. 2005. *Financial Management and Analysis of Projects*. Manila. <http://www.adb.org/documents/financial-management-and-analysis-projects>.

⁵ ADB. 2009. *Financial Due Diligence: A Methodology Note*. Manila. <http://www.adb.org/documents/financial-due-diligence-methodology-note>.

⁶ Financial management assessment was conducted under the project preparatory technical assistance in 2014.

⁷ ADB. 1992. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the People's Republic of China for Qingdao Environment Improvement Project*. Manila.

⁸ Tendering agency has grade A certificate for international tendering agent of the People's Republic of China and ongoing experience in five ADB loans and five World Bank loans.

Identified Risks	Action for Mitigating Risks	Responsible Unit
system for project and tested before loan implementation effectiveness		
3. Limited experience in ADB disbursement procedure	Provide training before project implementation	QMG, QEG, and ADB
4. Submission of project and corporate audited financial statements in English	Agree assurance to submit statements in English during loan negotiation	QMG, QEG, and ADB

ADB = Asian Development Bank, QEG = Qingdao Energy Group, QMG = Qingdao Municipal Government.
Source: Asian Development Bank estimates.

16. To enhance the company's financial planning and financial management capacity, ADB will work closely with QEG to build a detailed financial projection model for the company by the end of March 2016.

B. Disbursement Arrangements

1. Disbursement Arrangements for ADB

17. The loan proceeds will be disbursed in accordance with ADB's *Loan Disbursement Handbook* (2015, as amended from time to time), and detailed arrangements agreed upon between the Government of the People's Republic of China (PRC) and ADB. Online training for project staff on disbursement policies and procedures is available at: http://wpqr4.adb.org/disbursement_elearning. Project staff is encouraged to avail of this training to help ensure efficient disbursement and fiduciary control.

18. To facilitate project implementation through timely release of loan proceeds, QMFB will establish an imprest account promptly after loan effectiveness at a commercial bank acceptable to ADB. The imprest account is to be used exclusively for the ADB's share of eligible expenditures. The currency of the imprest account will be US dollar. QMG, who established the imprest account in its name, is accountable and responsible for proper use of advances to the imprest account. The initial and additional advances to the imprest account may be requested based on 6 months estimated expenditures to be financed through the imprest account. The imprest account will be established, managed, and liquidated in accordance with ADB's *Loan Disbursement Handbook* and detailed arrangements agreed by the Government and ADB. ADB's *Loan Disbursement Handbook* describes which supporting documents should be submitted to ADB and which should be retained by the government for liquidation and replenishment of an imprest account.

19. The statement of expenditure (SOE) procedure may be used for the reimbursement of eligible expenditures or liquidation of advances to the imprest account. The ceiling of the SOE procedure is the equivalent of \$200,000 per individual payment. Supporting documents and records for the expenditures claimed under the SOE should be maintained and made readily available for review by ADB's disbursement and review missions, upon ADB's request for submission of supporting documents on a sampling basis, and for independent audit. Reimbursement and liquidation of individual payments in excess of the SOE ceiling should be supported by full documentation when submitting the withdrawal application to ADB.

20. For efficiency, the minimum value per withdrawal application is US\$100,000 equivalent. Individual payments below this amount should be paid from the imprest account or by the QMG and subsequently claimed to ADB through reimbursement, unless otherwise accepted by ADB. QMFB requires furnishing withdrawal application, applicable summary sheet, corresponding

bank statement, and reconciliation statement to ADB for liquidation and replenishment of imprest account.

21. No withdrawals shall be made from the Loan Account until QMG and QEG have entered into an agreement duly executed and delivered between QMG and QEG.

2. Disbursement Arrangements for Counterpart Fund

C. Accounting

22. QMG will maintain, or cause to be maintained, separate books and records by funding source for all expenditures incurred on the project using accrual-based accounting following the equivalent national accounting standards. QMG will prepare consolidated project financial statements in accordance with the Government of the PRC's accounting laws and regulations, which are consistent with international accounting principles and practices.

D. Auditing and Public Disclosure

23. QMG will cause the detailed consolidated project financial statements to be audited, in accordance with equivalent national standards adopted by QMG General Auditor's Office, by an independent auditor acceptable to ADB. QMG will submit the audited project financial statements, together with the auditors' opinion in the English language, to ADB within 6 months of the end of the fiscal year.

24. QMG will also cause the entity-level financial statements to be audited in accordance with equivalent national standards adopted by QMG General Auditor's Office and by an independent auditor acceptable to ADB. The audited entity-level financial statements, together with the auditors' report and management letter, will be submitted in the English language to ADB within 1 month after their approval by the relevant authority.

25. The annual audit report for the project accounts will include an audit management letter and audit opinions which cover (i) whether the project financial statements present a true and fair view or are presented fairly, in all material respects, in accordance with the applicable financial reporting framework; (ii) whether loan proceeds were used only for the purposes of the project or not; (iii) the level of compliance for each financial covenant contained in the legal agreements for the project; (iv) the use of the imprest fund procedure; and (v) the use of the SOE procedure certifying the eligibility of those expenditures claimed under SOE procedures, and proper use of the SOE and imprest procedures in accordance with ADB's *Loan Disbursement Handbook* and the project documents.

26. Compliance with financial reporting and auditing requirements will be monitored by review missions and during normal program supervision, and followed up regularly with all concerned, including the external auditor.

27. The Government, QMG, and QEG have been made aware of ADB's approach on delayed submission, and the requirements for satisfactory and acceptable quality of the audited project financial statements.⁹ ADB reserves the right to require a change in the auditor (in a

⁹ ADB guidelines and procedures on delayed submission of audited project financial statements:

- When audited project financial statements are not received by the due date, ADB will write to the executing agency advising that (i) the audit documents are overdue; and (ii) if they are not received within the next 6

manner consistent with the constitution of the borrower), or for additional support to be provided to the auditor, if the audits required are not conducted in a manner satisfactory to ADB, or if the audits are substantially delayed. ADB reserves the right to verify the project's financial accounts to confirm that the share of ADB's financing is used in accordance with ADB's policies and procedures.

28. Public disclosure of the audited project financial statements, including the auditor's opinion on the project financial statements, will be guided by ADB's Public Communications Policy (2011).¹⁰ After review, ADB will disclose the audited project financial statements and the opinion of the auditors on the project financial statements no later than 14 days of ADB's confirmation of their acceptability by posting them on ADB's website. The management letter, additional auditor's opinions, and audited entity financial statements will not be disclosed.¹¹

VI. PROCUREMENT AND CONSULTING SERVICES

A. Advance Contracting and Retroactive Financing

29. To expedite project implementation, QMG has requested advance contracting and retroactive financing. This will include the procurement of goods, and consulting services. All advance contracting and retroactive financing will be undertaken in conformity with ADB's Procurement Guidelines (2015, as amended from time to time)¹² and ADB's Guidelines on the Use of Consultants (2013, as amended from time to time).¹³ The amount to be retroactively financed may finance costs incurred before loan effectiveness but not more than 12 months before the signing of the loan agreement. The issuance of invitations to bid, under advance contracting and retroactive financing will be subject to ADB approval. The Borrower, QMG, and the QEG have been advised that approval of advance contracting and retroactive financing does not commit ADB to finance the project.

30. **Advance contracting.** The advance contracting is needed mainly for two contract packages of goods and a consulting service contract (Table 5). The issuance of invitations to bid, the draft pre-qualification and bidding documents under advance procurement action will be subject to ADB approval.

31. **Retroactive financing.** QMG and QEG were informed that as a general rule, retroactive financing is permitted only if (i) it is specifically agreed by ADB and the Borrower; (ii) the goods that were requested for were procured in accordance with ADB's Procurement Guidelines (2015, as amended from time to time);¹⁴ (iii) the amount to be retroactively financed

months, requests for new contract awards and disbursement such as new replenishment of imprest accounts, processing of new reimbursement, and issuance of new commitment letters will not be processed.

- When audited project financial statements have not been received within 6 months after the due date, ADB will withhold processing of requests for new contract awards and disbursement such as new replenishment of imprest accounts, processing of new reimbursement and issuance of new commitment letters. ADB will (i) inform the executing agency of ADB's actions and (ii) advise that the loan may be suspended if the audit documents are not received within the next 6 months.
- When audited project financial statements have not been received within 12 months after the due date, ADB may suspend the loan.

¹⁰ Public Communications Policy: <http://www.adb.org/documents/pcp-2011?ref=site/disclosure/publications>.

¹¹ This type of information would generally fall under public communications policy exceptions to disclosure. ADB. 2011. *Public Communications Policy*. Paragraph 97(iv) and/or 97(v).

¹² Available at: <http://www.adb.org/documents/procurement-guidelines>.

¹³ Available at: <http://www.adb.org/documents/guidelines-use-consultants-asian-development-bank-and-its-borrowers>.

¹⁴ Available at: <http://www.adb.org/documents/procurement-guidelines>.

does not exceed 20% of the loan amount; and (iv) the expenditures have been incurred before effectiveness of the relevant loan but, generally, no earlier than 12 months before signing of the Loan Agreement. The advance contracting and retroactive financing will include consulting services, and goods (Table 5).

Table 5: Indicative Procurement Plan for Advance Contracting and Retroactive Financing

Pack. No.	General Description	Estimated Value (\$ million)	Procurement Method/ Recruitment Method	Review (Prior / Post)	Bidding Procedure	Comments
1	Loan implementation consulting services	1.0	QCBS	Prior	Firm	FTP (90:10)
2	Supply of heating network control and billing system	1.8	NCB	Prior	1S1E	
3	Supply of gas burners, boilers, pumps, and attachment (for Jidong, Shibeibinghai, Shibeibing and Licang district heating and cooling)	7.1	NCB	Prior	1S1E	

1S1E = single stage-one envelope, FTP = full technical proposal, NCB = national competitive bidding, QCBS = quality- and cost-based selection.

Source: Asian Development Bank estimates.

B. Procurement of Goods, and Consulting Services

32. All procurement of goods will be undertaken in accordance with ADB's Procurement Guidelines (2015, as amended from time to time). Taking into consideration the maturity of district heating equipment market in the PRC and experiences from past district heating projects, ADB-financed goods contracts estimated at \$10 million and above will be procured through international competitive bidding and contracts estimated at below \$10 million will be procured through national competitive bidding, using approved national standard bidding documents. The relevant sections of ADB's Anticorruption Policy (1998, as amended to date) will be included in all documents and contracts.¹⁵

33. An 18-month procurement plan indicating threshold and review procedures, goods, and consulting service contract packages and national competitive bidding guidelines is in Section C.

34. All consultants financed by ADB will be recruited according to ADB's Guidelines on the Use of Consultants (2013, as amended from time to time).¹⁶ The terms of reference for project implementing consulting service is provided in paras. 41–45 (Section D). An estimated 39 person-months (6 international, 33 national) of consulting services are required to (i) enhance the project engineering designs; (ii) conduct energy conservation awareness campaign; (iii) facilitate the environmental management plan (EMP) during project implementation; (iv) provide capacity building and institutional strengthening on EMP, grievance redress mechanism, and health and safety issues; and (v) knowledge sharing activities in advance district energy application.

¹⁵ Available at: <http://www.adb.org/Documents/Policies/Anticorruption-Integrity/Policies-Strategies.pdf>.

¹⁶ Checklists for actions required to contract consultants by method are available in e-Handbook on Project Implementation at: <http://www.adb.org/documents/handbooks/project-implementation>.

C. Procurement Plan

Table 6: Basic Data

Project Name: Qingdao Smart Low-Carbon District Energy Project			
Project Number: 48003-002		Approval Number: TBD	
Country: People's Republic of China (PRC)		Executing Agency: Qingdao Municipal Government	
Project Procurement Classification: B			
Procurement Risk: Low			
Project Financing Amount: \$263.6 million		Implementing Agency: Qingdao Energy Group	
ADB Financing: \$130 million			
Non-ADB Financing: \$133.6 million			
Date of First Procurement Plan: TBD		Date of this Procurement Plan: 4 November 2015	

1. Methods, Thresholds, Review and 18-Month Procurement Plan

a. Procurement and Consulting Methods and Thresholds

35. Except as ADB may otherwise agree, the following process thresholds (Table 7) shall apply to procurement of goods. The first two packages of NCB documents for advance procurement (Table 5) shall be submitted for ADB's prior review and approval. All other NCB documents that cost less than \$10 million are subject to post review.

Table 7: Procurement of Goods

Method	Threshold	ADB Prior or Post Review
International Competitive Bidding for Goods	Equal to or more than \$10,000,000	Prior
National Competitive Bidding for Goods	More than \$100,000 but less than \$10,000,000	Post ^a
Shopping for Equipment and Materials	Less than \$100,000	Post

^a The first two packages of national competitive bidding procurement documents shall be submitted for ADB's prior review and approval.

Source: Asian Development Bank estimates.

Table 8: Procurement of Consulting Service

Consulting Services		
Method		Comments
Quality- and Cost- Based Selection Full Technical Proposal		Firm with four loan implementation consultants will be engaged.

Source: Asian Development Bank estimates.

b. Goods Contracts Estimated to Cost \$1 Million or More

36. Table 9 lists goods contracts for which the procurement activity is either ongoing or expected to commence within the next 18 months.

Table 9: List of Goods Contracts

Pack. No.	General Description	Estimated Value	Procurement Method	Review (Prior / Post)	Bidding Procedure	Advertisement Date (quarter/year)	Comments
4	Supply of gas engines, boilers, heat pumps, plastic pipe, and	8.4	NCB	Post	1S1E	Q2/2016	

Pack. No.	General Description	Estimated Value	Procurement Method	Review (Prior / Post)	Bidding Procedure	Advertisement Date (quarter/year)	Comments
	attachment #1 (for Shibeï–Underground, Shibeï–heat exchange stations, and Licang Tongli)						
5	Supply of control system for heating network, building, and heat exchange station	3.0	NCB	Post	1S1E	Q3/2016	
6	Supply of gas power generator, chillers, and hot water boilers (for Jidong, and Licang–Tongli)	6.6	NCB	Post	1S1E	Q2/2017	
Total		18.0					

1S1E = single stage-one envelope, NCB = national competitive bidding.
Source: Asian Development Bank estimates.

c. Consulting Services Contracts Estimated to Cost \$100,000 or More

37. Table 10 lists consulting services contracts for which the recruitment activity is either ongoing or expected to commence within the next 18 months.

Table 10: List of Consulting Services Contracts

Package Number	General Description	Estimated Value (\$ million)	Recruitment Method	Review (Prior / Post)	Advertisement Date (quarter/year)	Type of Proposal
1	Consulting services	1.0	Firm	Prior	Q4/2015	Full Technical Proposal – Quality- and cost-based selection (90:10)

Source: Asian Development Bank estimates.

2. Indicative List of Packages Required Under the Project

38. Table 11 provides an indicative list of goods contracts over the life of the project, other than those mentioned in previous sections (i.e., those expected beyond the current period).

Table 11: Indicative List of Goods Contracts

Pack. No.	General Description	Estimated Value (\$ million)	Estimated Number of Contracts	Procurement Method	Review (Prior/ Post)	Bidding Procedure
7	Supply of gas engines, boilers, heat pumps, plastic pipe, and attachment #2 (for Shinan, Shibeï–heat exchange stations, and Jidong)	9.1	1	NCB	Prior	1S1E
8	Supply of control system for building, and heat exchange station #1	3.6	1	NCB	Post	1S1E
9	Supply of heat accumulator, boilers, gas power generators, chiller, solar collectors, and heat pumps (for Shibeï–Binghai, Licang–Houhai, and Shibeï–Solar)	9.5	1	NCB	Post	1S1E
10	Supply of heat exchangers, boilers, heat pumps, attachment, and plastic pipes (for Shibeï–heat exchange stations, Shibeï–	9.2	1	NCB	Post	1S1E

Pack. No.	General Description	Estimated Value (\$ million)	Estimated Number of Contracts	Procurement Method	Review (Prior/ Post)	Bidding Procedure
11	Binhai, Licang-Houhai Supply of control system for building, and heat exchange station #2	3.3	1	NCB	Post	1S1E
12	Supply of gas power generators (for Licang-Houhai)	13.2	1	ICB	Prior	1S1E
13	Supply of boilers, steam power generators, and gas engines (for Licang-Houhai, Shibeih-heat exchange stations, and Shibeih and Licang-district heating and cooling)	9.8	1	NCB	Post	1S1E
14	Supply of boilers, pumps, attachment, and plastic pipes (for Shibeih-Binhai, Licang-Tongli, and Licang-Houhai)	10.0	1	NCB	Post	1S1E
15	Supply of control system for building, and heat exchange station #3	2.2	1	NCB	Post	1S1E
16	Supply of gas power generators (for Shibeih-Binhai)	14.1	1	ICB	Prior	1S1E
17	Supply of boilers, chillers, and heat exchangers (for Shibeih-Binhai, Shinan, and Shibeih and Licang district heating and cooling)	8.3	1	NCB	Post	1S1E
18	Supply of gas power generators, boilers, gas engines, attachment, and plastic pipes (for Jidong, Shinan, and Shibeih-Binhai)	9.8	1	NCB	Post	1S1E
Total		102.1				

1S1E = single stage-one envelope, ICB = international competitive bidding, NCB = national competitive bidding.
Source: Asian Development Bank estimates.

3. List of Awarded and On-going, and Completed Contracts

39. Tables 12 through 15 lists the awarded and ongoing contracts.

Table 12: List of Awarded and On-going and Goods Contracts

Pack. No.	General Description	Estimated Value (\$ million)	Contract Value	Procurement Method	Advertisement Date (quarter/year) ^a	Date of ADB Approval of Contract Award ^b

^a Date of ADB approval of contract award is the date of no-objection letter to QMG and QEG.

^b Indicate the contractor's name and the contract signing date.

Table 13: List of Awarded and Ongoing Consulting Services Contract

Pack. No.	General Description	Estimated Value (\$ million)	Awarded Contract Value	Recruitment Method	Advertisement Date (quarter/year)	Date of ADB Approval of Contract Award ^a	Comments ^b

^a Date of ADB approval of contract award is the date of no-objection letter to QMG and QEG.

^b Indicate the contractor's name and the contract signing date.

Table 14: List of Completed Goods Contracts

Pack. No.	General Description	Estimated Value (\$ million)	Contract Value	Procurement Method	Advertisement Date (quarter/year)	Date of ADB Approval of Contract Award ^a	Date of Completion ^b	Comments

^a Date of ADB approval of contract award is the date of no-objection letter to QMG and QEG.

^b Indicate the contractor's name and the contract signing date.

Table 15: List of Completed Consulting Services Contract

Pack. No.	General Description	Estimated Value (\$ million)	Contract Value	Recruitment Method	Advertisement Date (quarter/year)	Date of ADB Approval of Contract Award ^a	Date of Completion ^b	Comments

^a Date of ADB approval of contract award is the date of no-objection letter to QMG and QEG.

^b Indicate the contractor's name and the contract signing date.

4. Non-ADB Financing

40. Table 16 lists goods, works, and consulting services contracts over the life of the project, financed by Non-ADB sources.

Table 16: List of Goods and Works over the Life of the Project financed by Non-ADB Sources

General Description	Estimated Value (Cumulative) (\$ million)	Estimated Number of Contracts	Procurement Method
Civil works for energy stations, heat exchange stations, and heating pipelines	80.1	24	DP
Services for detailed design, monitoring, and inspections.	20.2	5	DP
Total	100.3		

DP = domestic procedures.

Source: Asian Development Bank estimates.

5. National Competitive Bidding

41. The Borrower's *Law of Tendering and Bidding of the People's Republic of China* promulgated by Order No. 21 of the President of the People's Republic of China on August 30, 1999, are subject to the following clarifications required for compliance with the Guidelines:

- (i) All invitations to prequalify or to bid shall be advertised in the national press, or official gazette, or a free and open access website in the Borrower's country. Such advertisement shall be made in sufficient time for prospective bidders to obtain prequalification or bidding documents and prepare and submit their responses. In any event, a minimum preparation period of thirty (30) days shall be given. The preparation period shall count (a) from the date of advertisement, or (b) when the documents are available for issue, whichever date is later. The advertisement and the prequalification and bidding documents shall specify the deadline for such submission.

- (ii) Qualification requirements of bidders and the method of evaluating the qualification of each bidder shall be specified in detail in the bidding documents, and in the prequalification documents if the bidding is preceded by a prequalification process.
- (iii) If bidding is preceded by a prequalification process, all bidders that meet the qualification criteria set out in the prequalification document shall be allowed to bid and there shall be no limit on the number of pre-qualified bidders.
- (iv) All bidders shall be required to provide a performance security in an amount sufficient to protect the Borrower/Project Executing Agency in case of breach of contract by the contractor, and the bidding documents shall specify the required form and amount of such performance security.
- (v) Bidders shall be allowed to submit bids by mail or by hand.
- (vi) All bids shall be opened in public; all bidders shall be afforded an opportunity to be present (either in person or through their representatives) at the time of bid opening, but bidders shall not be required to be present at the bid opening.
- (vii) All bid evaluation criteria shall be disclosed in the bidding documents and quantified in monetary terms or expressed in the form of pass/fail requirements.
- (viii) No bid may be rejected solely on the basis that the bid price falls outside any standard contract estimate, or margin or bracket of average bids established by the Borrower/Project Executing Agency.
- (ix) Each contract shall be awarded to the lowest evaluated responsive bidder, that is, the bidder who meets the appropriate standards of capability and resources and whose bid has been determined (a) to be substantially responsive to the bidding documents and (b) to offer the lowest evaluated cost. The winning bidder shall not be required, as a condition of award, to undertake responsibilities for work not stipulated in the bidding documents or otherwise to modify the bid as originally submitted.
- (x) Each contract financed with the proceeds of the Loan shall provide that the suppliers and contractors shall permit ADB, at its request, to inspect their accounts and records relating to the performance of the contract and to have said accounts and records audited by auditors appointed by ADB.
- (xi) Government owned enterprises in the Borrower's country may be permitted to bid if they can establish that they (a) are legally and financially autonomous, (b) operate under commercial law and (c) are not a dependent agency of the Borrower/Project Executing Agency.
- (xii) Re-bidding shall not be allowed solely because the number of bids is less than three.

D. Consultants' Terms of References

42. The project will have one consulting service package to support QMG and QEG in the project implementation and capacity development. A consulting firm will be recruited in accordance with ADB's Guidelines on the Use of Consultants (2013, as amended from time to time) through the quality- and cost-based selection method (with a quality-cost ratio of 90:10), following submission of full technical proposals.

43. **District Energy Specialist/Team Leader** (International, 6 person-months, intermittent). The specialist should have at least a master's degree on district energy or relevant fields, a minimum of 10 years of international work experience on district heating, and excellent ability to communicate in English. The expert will undertake the following activities:

- (i) liaise with ADB, QMG, QEG, and the design institute during the design stage

- and construction;
- (ii) review and provide systematic optimization advice for the preliminary design of heat exchange stations, thermal storage facilities and peak-shaving boilers;
- (iii) review and provide systematic optimization advice for the preliminary design of combined cooling, heating, and power components and future working scheme; review and provide systematic optimization advice for the preliminary design of sewage sourced heat pump components, air sourced heat pump component and soil sourced heat pump component;
- (iv) review and provide systematic optimization advice for the low-temperature secondary heating network and hydraulic computation, based on experience of related projects in Nordic countries;
- (v) review and provide systematic optimization advice for the solar heating system and the solar energy operation system, based on experience of related projects in Nordic countries;
- (vi) provide systematic optimization advice for the updating of the whole smart heating network, based on the current construction of the heating operation control system and the heating management system in the procurement plan;
- (vii) provide technical and optimization advice for the compilation of the bidding documents;
- (viii) arrange overseas study tour and technical training sessions;
- (ix) provide technical help during the acceptance process of the whole project, and engage in the construction and supervision work of every distribute energy station, substation, and pipeline network project; and
- (x) prepare a technical evaluation report on project implementation, which reflects the performance of each expert during project implementation.

44. **District Heating Engineer/Deputy Team Leader** (national, 18 person-months, intermittent). The specialist should have at least a master's degree on district energy or relevant fields; at least 7 years of work experience on district energy; a good command of English; and experience on district heating, renewable energy heating, and international cooperation. The expert will undertake the following activities:

- (i) assist the international district energy specialist in liaising with ADB, QMG, QEG, and a design institute during the design stage and first phase of construction;
- (ii) assist the international district energy specialist in revising the preliminary design of heat exchange stations, thermal storage facilities and peak-shaving boilers;
- (iii) assist the international district energy specialist in revising the preliminary design of combined cooling, heating, and power components and future working scheme;
- (iv) assist the international district energy specialist in revising the preliminary design of sewage sourced heat pump components, air sourced heat pump component and soil sourced heat pump component;
- (v) help the international district energy specialist in reviewing and providing systematic optimization advice for the low-temperature secondary heating network and hydraulic computation, based on experience of related projects in Nordic countries;
- (vi) help the international district energy specialist in reviewing and providing systematic optimization advice for the solar heating system and the solar energy operation system, based on experience of related projects in Nordic countries;
- (vii) help the international district energy specialist in providing systematic optimization advice for the updating of the whole smart heating network, based on the current construction of the heating operation control system and the

- heating management system in the procurement plan;
- (viii) help the international district energy specialist in providing technical and optimization advice for the compilation of the bidding documents;
- (ix) assist the international district energy specialist in liaising with customers and arrange visiting schedule during the overseas study trip and technical training sessions;
- (x) help the international district energy specialist in providing technical help during the acceptance process of the whole project, and engage in the construction and supervision work of every distribute energy station, substation, and pipeline network project; and
- (xi) assist the international district energy specialist in preparing the technical evaluation report of the project implementation, which reflects the performance of each expert during project implementation.

45. **Environment Specialist** (national, 12 person-months, intermittent). The expert should have at least a master's degree on environmental management or relevant fields, a minimum of 5 years work experience on environmental management and monitoring, or relevant fields, experience on the supervision of large-scale district heating project and operation, or relevant projects, and fair ability to communicate in English. Work experience on international financial institutions projects is preferred. The expert will undertake the following activities:

- (i) conduct regular site visits;
- (ii) assist QEG in updating the EMP and environmental monitoring plan;
- (iii) monitor implementation of environmental protection measures specified in the EMP;
- (iv) collect environmental load data from QMG or other government agencies;
- (v) review monitoring records and environmental performance documents prepared by contractors, environmental monitoring stations, and other relevant environmental inspection authorities;
- (vi) identify any environment-related implementation issue, suggest necessary corrective actions, and reflect them in a corrective action plan;
- (vii) collect other relevant environment indicators to measure the positive environment impact (i.e., emissions reduction brought by the project);
- (viii) collect and review data for performance targets and indicators of outcome and outputs specified in the design and monitoring framework of the project;
- (ix) conduct quantification and monitoring of greenhouses gas emissions annually in accordance with internationally recognized methodologies; prepare semiannual and annual environmental safeguards monitoring reports and a project completion report; and
- (x) provide training on environmental management implementation and monitoring, including grievance redress mechanism to staff from QMG, QEG, contractors and construction supervision companies.

46. **Social Specialist** (national, 3 person-months, intermittent). The specialist should have at least a master's degree on environmental management, social development or relevant fields, at least 5 years work experience on relevant field, and fair ability to communicate in English. The specialist will undertake the following activities:

- (i) prepare environmental protection campaign with the cooperation of QMG;
- (ii) design and prepare campaign materials for different target groups;
- (iii) develop performance criteria and design and develop questionnaires that can be used for campaign evaluation;
- (iv) lead and supervise the campaign team ensuring effective and successful

- (v) execution of the campaigns; and
 (v) monitor the progress of gender related activities.

47. During the consulting services, consultants shall submit the required reports to QEG, and ADB, both in English and Chinese. The consulting service inputs for project management and capacity development are summarized in the Table 17.

Table 17: Consulting Service Inputs for Project Management and Capacity Development

Item	Amount (\$'000)
1. Consultants	
a. Remuneration and per diem	
i. International consultant	169
ii. National consultants	211
b. International and local travel	39
c. Reports, translations, and communications	20
2. Workshop, training, seminars, and conferences ^a	40
3. Surveys	60
4. Overseas training ^b	370
5. Contingency	91
Total	1,000

^a Capacity building trainings on the project environmental management plan, health safety and environment will be conducted during construction and operation phases.

^b Destination of study tour will be Scandinavian countries to acquire advanced district energy technologies.

Source: Asian Development Bank estimates.

VII. SAFEGUARDS

A. Environment

48. **Environment due diligence.** The project is classified as category B for environment. The initial environmental examination (IEE) was approved on 6 July 2015. The IEE complies with ADB's policies and requirements including ADB's Safeguard Policy Statement (2009).¹⁷ It identifies potential environmental adverse impacts. During construction, these would include (i) soil erosion; (ii) noise, vibration, and dust; (iii) solid waste; (iv) community disturbance and public safety; and (v) occupational health and safety. During operation, potential adverse impacts would be (i) emission of nitrogen oxides from the heat sources, (ii) noise from the heat sources and the heat exchange stations, (iii) waste water, and (iv) occupational health and safety. The IEE concluded that all the construction and operational risks it pinpointed could be mitigated by implementing measures specified by the EMP, which is provided in Appendix 1 and forms part of the project administration manual. The EMP defines mitigation measures, monitoring requirements, and institutional responsibilities to ensure proper environmental management throughout the project construction and operation.

49. **EMP update, bidding documents.** In the design stage, QEG will provide the EMP to the design institute for incorporating mitigation measures into the detailed designs. ADB would need to be notified on any design changes and the IEE would need to be updated accordingly if the design change could affect the findings of the environmental assessment. The EMP will be updated at the end of the detailed design, if needed, and disclosed on the ADB website. To ensure that bidders will respond to the EMP's provisions, QEG will provide the following specification clauses to be incorporated in the bidding documents: (i) a list of environmental management requirements to be budgeted by the bidders in their proposals, (ii) environmental clauses for contractual terms and conditions, and (iii) the IEE including updated EMP for compliance.

50. **EMP implementation responsibilities.** QMG and QEG will be responsible for ensuring that the project to be designed, constructed, decommissioned, and operated is in accordance with (i) national and local government environmental, health and safety laws, regulations, procedures, and guidelines; (ii) ADB's Safeguard Policy Statement (2009); and (iii) the IEE including the EMP. QMG holds the final responsibility for the implementation and compliance with the EMP and monitoring plan, and the submission of environmental monitoring reports. An environment, health and safety unit (EHSU) will be established within QEG, which is responsible for ensuring that environmental mitigation measures in the EMP will be properly implemented. The nominated environment officers will undertake effective environmental management activities specified in the EMP. The effectiveness of mitigation measures will be evaluated through ADB review missions and EMP monitoring. QEG shall make available the necessary budgetary and human resources to fully implement the EMP. If any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the project that were not considered in the IEE and/or EMP, QEG should promptly inform ADB in writing of the occurrence of such risks or impacts, with detailed description of the event and the proposed action plan for incorporation in the updated EMP.

51. The contractors and construction supervision companies will be responsible for the internal environmental monitoring and supervision during construction. The environmental officers at EHSUs are responsible for supervising the contractors and construction supervision

¹⁷ ADB. 2009. *Safeguard Policy Statement*. Manila.

companies. The EHSU, under the implementing agency, will be responsible for internal monitoring during operation. Environmental impact monitoring will be conducted by local environmental monitoring stations that will be contracted by QEG, as an external independent monitor. EMP implementation and supervision responsibilities are defined in the EMP. If the monitoring work reveals any breach of the performance standards set out in the EMP, corrective action will be taken. QEG is responsible for preparing and submitting environmental monitoring reports through QEG and QMG to ADB, semiannually during construction and annually during operation.

52. **Capacity building.** To ensure proper environmental assurance, a loan implementation environment consultant will provide trainings to construction supervision companies, contractors, and EHSU at QEG in accordance with the training plan (Table A.2 of Appendix 1).

53. **Grievance redress mechanism.** Environmental grievances may occur during construction and operation. QEG agreed to establish a project grievance redress mechanism, which follows the procedure and timeframe defined in the EMP. The loan implementation environment consultant will provide training to the staff at EHSU on access points to the grievance redress mechanism to ensure that responsibilities and procedures are clear.

54. **Prohibited investment activities.** Pursuant to ADB's Safeguard Policy Statement (footnote 16), ADB funds may not be applied to the activities described on the ADB Prohibited Investment Activities List set forth at Appendix 5 of the Safeguard Policy Statement.

B. Involuntary Resettlement and Indigenous Peoples

55. The project is classified category C for involuntary resettlement and indigenous peoples. The project does not entail permanent land acquisition, land use restriction, demolition of any structure, and involuntary resettlement. Installing the underground heating pipelines will temporarily occupy the publicly-owned land (road and sidewalks) for a maximum of 6 months. The project will be implemented in a large urban area where the vast majority of people are Han, and there is no significant difference in the lifestyle and socioeconomic status between individuals of ethnic majority (Han) and minorities. The project site is not located close to any ethnic minority towns or villages. Thus, it is not expected to have adverse impact on ethnic minorities.

56. If there is any change in scope that may result in affecting people by land acquisition, structure demolition, and involuntary resettlement, QEG is required to inform ADB of the situation in advance, and prepare and submit a resettlement plan to ADB for review and approval, in accordance with ADB's Safeguard Policy Statement,¹⁸ prior to award of works all efforts should be made to exclude project activities that caused involuntary resettlement.

¹⁸ People who are, or may in the future be, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, affected people should make a good faith effort to solve their problems by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism.

VIII. GENDER AND SOCIAL DIMENSIONS

A. Summary Poverty Reduction and Social Strategy

57. **Social benefits.** The project will directly benefit 420,000 people in the project area, of whom about 210,000 are female and 7,495 are from poor households. It will provide direct benefits to 22,000 children in 15 schools and an additional 7,000 in 55 kindergartens, as well as patients and medical staff in 7 hospitals. The project will (i) reduce cases of respiratory diseases by improving indoor and outdoor air quality, (ii) reduce carbon monoxide poisoning by providing safer district heating services, (iii) provide a better medical environment by providing cleaner and more reliable heating services, (iv) improve living conditions by providing adequate and reliable heating services, (v) reduce household spending on heating by shifting consumers from the use of stoves and decentralized heating systems to centralized energy-efficient heating systems, (vi) provide a better learning environment for students during the winter by providing schools with cleaner and more reliable heating services, and (vii) increase income through the creation of 350 temporary jobs during construction.

58. **Gender impact.** The project's gender category is some gender elements. Its benefits for women will include (i) access to a reliable, cleaner, and safer heating system; (ii) an easing of the domestic chores related to space heating (1 hour per day); (iii) a reduced incidence of respiratory diseases related to indoor air pollution; and (iv) a lowering of the current rate of carbon monoxide poisoning and accidental fires.

59. The project will (i) organize energy conservation-awareness campaigns in partnership with a women's federation at least twice during implementation, targeting all 100,000 women in the project area (including 11,000 female students); (ii) aim to fill 50% of the 310 permanent positions to be created during operation with women employees; (iii) ensure that QMG provides a 100% subsidy for heating tariffs to poor households headed by women and that heating companies waive their connection fees for these households; and (iv) conduct customer satisfaction surveys in a gender-responsive manner to improve service delivery.

IX. PERFORMANCE MONITORING, EVALUATION, REPORTING AND COMMUNICATION

A. Project Design and Monitoring Framework

Impacts the Project is Aligned with Energy efficiency in district energy systems improved. ^a Cases of respiratory and heart diseases decreased. ^a			
Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting Mechanisms	Risks
Outcome Carbon and pollutant emission from district energy system in Qingdao avoided	By 2022 Annual standard coal consumption of more than 537,867 tons avoided. As a result, annual emissions of 1,398,456 tons of carbon dioxide, 12,909 tons of sulfur dioxide, 5,379 tons of particulate matter, and 3,765 tons of nitrogen oxide also avoided (2015 baseline: 0)	Data from the project's annual environmental compliance report	The project system achieves lower than anticipated energy efficiency and environmental performance levels
Output A smart, distributed district energy system constructed in Qingdao	By 2020 a. Capacity to supply 1,003 MWth of heating (55 MWth from renewables), 176 MWth of cooling, and 79 MWe of electricity constructed, along with 116 km of pipelines (2015 baseline: 0 MWth, MWe, and 0 km) b. Automated information and communication technology to gather and act on information about the behaviors of suppliers and consumers installed (2015 baseline: 0) c. District energy system in eight locations installed (2015 baseline: 0)	Loan review missions and project performance reports	Technical specifications change due to a change in energy demand
Key Activities with Milestones 1. A smart, distributed district energy system constructed in Qingdao 1.1 Install small, distributed natural gas boilers, waste heat recovery system from sewage plants and industries, heat pump systems, a solar heating system, a heat storage system, and low-temperature pipelines in eight locations in Qingdao (Q2 2016–Q4 2020) 1.2 Install a smart energy management system (Q2 2016–Q4 2020) 1.3 Supervise project implementation (Q2 2016–Q4 2020)			
Inputs Asian Development Bank: \$130,000,000 Counterpart funds: \$133,600,000			
Assumptions for Partner Financing Not applicable.			

km = kilometer, MWe = megawatt-electricity equivalent, MWh = megawatt-hour, MWth = megawatt-thermal equivalent, Q = quarter.

^a

Qingdao municipal government. 2004. *Qingdao City Low Carbon Development Plan*. Qingdao.
 Source: Asian Development Bank.

B. Monitoring

60. **Project performance monitoring.** The basis for performance monitoring is the design and monitoring framework, which identifies performance targets for the outcome, and outputs of the project. The performance indicators include (i) energy intensity improvements, (ii) reductions in emissions, (iii) installation of infrastructure, (iv) number of beneficiaries, and (v) heating area coverage. QEG is responsible for (i) collecting data from the sources identified in the design monitoring framework, and (ii) preparing the summary of performance indicators through quarterly progress reports.

61. **Compliance monitoring.** QMG, with assistance of QEG, and the loan implementation consultants, will conduct compliance monitoring concerning the use of the loan proceeds, project implementation, and compliance of loan and project covenants. The findings of monitoring should be included in the (i) quarterly progress reports on project implementation, (ii) a report for midterm review, and (iii) a project completion report.

62. **Environment safeguard monitoring.** During construction, contractors will prepare environmental records in accordance with the monitoring plan defined in the EMP to be submitted to the EHSUs. QEG will contract local environmental monitoring stations (EMSs) as an independent and external monitor to conduct environmental impact monitoring in accordance with the monitoring plan defined in the EMP. The EMSs will prepare quarterly monitoring report and submit to QEG. The loan implementation environment consultant will (i) review environmental records from contractors and quarterly environmental monitoring reports from the EMSs, (ii) conduct site visits, (iii) assess project progress and compliance with the EMP, and (iv) prepare semiannual environmental monitoring reports and submit them to ADB through QEG. Monitoring reports submitted to ADB will be disclosed.

C. Evaluation

63. ADB will undertake annual project reviews between 2016 and 2020 to evaluate the progress of project implementation. ADB, QEG, and QMG will undertake a comprehensive midterm review of the project in 2018, covering (i) physical progress of project implementation; (ii) technical issues; (iii) environmental impact; (iii) social impact; (iv) progress and issues on procurement and disbursement; (v) compliance with assurances in the loan and project agreements, and other relevant aspects that may have an impact on the performance of the project and its continuing viability. It will also include potential loan savings, identify areas for reallocation of loan proceeds, and change disbursement percentages, as appropriate.

D. Reporting

64. QEG and QMG will provide ADB with (i) quarterly progress reports with fourth quarter reports serving as the annual progress reports including (a) the use of the loan proceeds, (b) progress achieved by output as measured through the indicator's performance targets, (c) progress of energy conservation campaign, (d) key implementation issues and solutions, (e) updated procurement plan, and (f) updated implementation plan including procurement plan and disbursement projection for the next 12 months; and (ii) semiannual environmental monitoring report during construction and annual environmental monitoring report during operation; (iii) audited QEG's annual financial statements and project accounts, together with the associated auditor's report, in English; and (iv) a project completion report within 6 months

of physical completion of the project. Table 18 summarizes the key reporting requirements during project implementation.

Table 18: Summary of Key Reporting Requirements During Implementation

Name of Report/Document	Timing of Reporting
1. Quarterly progress reports on project implementation, with the fourth quarter reports serving as the annual reports for the years concerned	Every 3 months until loan completion
2. Environmental monitoring reports	Until loan completion every 6 months during project construction and annually during operation
3. Audited QEG's annual financial statements and project accounts Auditor's report (including auditor's opinion) on statement of expenditures	Before 30 June of each year from 2016 throughout the implementation period
4. Project completion report	Within 6 months after project and loan completion

E. Stakeholder Communication Strategy

65. Project information will be communicated through public consultation, information disclosure mechanism in ADB's and government's website, meetings, interviews, focus group discussions, and community consultation meetings, in accordance with ADB's requirements of information disclosure policy.

66. Meaningful consultation for the project has been conducted during feasibility study and environment impact assessment (EIA) in accordance with the PRC Interim Guideline on Public Consultation in EIA (2006) and ADB's Safeguard Policy Statement. During construction, the affected people will be consulted through formal questionnaire surveys and informal interviews by the environmental management unit and/or the external environmental monitor. The local environmental protection bureau and ADB shall disclose the project's environmental information, as follows: (i) the project IEE was disclosed at the ADB website on 3 August 2015; (ii) the domestic Chinese EIA are disclosed on the website of QEG; and (iii) the semiannual EMP progress and monitoring reports, as well as the annual EMP verification reports, will be disclosed at ADB website. QEG will establish the grievance redress mechanism and procedures in accordance with the proposed project grievance redress mechanism to address environment and social issues associated with the project.¹⁹

67. Public disclosure of all project documents will be undertaken by QEG and on ADB website including the project data sheet, design and monitoring framework, IEE, and the report and recommendation of the president to the Board of Directors. Disclosure of social and environmental monitoring reports will be undertaken during project implementation.

¹⁹ The proposed grievance redress mechanism is provided in Linked Document 12–Initial Environment Examination.

X. ANTI-CORRUPTION POLICY

68. ADB reserves the right to investigate, directly or through its agents, any violations of the Anticorruption Policy relating to the project.²⁰ All contracts financed by ADB shall include provisions specifying the right of ADB to audit and examine the records and accounts of QMG and all the project contractors, suppliers, consultants and other service providers. Individuals/entities on ADB's anticorruption debarment list are ineligible to participate in ADB-financed activity and may not be awarded any contracts under the project.²¹

69. To support these efforts, relevant provisions are included in the loan agreement and the bidding documents for the project. ADB's Anticorruption Policy has been explained to and discussed with QMG and QEG. QMG and QEG have indicated their commitment to promote good governance and establish a corruption-free environment under the project. QMG will undertake anticorruption actions, including (i) conducting periodical inspections on the contractors' activities related to fund withdrawals and settlement, and (ii) ensuring that all contracts financed by ADB in connection with the project include relevant provisions of ADB's Anticorruption Policy in all bidding documents for the project specifying the right of ADB to audit and examine the records and accounts of the QEG, and all the contractors, suppliers, consultants and other service providers as they relate to the project.

²⁰ Available at: <http://www.adb.org/Documents/Policies/Anticorruption-Integrity/Policies-Strategies.pdf>.

²¹ ADB's Integrity Office website is available at: <http://www.adb.org/integrity/unit.asp>.

XI. ACCOUNTABILITY MECHANISM

70. People who are, or may in the future be, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, the affected people should make a good faith effort to solve their problems by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism.²²

²² For further information see: <http://www.adb.org/site/accountability-mechanism/main>.

XII. RECORD OF PAM CHANGES

71. The project administration manual is a living document and is subject to change after ADB Board approval of the project's report and recommendation of the President. It is concise yet informative, providing checklists of all activities related to project implementation along with the necessary procedures for the project management office's to effectively implement and monitor the project.

No.	Changes/Updates	Date	Remarks
1	PAM initial draft agreed	30 June 2015	Agreed during the loan fact-finding mission

ENVIRONMENT MANAGEMENT PLAN

A. Objectives

1. This is the Environmental Management Plan (EMP) for the proposed Qingdao Smart Low-Carbon District Energy Project in the People's Republic of China (PRC). The proposed project will demonstrate the first coal-free energy efficient small-scale energy (heating, cooling, and power) systems in eight different locations in Qingdao City, located on the eastern coast of Shandong Province.

2. The objectives of the EMP are to ensure (i) implementation of identified mitigation and management measures to avoid, reduce, and mitigate anticipated adverse environment impacts; (ii) implementation of monitoring and reporting; and (iii) the project compliance with the PRC's relevant environmental laws, standards and regulations and ADB's Safeguard Policy Statement.¹ Organizational responsibilities and budgets are clearly identified for execution, monitoring and reporting.

B. Implementation Arrangements

3. The Qingdao municipal government (QMG) will be the executing agency and will be responsible for overall project guidance during implementation. It has set up a project leading group comprising representatives of its municipal development and reform commission, finance bureau, utility bureau, planning bureau, housing and urban–rural development commission, land and resources bureau, and environment protection bureau. QEG will be the project implementing agency. QEG will sign onlending agreements with QMG and be responsible for day-to-day management during project preparation and implementation.

4. QEG will establish a project management office (PMO) with a project manager. The PMO will include an appropriately staffed Environment, Health and Safety Unit (EHSU), and will be supported by a loan implementation EHS consultant (LIEC). The PMO EHSU will include a designated staff member responsible for the grievance redress mechanism (GRM). QEG branch offices will be responsible for the implementation of each project component. A conceptualized project management chart is presented in **Figure A.1**.

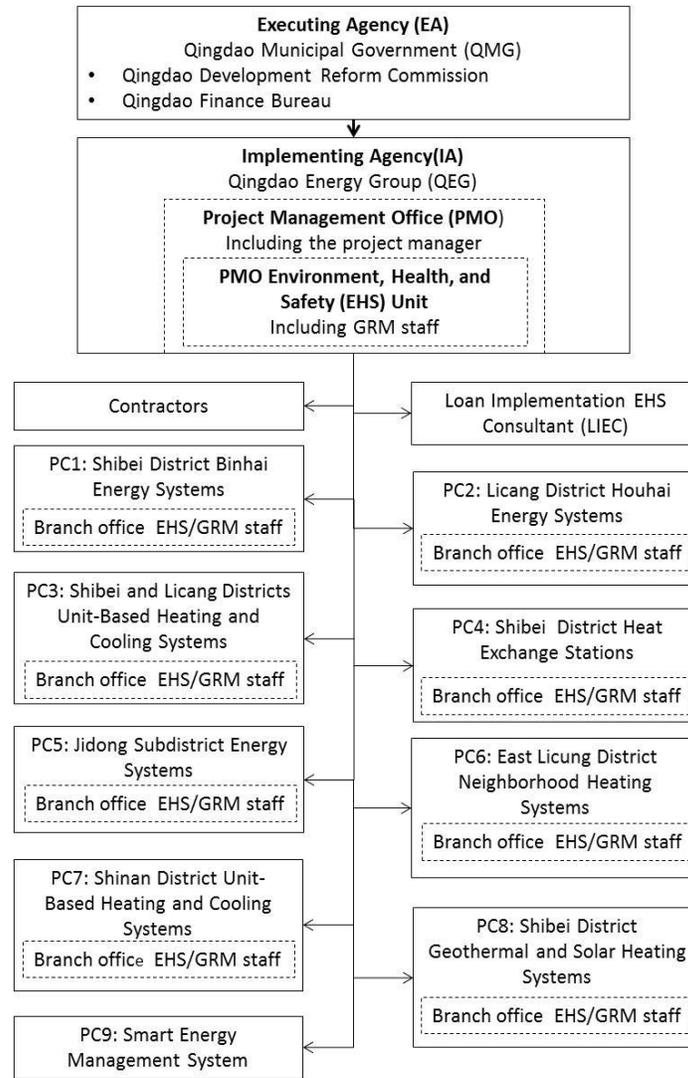
5. The PMO will be responsible for the day-to-day project implementation management including procurement and contract management, and payment to contractors.

6. The EHSU within the PMO will consist of an EHSU manager and an appropriate number of staff, including a designated GRM staff. At each branch office, an appropriate number of EHS staff will be appointed, including a designated GRM contact. To ensure the EMP requirements are incorporated into construction contracts, the PMO EHSU will prepare and provide the following specification clauses to incorporate in the bidding procedures: (i) a list of environmental management requirements to be budgeted by the bidders in their tendering documents; (ii) environmental clauses for contractual terms and conditions; and (iii) environmental monitoring requirements in the domestic EIA, the project IEE and this EMP. The PMO EHSU will oversee EMP implementation and provide specific mitigation implementation guidance to the EHS staff at QEG branch offices, who will ensure the day-to-day EMP implementation by contractors during construction and operator during operation. The PMO EHSU will prepare consolidated environmental (EMP) monitoring reports semiannually during

¹ ADB. 2009. *Safeguard Policy Statement*. Manila.

construction and annually during operation, and submit them to ADB, QEG, and Qingdao environment protection bureau (EPB).

Figure A.1: Conceptualized Project Management Structure



7. The PMO through the EHSU will be responsible for contracting the third party environmental monitoring stations/companies to undertake construction and operation environmental phase monitoring

8. The LIEC will be a part-time national EHS specialist and will support the PMO EHSU in mitigation implementation, environmental monitoring, reporting, and addressing any environment related issues that arise including grievances. The LIEC will also support contractors in developing construction site EMPs (CSEMPs), and EHS plans during construction and operation.

9. The contractors will be responsible for implementing relevant mitigation measures during construction. Following the award of the construction contract, the contractors will prepare CSEMPs which detail the means by which the contractors will comply with the EMP.

The contractors will identify a lead focal point for environmental issues (e.g., Chief Site Engineer), will implement the CSEMPs, and will take all reasonable measures to minimize the impact of construction activities on the environment. The contractors will also submit monthly environmental records to the EHS staff at the relevant branch offices on EMP implementation, including the Environmental Monitoring Plan (EMoP). They are also required to report any spills, accidents, and grievances received, and take appropriate action. The EHS staff at the relevant branch offices will review the records and submit them to the PMO EHSU.

10. The PMO EHSU with the support of the LIEC will be responsible for regular internal inspections of mitigation measures at the construction site, in accordance with the EMoP. A third party environmental monitoring station/company will be engaged by the PMO and will undertake construction and operation phase ambient environmental monitoring as per the EMoP. It is anticipated that the Qingdao EPB will also undertake random environmental compliance inspections during construction and operation. The Qingdao EPB will also conduct environmental acceptance inspections for each project component after a three month trial operation period.

11. ADB will conduct due diligence of environment issues during the project review missions. ADB will review the semiannual and annual environmental monitoring reports submitted by the PMO and will disclose the reports on its website. If the PMO fails to meet safeguards requirements described in the EMP, ADB will seek corrective measures and advise the QEG on items in need of follow-up actions.

12. Key project institutions and their EMP implementation responsibilities are summarized in **Table A.1**.

C. Institutional Strengthening and Capacity Building

13. The institutional strengthening and capacity building focusses on the safeguards requirements of relevant PRC laws and regulations and ADB's Safeguard Policy Statement. The training will focus on ADB's Safeguard Policy Statement, PRC safeguard requirements, development and implementation of EHS plans during construction and operation; implementation of the EMP, the EMoP, and the GRM; and typical good construction EHS plans and practices. The capacity building program will emphasize workers' and community health and safety issues and measures.

14. In the construction phase, significant works should not be undertaken until the CSEMP and the construction EHS plan are developed, and proper training has been provided on their implementation. Similarly, the operation of each project component should not commence until the operation phase EHS plan for each project component is developed, and training provided on their implementation.

15. The development of the EHS plans, training topics, contents, estimated budgets and number of participants are presented in **Table A.2**.

Table A.1: Summary of Institutions and Responsibilities for EMP Implementation

Institution	Responsibilities
Qingdao municipal government – Executing Agency	Ultimate responsibility for the implementation of environmental management plan (EMP).

Institution	Responsibilities
Qingdao Energy Group (QEG) - Implementing Agency	Establish appropriately staffed project management unit (PMU); provide overall project management guidance to PMO.
Project Management Office (PMO)	Establish appropriately staffed Environment, Health and Safety Unit within PMO (PMO EHSU); provide overall management and direction to EHSU.
PMO Environment, Health and Safety Unit (EHSU)	Ensure incorporation of EMP requirements into bidding documents and contracts; oversee EMP implementation; provide mitigation implementation guidance to branch office EHS staff and/or contractors; undertake regular compliance inspections of mitigation measures at the construction sites, in accordance with the EMoP; identify a staff member within the EHSU to be responsible for the implementation of the grievance redress mechanism (GRM); recruit and supervise the third party environmental monitoring station/company, which will undertake construction and operation phase environmental monitoring; prepare and submit consolidated environmental (EMP) monitoring reports to QEG, QMG, and ADB semiannually during construction and annually during operation; coordinate the role of the LIEC.
Loan Implementation EHS Consultant (LIEC)	Provide technical assistance to the PMO EHSU and the EHS/GRM staff at branch offices in all aspects of EMP, EMoP, and GRM implementation; develop construction and operation phase EHS plans and provide training to the staff of QEG, QEG branch offices, and contractors on EMP, Construction Site EMPs (CSEMPs), EMoP, GRM, and EHS, utilizing additional consultants as required; assist and coordinate environmental monitoring, including undertaking compliance inspections and assisting with ambient monitoring; assist PMO EHSU and the EHS/GRM staff at branch offices in addressing any environmental safeguard issues that may arise, including grievances; and assist the PMO EHSU in preparing semi-annual and annual environmental (EMP) monitoring reports.
QEG Branch Offices in charge of project components	Designate an appropriate number of qualified EHS and GRM staff; undertake day-to-day EMP, EMoP, and GRM implementation; provide guidance and supervision to contractors in their EMP, CSEMP, EMoP and GRM implementation; coordinate with the PMO EHSU and LIEC in environmental safeguard issues; review and maintain the monthly environmental records from contractors; prepare project component specific environmental (EMP) monitoring reports and submit to the PMO EHSU semiannually during construction and annually during operation.
Contractors	Develop and implement CSEMPs in accordance with the EMP and other contract conditions; implement all required mitigations during construction; prepare and submit monthly environmental records to the EHS/GRM staff at branch office, which shall contain the status of implementation and compliance of the CSEMP, including information on all spills, accidents, grievance received, and appropriate actions taken.
Environmental Monitoring Station/Company	Conduct ambient monitoring according to the EMP monitoring plan (EMoP).
Qingdao EPB	Inspect the facilities during construction and operation to ensure compliance; enforce applicable PRC's environmental laws and regulations; review EMP monitoring reports; and conducting an environmental acceptance inspection after a three months trial operation period.
ADB	Conduct due diligence of environment issues during the project review missions; monitor and supervise the overall environmental performance of the project; review and quality control the environmental monitoring reports and disclose the

Institution	Responsibilities
	project monitoring reports on its website.

Table A.2: Institutional Strengthening and Training Program

Training Topic	Trainers	Attendees	Contents	Times	Period (days)	# Persons	Budget (\$)	Source of Funds
Construction Phase EHS Plan Development and Training	LIEC	QEG, PMO, EHSU, QEG Branch Offices, Qingdao EPB, Contractors	ADB and PRC EHS laws, regulations, and policies <ul style="list-style-type: none"> - Asian Development Bank's Safeguard Policy Statement - Project applicability to PRC EHS laws, policies, standards and regulations - International environmental, health and safety management practice in civil construction - International environmental, health and safety management practice in civil construction 				EHS Plan Development (fees and per diem): 8 plans x 5 days/plan x 400/day = \$16,000	Counter part funding for the project
			GRM <ul style="list-style-type: none"> - GRM structure, responsibilities, and timeframe - Types of grievances and eligibility assessment 	1	3	40	EHS Plan Training Course Development (fees and per diem): 5 days x \$400/day = \$2,000	
			Implementation of EMP, CSEMP and EMoP <ul style="list-style-type: none"> - Impacts and mitigation measures during construction and operation at EMP and CSEMP - Monitoring and auditing mechanism - Reporting requirements - Issue of non-compliance and corrective actions for EMP, CSEMP, EMoP and GRM. 				Course Delivery (fees and per diem): 5 days x 400/day = \$2,000 (fixed costs): \$2000 per course delivery x 1 = \$2,000	
			Implementation of EHS Plans <ul style="list-style-type: none"> - Plan descriptions - Roles and responsibilities - Community EHS concerns and actions 				TOTAL = \$22,000	

Training Topic	Trainers	Attendees	Contents	Times	Period (days)	# Persons	Budget (\$)	Source of Funds
							EHS Plan Development (fees and per diem): 8 plans x 5 days/plan x 400/day = \$16,000	
Operation Phase EHS Plan Training	LIEC	QEG, PMO, EHSU, QEG Branch Offices, Qingdao EPB, Contractors	International good practices in natural gas-fired boiler operation – Environmental, health and safety issues associated with natural gas-fired boilers. Implementation of Operation Phase EHS Plans – Plan descriptions – Roles and responsibilities – Community EHS concerns and actions	1	3	40	EHS Plan Training Course Development (fees and per diem): 5 days x \$400/day = \$2,000 Course Delivery (fees and per diem): 5 days x 400/day = \$2,000 (fixed costs): \$2,000 per course delivery x 1 = \$2,000	Counter part funding for the project
TOTAL = \$22,000								
Total				2	6	80	\$44,000	

CSEMP = construction site environment management plan, EHS = environment, health and safety, EHSU = environment, health and safety unit, EMP = environmental management plan, EMoP = environmental monitoring plan, EPB = environment provincial bureau, GRM = grievance redress mechanism, LIEC = loan implementation environment, health and safety consultant, PMO = project management office

D. Potential Impacts and Mitigation Measures

16. The potential impacts of the project during construction and operation have been identified and appropriate mitigation measures developed (see Chapter V of the IEE). Detailed impacts and mitigation measures are presented in **Table A.3**.

E. Environment Monitoring Plan

17. An EMoP to monitor the environmental impacts of the project and assess the effectiveness of mitigation measures is presented in **Table A.4**. The EMoP includes both compliance inspection undertaken by the PMO EHSU supported by the LIEC, and ambient air, noise, wastewater and flue gas monitoring undertaken during both construction and operation phases. Ambient and discharge monitoring will be conducted in compliance with relevant PRC regulations, methods and technical specifications.

18. The data and results of environmental compliance inspection and monitoring activities will be used to assess: (i) the extent and severity of actual environmental impacts against the predicted impacts and baseline data collected before the project implementation, (ii) performance or effectiveness of environmental mitigation measures or compliance with pertinent environmental rules and regulations, (iii) trends in impacts; (iv) overall effectiveness of EMP implementation, and (v) the need for additional mitigation measures and corrective actions if non-compliance is observed.

Table A.3: Environment Impacts and Mitigation Measures

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
<u>A. Pre-construction Phase</u>					
Incorporate Mitigation Measures and Monitoring in Detailed Design and Bidding and Contracting	Include mitigation measures and monitoring program in detailed design	– Environmental mitigation measures identified in the initial environmental examination, the EMP and the domestic EIA will be incorporated into the detailed design.	EHSU supported by LIEC	PMO, ADB	Detailed Design Budget
	Include mitigation measures and monitoring program in bidding documents	– Environmental mitigation measures identified in the initial environmental examination, EMP and the domestic EIA will be incorporated in the bidding documents for the project, and will be included in contract documents for civil constructions and equipment installations. All contractors shall be required to strictly comply with the EMP.	EHSU supported by LIEC	PMO, ADB	Detailed Design Budget
	Environmental monitoring incorporated into design.	– The environmental monitoring plan (see Table A.4 in Appendix I) will be incorporated into the design to ensure that environmental impacts are closely monitored and activities of the project construction and operating are closely supervised against the PRC environmental laws, regulations and standards, ADB's Safeguard Policy Statement, and the project EMP and approved domestic EIA.	EHSU supported by LIEC	PMO, ADB	Detailed Design Budget
Grievance Redress Mechanism (GRM)	Impacts on Affected Persons	– In accordance with the GRM presented in Chapter VIII of the EIA, a staff member within the PMO EHSU will be assigned overall responsibility for the GRM; GRM training will be provided for PMO members and GRM access points; and the GRM access point phone numbers, fax numbers, addresses and emails will be disclosed to the public.	EHSU supported by LIEC	PMO, ADB	PMO Operating Budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
Closure of Coal-fired neighborhood boilers and stoves	Air quality	<ul style="list-style-type: none"> The closure of coal-fired neighborhood boilers and household stoves will be done by local government as part of air quality improvement policy in Qingdao. Even though it is not part of the project scope, the closure progress will be checked and recorded to assess the project benefits on air quality improvement. 	Qingdao municipal government	Qingdao EPB	PMO Operating Budget and
Emission reduction efforts at Taineng Thermal Power Plant (TPP) and Houhai TPP		<ul style="list-style-type: none"> Taineng and Houhai TPPs are currently upgrading equipment to comply with newly introduced stringent air emissions standards. Even though these efforts are not part of the project scope, their status of ongoing emission reduction efforts will be checked and recorded in order to assess system-wide air quality improvement in project areas. 	Taineng TPP and Houhai TPP	Qingdao EPB	PMO Operating Budget and LIEC budget
<u>B. Construction Phase</u>					
Erosion and Spoil	Soil erosion, spoil disposal	<p>Good practice construction erosion controls and site maintenance:</p> <ul style="list-style-type: none"> At each construction site the potential for storm water runoff will be assessed and appropriate storm water drainage systems to minimize soil erosion will be implemented, including perimeter bunds and establishment of temporary detention and settling ponds to control topsoil runoff. Land excavation and filling will be balanced so as to minimize the requirement for fill transportation. During earthworks the area of soil exposed to potential erosion at any one time will be minimized through good project and construction management. Temporary spoil storage sites will be identified, designed, and operated to minimize impacts. Spoil sites will be restored at the conclusion of storage activities. 	Contractors	EHSU supported by LIEC	Contractor construction budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<ul style="list-style-type: none"> - Excess spoil that cannot be used onsite will be transported to an approved spoil disposal site. - Spoil and aggregate piles will be covered with landscape material and/or regularly watered. - Spoil will be reused onsite to the maximum extent feasible as fill. - Waste construction material such as residual concrete, bricks, etc. will be used for backfill at the sites or nearby construction sites to the maximum extent feasible. - Construction and material handling activities will be limited or halted during periods of rains and high winds. - Pipelines will be installed and backfilled in a sequenced section-by-section approach. Open excavation areas during trenching activities will be minimized, and appropriate construction compaction techniques utilized. - Any planned paving or vegetating of areas will be done as soon as practical after the materials are removed to protect and stabilize the soil. - Once construction is complete disturbed surfaces will be properly sloped and revegetated with native trees and grass (see greening plan, below). 			
Wastewater	Surface and groundwater contamination from construction wastewater, and domestic water	<p>Good wastewater management practices:</p> <ul style="list-style-type: none"> - Site visits have confirmed that there are municipal wastewater treatment plants serving all component locations. Adequate temporary sanitary facilities and ablutions will be provided for construction workers. Toilets will be equipped with septic tanks in accordance with PRC standards. Domestic wastewater will be treated in the septic tanks to meet <i>Wastewater Quality Standards for Discharge to Municipal Sewers</i> (CJ 343-2010) and discharged to the municipal sewer network for final treatment at a municipal wastewater treatment plant. 	Contractors	EHSU supported by LIEC	Contractor construction budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<ul style="list-style-type: none"> – Wastewater from the canteen will be treated in an oil-water separator, and then discharged into the municipal sewer network for final treatment at a municipal wastewater treatment plant. – Construction wastewater will be directed to temporary detention and settling ponds. Areas where construction equipment is being washed will be equipped with water collection basins and sediment traps. After settling, supernatant will be recycled and sediment will be periodically excavated, and either reused if possible as fill, disposed at official spoil disposal sites, or disposed at official landfills. – Maintenance of construction equipment and vehicles will not be allowed on site so as to reduce wastewater generation. 			
Air Pollution	Dust, vehicle emissions	<ul style="list-style-type: none"> – Energy station sites, HES sites, boiler house sites and pipeline sections under construction will be fully enclosed by fence prior to the commencement of construction. Fence height will be increased near sensitive locations (residential areas, schools, clinics and hospitals). – Water will be sprayed on active construction sites including where fugitive dust is being generated on a daily basis, and more frequently during windy days. – All construction piles (spoil, aggregate other construction materials) with the potential to generate dust will be covered and/or regularly watered. – Construction waste will be properly managed (see below). – Construction activities will be halted during high wind events (e.g. wind speed is more than Class 4 (5.5. m/s) of the PRC National Standard for Wind Power Classification (GB/T 28591-2012)). – Once construction is complete disturbed surfaces will be properly sloped and revegetated with native trees and 	Contractors	EHSU supported by LIEC	Contractor construction budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<p>grass (see greening plan, below).</p> <ul style="list-style-type: none"> – Transport vehicles will be limited to low speeds in construction sites. – Loads will be covered during truck transportation to avoid spillage or fugitive dust generation. Fine materials will be transported in fully contained trucks. – Construction site roads will be well maintained, and watered and swept on an as-needed basis. Construction site road entry points will be equipped with truck drive through wash ponds. – Transport routes will avoid residential neighborhoods and other sensitive areas to the maximum extent practical. – Vehicles and construction machineries will be maintained to a high standard (to be done off-site) to ensure efficient operating and fuel-burning and compliance with the PRC emission standards GB 11340-2005, GB 17691-2005, GB 18285 -2005 and GB 18352-2005. – The use of coal for cooking onsite, heating and hot water will be prohibited. – Non-ozone depleting blowing agents will be utilized for the polyurethane foam during the construction of pre-insulated bonded heating pipes. 			
Noise	Impacts from construction noise on sensitive resources	<p>To ensure construction activities meet PRC noise standards (Noise Standards for Construction Site Boundary, GB 12523-2011) and to protect workers and adjacent residents, the following mitigation measures will be implemented:</p> <ul style="list-style-type: none"> – Construction activities, and particularly noisy ones, are to be limited to reasonable hours during the day and early evening. Construction activities will be strictly prohibited during night time (22:00 h to 07:00 h). Exceptions will only be allowed in special cases, and only after getting approval of the surrounding residents, Qingdao EPB and other relevant departments. – When undertaking construction planning, simultaneous 	Contractors	EHSU supported by LIEC	Contractor construction budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<p>high-noise activities will be avoided, and high noise activities will be scheduled during the day rather than evening hours. Similarly, construction sites will be planned to avoid multiple high noise activities or equipment from operating at the same location.</p> <ul style="list-style-type: none"> – Low-noise equipment will be selected as much as possible. – Equipment and machinery will be equipped with mufflers and will be properly maintained to minimize noise. Noise levels from equipment and machinery must conform to the PRC standard GB 12523-2011. – Machines in intermittent use will be shut down in the intervening periods between work or throttled down to a minimum. – Noise personal protective equipment (PPE) will be provided to workers. – Transportation routes and delivery schedules will be planned during detailed design to avoid densely populated and sensitive areas and high traffic times. – Vehicles transporting construction materials or wastes will slow down and not use their horn when passing through or nearby sensitive locations, such as residential communities, schools and hospitals. – Given their location within residential areas, special attention will be paid to protect sensitive sites near HESSs and community boiler houses, and along the pipeline routes: <ul style="list-style-type: none"> – High noise construction activities will be positioned as far away from sensitive sites as possible. – Low noise equipment will be utilized to the extent possible. – Temporary or permanent noise barriers will be installed to protect sensitive sites. – To minimize noise impacts from high pressure cleaning 			

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<p>of heating pipelines the following mitigation measures may be utilized as appropriate:</p> <ul style="list-style-type: none"> - Low noise valves. - Mufflers after the valves (noise reduction of 20-30 dB). - Throttle orifices in the pipelines to share the pressure drop from valves and reduce noise. - Sound insulation on the external walls of pipelines. - Auxiliary regulating valves. 			
Solid Waste	Inappropriate Waste Disposal	<ul style="list-style-type: none"> - Wastes will be reused or recycled to the extent possible. Waste construction material such as residual concrete, bricks will be used for backfill at the sites. - Littering by workers will be prohibited. - Domestic waste containers will be provided at all work sites. Domestic waste will be collected on a regular basis by the local sanitation departments and transported for recycling, reuse, or disposal at a licensed landfill, in accordance with relevant PRC regulations and requirements. - Construction waste dumpsters will be provided at all work sites. Construction waste will be collected on a regular basis by a licensed waste collection company and transported for recycling, reuse, or disposal at a licensed landfill, in accordance with relevant PRC regulations and requirements. - Excavated soil will be backfilled onsite to the extent possible. Excess spoil that cannot be used on-site will be transported to an approved spoil disposal site. - There should be no final waste disposal on site. Waste incineration at or near the site is strictly prohibited. - Contractors will be held responsible for proper removal and disposal of any significant residual materials, wastes, and contaminated soils that remain on the site 	Contractors, local sanitation departments (domestic waste), licensed waste collection companies (construction waste)	EHSU supported by LIEC	Contractor construction budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<ul style="list-style-type: none"> – after construction. 			
Hazardous and Polluting Materials	Inappropriate transportation, storage, use and spills	<ul style="list-style-type: none"> – A hazardous materials handling and disposal protocol that includes spill emergency response will be prepared and implemented by contractors. – Storage facilities for fuels, oil, chemicals and other hazardous materials will be within secured areas on impermeable surfaces provided with dikes, and at least 300 meters (m) from drainage structures and important water bodies. A standalone site within the storage facility will be designated for hazardous wastes. – Suppliers of chemicals and hazardous materials must hold proper licenses. They will follow all relevant protocols in “Operation Procedures for Transportation, Loading and Unloading of Dangerous or Harmful Goods” (JT 3145-91). – A licensed company will be hired to collect, transport, and dispose of hazardous materials in accordance with relevant PRC regulations and requirements. – Vehicles and equipment will be properly maintained and refueled in designated service areas on impermeable surfaces provided with oil traps, at least 300 m from drainage structures and important water bodies. 	Contractors, waste management companies	EHSU supported by LIEC	Contractor construction budget
Flora and Fauna	Removal of vegetation	<p>A greening plan will be implemented:</p> <ul style="list-style-type: none"> – Site vegetation plans will be developed at new facility construction sites (energy stations, boiler houses, HESs) using appropriate native species. – Any existing vegetated areas impacted by pipeline works or construction of boiler rooms, energy stations and HESs will be restored post-construction using appropriate native species. 	DI (plan design), Contractors (plan implementation)	EHSU supported by LIEC	Contractor construction budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
Socioeconomic Resources	Community Disturbance and Safety	<p>Traffic and Public Safety</p> <p>Traffic control plans, agreed to by the local traffic control authority, will be developed and implemented for each component in order to minimize community disturbance:</p> <ul style="list-style-type: none"> – Local government, using information provided by the PMO, will inform residents, institutions, business and other affected parties as to planned construction activities including schedule and duration of construction works, and expected traffic and other disruptions. – Transportation routes and delivery schedules will be planned during detailed design to avoid densely populated and sensitive areas and high traffic times. – Warning signs and cones will be installed along roads to protect workers and people in the neighborhood. Safety flags will be used if appropriate. – Vehicles transporting construction materials or wastes will slow down and not use their horn when passing through or nearby sensitive locations, such as residential communities, schools and hospitals. – During evening construction, warning lights will also be used. – Roadside earthworks should be completed as quickly as possible, and all spoil will either be backfilled or removed. – Road crossing will use the pipe-jacking installation method where possible in order to minimize disruption. <p>Public access to construction sites and other areas of danger will be restricted and temporary barriers installed.</p>	DI (plan design), Contractors (plan implementation)	EHSU supported by LIEC	Contractor construction budget
		<p>Access to Public Services, Private Properties and Businesses</p> <ul style="list-style-type: none"> – Local authorities will be consulted to minimize disruption of public services such as telephone, water, gas and power supply. Contractors will use good construction practices to avoid disruption of other services. – Contractors will take measures to minimize disruption of 	Contractors	EHSU supported by LIEC	Contractor construction budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<p>access to private properties and businesses where possible.</p> <ul style="list-style-type: none"> – Temporary access to affected private properties, businesses and public service buildings will be provided including temporary crossings over pipeline trenches, and subsequently good quality permanent access will be provided. – Pipelines construction should be planned to take place simultaneously with other construction activities so as to minimize the length of disruption. 			
	Worker Occupational Health and Safety	<p>Contractors will implement adequate precautions to protect the health and safety of their workers:</p> <ul style="list-style-type: none"> – Each contractor will implement the relevant construction phase EHS plan developed by the LIEC and EHS consultants. – An EHS officer will be appointed by each contractor to implement and supervise the EHS management plan. – The EHS Plan will: <ul style="list-style-type: none"> • Identify and minimize the causes of potential hazards to workers. • Implement appropriate safety measures. • Ensure the provision of adequate type and number of fire extinguishers and first aid facilities onsite. • Provide training to workers on occupational health and safety and emergency response, especially with respect to using potentially dangerous equipment. • Ensure that all equipment is maintained in a safe operating condition. • Ensure that material stockpiles or stacks, such as pipes are stable and well secured to avoid collapse and possible injury to workers. • Provide appropriate personal protective 	<p>EHS Plan Developed by LIEC and consultants</p> <p>EHS Plan implemented by contractors</p>	<p>EHSU</p> <p>EHSU supported by LIEC</p>	<p>LIEC Budget</p> <p>Contractor construction budget</p>

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<p>equipment (PPE) to workers to minimize risks, including ear protection, hard hats and safety boots, and post adequate signage in risk areas.</p> <ul style="list-style-type: none"> • Provide procedures for limiting exposure to high noise or heat working environments in compliance with PRC noise standards for construction sites (GB 12523-2011). • Provide training to workers on the storage, handling and disposal of hazardous wastes. • Ensure regular safety meetings with staff. 			
Physical Cultural Resources	As yet unknown PCRs may be damaged if proper precautions are not taken.	<ul style="list-style-type: none"> – A construction phase chance find procedure will be established and activated if any chance finds of PCRs are encountered: <ul style="list-style-type: none"> • construction activities will be immediately suspended if any PCRs are encountered; • destroying, damaging, defacing, or concealing PCRs will be strictly prohibited in accordance with PRC regulations; • the local Cultural Heritage Bureau will be promptly informed and consulted; and, • construction activities will resume only after thorough investigation and with the permission of the local Cultural Heritage Bureau. 	Contractors	EHSU supported by LIEC and local Cultural Heritage Bureau	In the event that a PCR is discovered, the direct cost for compensation to contractor will be covered by a special fund to be developed for cultural relic protection.
C. Operation Phase					
Air Pollution	Combustion Emissions	<ul style="list-style-type: none"> – Low nitrogen oxide natural gas-fired boilers, turbines and engines with design emission levels that are in compliance with the most stringent of PRC national and Shandong provincial standards. – Waste heat recovery from industry and municipal sewage plants. 	<p>DI (plan design)</p> <p>Contractors (construction)</p>	<p>EHSU</p> <p>EHSU</p>	Design and construction budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<ul style="list-style-type: none"> – Extracted heat using heat pump technology from various sources such as air, wastewater, and geothermal. – Parabolic trough solar heating. – Heat storage for peak demand shaving. – Gas emissions will be sampled on a regular basis to confirm compliance with relevant PRC emission standards, and ambient monitoring will be undertaken through the Qingdao EPB Continuous Ambient Air Quality Monitoring Stations. If either emissions monitoring or ambient monitoring indicates exceedances of relevant standards, additional denitrification and/or particulate control emissions devices will be added in consultation with the Qingdao EPB and the ADB. 	QEG (operation)	EHSU and Qingdao EPB	QEG operation budget
Wastewater	Discharge of Production and Domestic Wastewater	<ul style="list-style-type: none"> – Wastewater from the production water treatment plants will be treated in neutralization tanks then discharged to the municipal sewage network for final treatment in the relevant local municipal wastewater treatment plant. – Wastewater from the heat supply and cool supply system and boilers will be discharged to the municipal sewage network for final treatment in the relevant local municipal wastewater treatment plant. – Domestic will be treated in digestion tanks, and then in combination with the neutralized production wastewater, will be discharged to the municipal sewage network for final treatment in the relevant local municipal wastewater treatment plant. – All emission concentration of suspended solids, chemical oxygen demand, biochemical oxygen demand and ammonia nitrogen will be in compliance with <i>Wastewater Quality Standards for Discharge to Municipal Sewers</i> (CJ 343-2010), which sets the emission standards for wastewater discharged to a municipal sewerage system. 	QEG	Qingdao EPB	QEG operation budget
Solid Waste	Collection and Disposal	<ul style="list-style-type: none"> – Waste bins will be provided at all facilities. – Wastes will be routinely collected by the local sanitation 	District Sanitation	Qingdao EPB	QEG operation

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<p>department for recycling, if possible, or final disposal at an approved waste disposal site.</p> <ul style="list-style-type: none"> – No permanent on-site solid waste disposal will be permitted at component sites. – No burning of wastes will be permitted at component sites. – All structures and/or components replaced during maintenance activities will be reused or recycled to the extent possible. Non-recyclable parts will be disposed at an approved waste disposal site. 	Departments		budget
Chemical and Hazardous Materials	Inappropriate Management	<ul style="list-style-type: none"> – A register of all activities that involve the handling of potentially hazardous substances will be developed, including protocols for the storage, handling and spill response. This will include all fuels, oils, grease, lubricants, and other chemicals. – All chemicals, toxic, hazardous, and harmful materials will be transported in spill proof tanks with filling hoses and nozzles in working order, – All chemicals, toxic, hazardous, and harmful materials will be stored in secure areas with impermeable surfaces and protective dikes such that spillage or leakage will be contained from affecting soil, surface water or groundwater systems. Their usage will be strictly monitored and recorded. Some chemicals will be stored off-site, such as water quality analysis chemicals which will be stored at an independent laboratory. – Material safety data sheets (MSDSs) will be posted for all hazardous materials. – Oil absorbents will be readily accessible in marked containers. – Good housekeeping procedures will be established to avoid the risk of spills. – Spills will be dealt with immediately, and personnel will be trained and tasked with this responsibility. 	QEG, Licensed Contactors	Qingdao EPB	QEG operation budget

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<ul style="list-style-type: none"> – Workers will be properly trained before handling hazardous wastes and have the requisite PPE. – Hazardous waste will be temporarily stored in closed containers away from direct sunlight, wind, water and rain in secure designated areas with impermeable surfaces and protective dikes such that spillage or leakage will be contained. – Hazardous wastes will be collected and disposed by licensed contractors (e.g. Qingdao Xintiandi Integrated Solid Waste Disposal Co. Ltd.) on an as needed basis. 			
Noise	Impact on Sensitive Receptors	– The project design will use low-noise equipment as far as possible, and will also utilize noise elimination, shock absorption, insulated enclosures and sound dampening materials on exterior walls.	Contractors (construction)	EHSU	Contractor construction budget
		– All plant and equipment, including vehicles will be properly maintained in order to minimize noise.	QEG (operation)	Qingdao EPB	QEG operation budget
		– Appropriate personal noise protective equipment will be provided to the workers who are likely to be exposed to high noise level environments.			
		– Noise monitoring will be undertaken, and if required additional noise control measures like noise reduction barriers will be implemented.			
Occupational Health and Safety	Risks to Workers	To minimize risks associated with leaks of natural gas:	Contractors (construction)	EHSU	Contractor construction budget
		– All natural gas works will be in compliance with relevant PRC building code requirements, including the <i>Code for Design of City Gas Engineering</i> (GB 50028-2006) and <i>Regulation on Electric Apparatus Design for Explosion and Fire Risk Environment</i> (GB50058-92).	QEG (operation)	Qingdao EPB	QEG operation budget
		– Independent gas regulation stations will be constructed at least 14 m away from other buildings and 30 m from			

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<p>the site boundary, to minimize the risk of explosion damaging other project facilities or the public.²⁴</p> <ul style="list-style-type: none"> – The gas regulation stations will be specially designed to withstand and contain explosions. – Gas regulation stations and the connection to the boilers will be equipped with flammable gas detection, alarm and fire suppression systems. Electrical devices within the explosion risk area will be safety equipped. – Gas pipelines will be grounded and equipped with anti-lightning devices where applicable. – All other at risk areas will have flammable gas detection and alarm systems able generate audible and visual alarms, and automatic fire suppression systems. – All gas related devices will be brightly colored and equipped with warning signs. <p>To mitigate potential health and safety risks to workers, the following measures will be taken:</p> <ul style="list-style-type: none"> – Operation phase EHS plans for natural gas systems including fire prevention and control will be developed and implemented, and workers will be trained regularly on their implementation. – Natural gas systems will be designed in strict compliance with relevant PRC fire, health and safety standards. Fire compartments will be established based on the fire risk and fire-resistant buildings/structures will include fire-proof doors and windows. – Fire-alarm and suppression systems will be installed and tested regularly to ensure it functions properly. – The process control system will include an out-of-limit alarm to ensure all hazardous materials are safety under control at all time. 	<p>Plans developed by LIEC and EHS Experts</p> <p>Plans implemented by QEG</p>	<p>PMO, Qingdao EPB</p> <p>Qingdao EPB</p>	<p>LIEC Budget</p> <p>QEG Budget</p>

²⁴ Gas regulation stations are defined as Class II explosion risks. Space within 4.5 meters away from a regulation station is included in the explosion risk region, as regulated in *Regulation on Electric Apparatus Design for Explosion and Fire Risk Environment* (GB50058-92). In the *Code for Design of City Gas Engineering* (GB 50028-2006) the recommended distance from a gas regulation station with no more than 1.6 MPa inlet pressure to other buildings is 9 m.

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<ul style="list-style-type: none"> – PPE, including goggles, gloves, safety shoes, will be provided to workers. – Naked fire sources, hot surfaces, electric sparks, electrostatic sparks and ignition sources will be strictly controlled, especially near natural gas. – Control measures will be strictly undertaken to ensure the discharge, exhaust and safety relief of flammable fuels in enclosed systems. – No unauthorized personnel should be allowed into gas-fired facilities. – Authorized personnel must have appropriate PPE at all times. 			
	Emergency Response	<p>An emergency risk and response applicable to all gas-fired facilities will be established in accordance with the “National Environmental Emergency Plan” (24 January 2006) and other relevant PRC laws, regulations and standards, and will include measures in the World Bank EHS guidelines with respect to occupational and community health and safety. The plan must be established and in place before the plant is operational.</p> <p>Indicative plan requirements are as follows:</p> <ul style="list-style-type: none"> – Procedures for responding to different types of emergency situations will be identified in the response plan. – Emergency exercises will be conducted and they should include different emergency scenarios. <p>Training Requirements</p> <ul style="list-style-type: none"> – Appropriate operating and maintenance employees will be trained to ensure that they are knowledgeable of the requirements of emergency response plan. Training will be provided as follows: <ul style="list-style-type: none"> – Initial training to all employees before the gas- 	<p>Plans developed by EHSU with support from LIEC</p> <p>Plans implemented by QEG</p>	<p>Qingdao EPB, local emergency authorities</p> <p>Qingdao EPB, local emergency authorities</p>	<p>LIEC budget</p> <p>QEG budget</p>

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<p>fired facilities are put in operation.</p> <ul style="list-style-type: none"> - When new equipment, materials, or processes are introduced. - When emergency response procedures have been updated or revised. 			
		<p>Annual Emergency Simulation</p> <ul style="list-style-type: none"> - Simulated emergency exercises will be conducted at least annually. 			
		<p>Receiving Notification of a Possible Emergency</p> <ul style="list-style-type: none"> - When a supervisor receives a report of a possible emergency situation, he/she should obtain at minimum the following information from the reporting person: <ul style="list-style-type: none"> - Name of person reporting emergency; - Nature of emergency - leak, fire, interruption of service if leak, odor present, etc. - Details of emergency: location, amount, how long has the odor been noticed, what actions have been taken, etc. - Leaks or other emergencies require prompt investigation. 			
		<p>Immediate Onsite Action</p> <ul style="list-style-type: none"> - The first responder will assess the nature of the report. This assessment should include the status of the emergency, an estimation of how the incident might progress, and an evaluation of the manpower, equipment, and materials needed to adequately cope with the situation. - If there is a strong odor or any measurable reading of gas detected inside a structure: <ul style="list-style-type: none"> - Clear the building of all occupants. - Eliminate potential ignition sources. - Localize or isolate the problem and shut off gas as needed. 			

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<ul style="list-style-type: none"> – Determine the extent of the hazardous area and establish a restricted area. – The responding supervisor shall determine the extent of the emergency and inform the dispatcher of the condition at the site. – If emergency procedures are put into effect, the responding supervisor should select a location and establish an emergency command post. – The responding supervisor will assign one person to remain at the command post to maintain communications until the emergency is over. – When necessary, the command post will be coordinated with the local emergency responders. When local emergency responders are involved, they will be in charge of the incident. – The responding supervisor will make himself known to fire and/or police department officials, or other authority having jurisdiction, and will remain with them during the emergency. – All employees reporting to the scene of the emergency will report to the command post for identification and instructions. – Key personnel will be alerted, and it will be their responsibility to keep the emergency personnel under their supervision informed and available for emergency call out. – When a system failure cannot be made safely by normal procedures, emergency shutdown procedures should be implemented. – Reduce system pressure or segment a section before repair procedures are implemented. – Well trained and qualified personnel will be dispatched to monitor system pressure and repair work. 			

Category	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Responsibility		Source of Funds
			Implemented by	Supervised by	
		<p>Communication with Public Officials</p> <ul style="list-style-type: none"> – When an emergency resulting in a hazard to the public safety occurs, the local fire department, police, the city medical emergency center and other relevant public officials should be notified. An emergency call list will be prepared and make it available at the plant control room. 			

ADB = Asian Development Bank, DI = design institute, EHSU = environment, health and safety unit, EIA = environmental impact assessment, EMP = environment monitoring plan, EPB = environment protection bureau, GRM = grievance redress mechanism, HES = heat exchange stations, IEE = initial environmental examination, LIEC = loan implementation environmental consultant, m = meters, PMO = project management office, PCR = physical cultural resources, PPE = personal protective equipment, PRC = People's Republic of China, TPP = thermal power plant, QEG = Qingdao Energy Group.
Source: Domestic Project EIA Report (2015) and TA consultants.

Table A.4: Environmental Monitoring Plan (EMoP)

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
A. Construction Phase						
Erosion and Spoil	Compliance inspection of erosion protection measures and spoil management	Construction sites, spoil disposal sites	Monthly; and once after completion of spoil disposal	EHS staff at branch offices supported by LIEC	PMO EHSU	PMO EHSU: PRC PMO Budget LIEC: ADB LIEC Budget
Wastewater generated from construction	Compliance inspection of wastewater mitigation measures (detention ponds, septic systems)	Construction sites	Monthly	EHS staff at branch offices supported by LIEC	PMO EHSU	PMO EHSU: PRC PMO Budget LIEC: ADB LIEC Budget
Air Pollution	Ambient dust monitoring (TSP, PM ₁₀)	Construction sites (or representative number of sites for project components with multiple sites)	Quarterly	3 rd party environmental monitoring station/ company; EHS staff at branch offices	PMO EHSU PMO EHSU	3 rd party lump sum construction phase environmental monitoring contract
	Compliance inspection of dust mitigation measures (water spraying, cover transport vehicles, etc.); and maintenance and condition of vehicles and construction equipment.	All construction sites	Weekly when there are construction activities	EHS staff at branch offices supported by LIEC		PMO EHSU: PRC PMO Budget LIEC: ADB LIEC Budget
Noise	Leq dB(A)	Construction sites (or representative number of sites for project components with multiple sites)	Quarterly: a day each time and two samples; once during daytime, once during nighttime.	3 rd party environmental monitoring station/ company; EHS staff at branch	PMO EHSU	3 rd party lump sum construction phase environmental monitoring contract

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
				offices		
Solid Waste	Compliance inspection of domestic and construction waste collection and disposal	Waste collection and disposal sites.	Monthly	EHS staff at branch offices supported by LIEC	PMO EHSU	PMO EHSU: PRC PMO Budget LIEC: ADB LIEC Budget
Hazardous and Polluting Materials	Compliance inspections of hazardous management, protocols, and licenses of suppliers and waste removers	Storage facilities for fuels, oil, chemicals and other hazardous materials. Vehicle and equipment maintenance areas.	Monthly	EHS staff at branch offices supported by LIEC	PMO EHSU	PMO EHSU: PRC PMO Budget LIEC: ADB LIEC Budget
Greening Plan	Compliance inspection of implementation of greening plans	Energy stations, HES sites, pipeline routes.	After construction is complete.	EHS staff at branch offices supported by LIEC	PMO EHSU	PMO EHSU: PRC PMO Budget LIEC: ADB LIEC Budget
	Compliance inspection to determine if traffic and public safety measures are in place	Pipeline and Energy Station construction sites at or near roads. Transportation routes.	Monthly	EHS staff at branch offices supported by LIEC	PMO EHSU	PMO EHSU: PRC PMO Budget LIEC: ADB LIEC Budget
Socioeconomic Impacts	Compliance inspection to determine if temporary access being provided to public and private properties	Pipeline routes	Monthly	EHS staff at branch offices supported by LIEC	PMO EHSU	PMO EHSU: PRC PMO Budget LIEC: ADB LIEC Budget
	Compliance inspection to determine if EHS Plans developed and implemented, and workers have	All construction sites	Monthly	EHS staff at branch offices supported by LIEC	PMO EHSU	PMO EHSU: PRC PMO Budget LIEC: ADB LIEC Budget

Subject	Parameter	Location	Frequency	Implemented by	Supervised by	Source of Funds
appropriate PPE						
B. Operation Phase						
Gas Exhaust Emissions	SO ₂ , NO ₂ , TSP (PM)	Exhaust stacks of natural gas boilers, generators, turbines and engines	Four times per year (two times in heating season, two times in cooling season).	3 rd party environmental monitoring company; EHS staff at branch offices	PMO EHSU	3 rd party lump sum operation phase environmental monitoring contract
Ambient Air Quality	SO ₂ , NO ₂ , PM ₁₀ , PM _{2.5}	Qingdao EPB Monitoring Stations	Continuous	Qingdao EPB Monitoring Stations	Qingdao EPB	Qingdao EPB (Non project funds)
Domestic and Production Wastewater Discharged to Municipal Sewer	SS, COD, BOD ₅	Energy Station Discharge Locations	Four times per year (two times in heating season, two times in cooling season).	3 rd party environmental monitoring company; EHS staff at branch offices	PMO EHSU	3 rd party lump sum operation phase environmental monitoring contract
Noise	Leq dB(A)	Compliance monitoring: at 1 m outside of the site boundary (Energy Stations, HESs)	Four times per year (two times in heating season, two times in cooling season).	3 rd party environmental monitoring company; EHS staff at branch offices	PMO EHSU	3 rd party lump sum operation phase environmental monitoring contract
Health and Safety	Compliance inspection to determine if EHS plans developed and implemented, and workers have appropriate PPE	Energy Stations, HESs, pipelines	Ongoing, random	EHS staff at branch offices supported by LIEC	PMO EHSU	Included in IAs' operation budgets

dB = decibel, CEMS = continuous emissions monitoring system, EHSU = environment, health and safety unit, EMS = environment monitoring station, EPB = environment protection bureau, IA = implementing agency, Leq = equivalent continuous noise level, LIEC = loan implementation environmental consultant, NO₂ = nitrogen dioxide, PM = particulate matter, pH = potential hydrogen, TSP = total suspended particulate matter, PMO = project management office, SO₂ = sulfur dioxide.

Source: Domestic EIA Report (2015) and ADB PPTA consultants estimate.

F. Reporting Requirements

19. The contractors will submit monthly reports to the EHS staff at the relevant branch office on the implementation and compliance with the CSEMP, including information on all spills, accidents, grievance received, and appropriate actions taken.

20. Based on the contractors' monthly reports and the compliance inspection and ambient monitoring results, the EHS staff at branch offices, with support from the LIEC, will prepare project component specific environmental (EMP) monitoring reports semi-annually during construction and annually during operation and submit them to the PMO EHSU. The PMO EHSU will prepare consolidated environmental (EMP) monitoring reports, with support from the LIEC. These reports will be submitted to the PMO, who will review them and then submit them to the ADB, QMG, and the Qingdao EPB.

21. No later than 2 months after completion of each project component construction work, the EHS staff at the branch offices will submit a subproject construction completion environmental acceptance report to the Qingdao EPB and send a copy to the PMO EHSU. Within 3 months after project component completion, an environmental acceptance inspection will be undertaken by the Qingdao EPB. ADB can request the PMO for copies of the construction completion environmental acceptance reports and the environmental acceptance approvals by the Qingdao EPB.

22. The environmental reporting requirements during the implementation of the project are summarized in the **Table A.5**.

Table A.5: Reporting Requirements

Report	Prepared by	Submitted to	Frequency
A. Construction Phase			
CSEMP compliance, spills and accidents	Contractors	EHS staff at branch offices	Monthly
Project component specific environmental monitoring report	EHS staff at branch offices supported by LIEC	PMO EHSU	Semiannually
(Consolidated) Environmental monitoring reports	PMO EHSU supported by LIEC	PMO reviews and submits to ADB	Semiannually
B. Operation Phase			
Project component specific environmental monitoring report, including annual carbon dioxide emissions	EHS staff at branch offices supported by LIEC	PMO EHSU	Annually
(Consolidated) Environmental monitoring report, including annual carbon dioxide emissions	PMO EHSU prepares and submits to PMO	PMO reviews and submits to ADB	Annually

ADB = Asian Development Bank, CSEMP = construction site EMPs, EHS = environment, health and safety, LIEC = loan implementation EHS consultant, PMO = project management office, EHSU = environment, health, and safety unit.

G. Performance Indicators

23. Performance indicators (**Table A.6**) have been developed to assess the implementation of the EMP. These indicators will be used to evaluate the effectiveness of environmental management.

H. Estimated Budget for Mitigation and Monitoring

24. The estimated budgets for environmental mitigation and monitoring are summarized in **Table A.7**. Construction phase costs are estimated at \$154,000; operation phase mitigation and monitoring costs are estimated at \$64,000. The budget does not include major capital costs for mitigations (e.g., low NO_x burners, etc).

Table A.6: Performance Indicators

No.	Description	Indicators
1	Staffing	<ul style="list-style-type: none"> (i) PMO EHSU established with appropriately qualified staff. (ii) IA Branch Offices designated with appropriately qualified staff. (iii) Appropriately qualified LIEC recruited. (iv) 3rd party environmental monitoring station/company engaged.
2	Budgeting	<ul style="list-style-type: none"> (i) Environment mitigation cost during construction and operation is sufficiently and timely allocated. (ii) Environment monitoring cost is sufficiently and timely allocated. (iii) Budget for capacity building is sufficiently and timely allocated.
3	Monitoring	<ul style="list-style-type: none"> (i) Compliance monitoring is conducted by EHS staff at branch offices, PMO EHSU and LIEC as per EMoP. (ii) Construction phase ambient and effluent monitoring is conducted by 3rd party environmental monitoring station/company. (iii) Operation phase gas exhaust, wastewater and ambient air quality monitoring is undertaken by 3rd party environmental monitoring station/company and Qingdao EPB monitoring stations.
4	Supervision	<ul style="list-style-type: none"> (i) ADB mission to review EMP implementation at least once a year during the construction phase. (ii) Qingdao EPB to supervise monitoring and reporting. (iii) Qingdao EPB to conduct an environmental acceptance inspection after a three months trial operation period.
5	Reporting	<ul style="list-style-type: none"> (i) Monthly environment monitoring reports prepared by the Contactors are submitted to EHS staff at IA branch offices. (ii) Semi-annual (during construction period) and annual (during operation) Project component specific environmental (EMP) monitoring reports, prepared by the EHS staff at branch offices are submitted to the PMO EHSU. (iii) Semi-annual (during construction period) and annual (during operation) (Consolidated) Environmental (EMP) monitoring reports prepared by the PMO EHSU supported by the LIEC, are submitted to ADB and Qingdao EPB through the PMO. (iv) Construction completion environmental acceptance reports prepared by the EHS staff at branch offices are submitted to the PMO EHSU and Qingdao EPB. (v) IA branch offices obtain environment acceptance approvals by the Qingdao EPB and submit the copies to the PMO EHSU, and, upon request, the ADB after a three months trial operation period.

No.	Description	Indicators
6	Capacity Building	<ul style="list-style-type: none"> (i) Construction Site Environmental Management Plans (CSEMPs) and construction phase EHS plans are developed and in place before substantive construction activities begin. (ii) Training on EHS plan implementation, ADB safeguard policy, EMP implementation, and GRM is provided to at the beginning of project implementation. (iii) Operation phase EHS plan developed and in place before substantive project operation activities begin. (iv) Training on EHS plan implementation and best international practices is provided prior to project operation.
7	Grievance Redress Mechanism	<ul style="list-style-type: none"> (i) GRM contact persons are designated at all branch offices and the PMO EHSU, and GRM contact information disclosed to the public before construction. (ii) All complains are recorded and processed within the set time framework in the GRM of this IEE.
8	Compliance with PRC standards	<ul style="list-style-type: none"> (i) Project complies with the PRC's environmental laws and regulations and meets all required standards.

Table A.7: EMP Budget

Construction Phase						
	Unit	Unit Cost	# Times	Cost USD	Cost RMB	Source of Funds
1. Ambient Monitoring						
Air - TSP	Quarterly	\$ 3,000	12	\$ 36,000	¥223,200	Counterpart Financing
Noise	Quarterly	\$ 3,000	12	\$ 36,000	¥223,200	
Subtotal				\$ 72,000	¥446,400	
2. Capacity Building						
Construction Phase HSE Plan Development and Training	HSE Plan Development	\$ 2,000	8	\$ 16,000	¥99,200	Counterpart Financing
	HSE Course Development	\$ 2,000	1	\$ 2,000	¥12,400	
	HSE Course Delivery	\$ 4,000	1	\$ 4,000	¥24,800	
Subtotal				\$ 22,000	¥134,200	
3. Loan Implementation Consultant (LIC)						
LIC HSE Specialist	Person Months	\$ 6,000	10	\$ 60,000	¥366,000	ADB Loan
TOTAL Construction Phase				Cost USD	Cost RMB	
				\$ 154,000	¥939,400	
Operation Phase (first 2 years)						
1. Exhaust Emissions Monitoring	Seasonal Sampling	\$ 5,000.00	4	\$ 20,000	¥120,001	Counterpart Financing
2. Ambient Monitoring						
Noise	Seasonal Sampling	\$ 3,000	4	\$ 12,000	¥400,000	Counterpart Financing
Wastewater	Seasonal Sampling	\$ 2,500	4	\$ 10,000	¥61,000	
Subtotal				\$ 22,000	¥461,000	
3. Capacity Building						
Construction Phase HSE Plan Development and Training	HSE Plan Development	\$ 2,000	8	\$ 16,000	¥99,200	Counterpart Financing
	HSE Course Development	\$ 2,000	1	\$ 2,000	¥12,400	
	HSE Course Delivery	\$ 4,000	1	\$ 4,000	¥24,800	
Subtotal				\$ 22,000	¥134,200	
TOTAL Operation Phase				Cost USD	Cost RMB	
				\$ 64,000	¥390,400	
GRAND TOTAL Construction + Operation				Cost USD	Cost RMB	
				\$ 218,000	¥1,329,800	

EMP Budget Notes:**Construction Phase**

- Construction phase ambient monitoring based on contract with 3rd party environmental monitoring company, with quarterly monitoring at a total of ten sites: four Energy Stations and the remainder being a sampling of other construction sites.
- Construction phase EHS plan development based on 5 consultant days at \$400/day (fees and per diem) per plan, and 8 component plans. Construction phase EHS course development based on 5 consultant days at \$400/day (fees and per diem). Course Delivery based on 5 consultant days per delivery at \$400/day (fees and per diem) and fixed costs of \$2000 per delivery.

Operation Phase

- Operation phase exhaust monitoring based on contract with 3rd party environmental monitoring company, with quarterly monitoring at a total of ten sites: four Energy Stations and the remainder being a sampling of other gas-fired heat sources.
- Operation noise and wastewater monitoring based on contract with 3rd party environmental monitoring company, with quarterly monitoring at a total of ten sites: four Energy Stations and the remainder being a sampling of other construction sites.
- Budget does not include costs for continuous ambient air quality monitoring at Qingdao EPB Monitoring Stations as that is funded by Qingdao EPB,
- Operation phase EHS plan development based on 5 consultant days at \$400/day (fees and per diem) per plan, and 8 component plans. Operation phase EHS course development based on 5 consultant days at \$400/day (fees and per diem). Course Delivery based on 5 consultant days per delivery at \$400/day (fees and per diem) and fixed costs of \$2000 per delivery.
- Budget does not include major capital costs for mitigations (e.g. low NOx burners, etc).

I. Mechanisms for Feedback and Adjustment

25. The effectiveness of mitigation measures and monitoring plans will be evaluated through a feedback reporting system. If, during compliance inspections and monitoring, substantial deviation from the EMP is observed, then the EHS staff at branch offices will consult with the PMO EHSU, the Qingdao EPB, and ADB and propose appropriate changes to the EMP monitoring and mitigation plan.

26. Any major EMP adjustments will be subject to ADB review and approval and ADB may pursue additional environmental assessment and, if necessary, further public consultation. The revised EMP with ADB confirmation is subject to reposting on the ADB's website as the ADB public communications policy requires. The revised EMP will be passed to the PMO EHSU, the EHS staff at branch offices, and the contractor(s) for implementation.

J. EPB Environmental Acceptance

27. After a three months trial operation period the Qingdao EPB will conduct an environmental acceptance inspection for each project component and issue environmental acceptance approvals. If the project component is in compliance with all conditions for approval of the domestic EIA (see IEE Appendix 2), the project component can be put into formal operation.