Technical Assistance Subproject Report

Project Number: 48453-008
Knowledge and Support Technical Assistance (C-KSTA)
March 2018

Promoting and Scaling up of Large-scale Carbon Capture and Storage Demonstration in the People's Republic of China

Financed by the Carbon Capture and Storage Fund under the Clean Energy Financing Partnership Facility

Subproject 1: Capacity Development Support to the National and Local Joint Engineering Research Center on Carbon Capture, Utilization, and Sequestration at Northwest University

Asian Development Bank

CURRENCY EQUIVALENTS
(as of 16 March 2018)

Currency unit	–	Yuan (CNY)
CNY1.00	=	$ 0.1582
$1.00	=	CNY 6.3213

ABBREVIATIONS

ADB	-	Asian Development Bank
CCSF	-	Carbon Capture and Storage Fund
CCUS	-	carbon capture, utilization, and sequestration
CO_2	-	carbon dioxide
EOR	-	enhanced oil recovery
FEED	-	front end engineering and design
NDRC	-	National Development and Reform Commission
NLJERC-CCUS	-	National and Local Joint Engineering Research Center for CCUS
PRC	-	People's Republic of China
TA	-	technical assistance
YPG	-	Yanchang Petroleum Group

NOTE
In this report, "$" refers to US dollars.

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I. THE TECHNICAL ASSISTANCE SUBPROJECT

A. Overall Progress of the TA Cluster

1. The knowledge and support technical assistance (TA) cluster was approved on 17 October 2017. The overall TA cluster is estimated at $5.5 million. Subproject 1 is estimated to cost $1.2 million and will be financed on a grant basis from the Carbon Capture and Storage Fund under the Clean Energy Financing Partnership Facility.[1] The implementing agency (the National and Local Joint Engineering Research Center for Carbon Capture, Utilization, and Sequestration at Northwest University) will provide counterpart staff, office accommodation, administrative assistance, domestic travel and workshops, and other in-kind contributions. The design and monitoring framework of subproject 1 is in Appendix 1.[2]

B. Subproject Outcome

2. The TA will have the following outcome: Enabling environment for large-scale carbon capture, utilization, and sequestration (CCUS) in the coal-chemical and coal-fired power subsector improved.[3]

C. Subproject Outputs, Methods, and Activities

3. **Output 1: Draft strategies and policy recommendations for enabling environment of CCUS demonstration prepared.** Output 1 will support the establishment of a favorable regulatory and business environment for the accelerated deployment of CCUS demonstration projects within the People's Republic of China (PRC). Key activities include (i) the development of a commercialization and industrialization strategy for the PRC; (ii) the establishment of a comprehensive regulatory and risk reduction framework, including industrial standards along the CCUS process chain; and (iii) the elaboration of at least one policy recommendation in the field of carbon dioxide (CO_2)-storage and CO_2-enhanced oil recovery (CO_2-EOR), as well as (iv) the establishment of a comprehensive report on strengthening the enabling environment for CCUS demonstration in the PRC. The expertise and findings developed under output 1 will be published in the form of consultant and workshop reports and will be disseminated to key-stakeholders within the PRC government agencies, ministries, research institutions, private sector as well as academia in the field of CCUS. The subproject output actively promotes the mainstreaming of a key high-level technology in the field of climate change mitigation and reflects efforts summarized in output 1 of the TA cluster.

4. **Output 2: Knowledge and lessons from CCUS deployment in Shaanxi Province shared and disseminated.** Building on the findings generated in output 1, output 2 provides targeted support to the National and Local Joint Engineering Research Center for CCUS (NLJERC-CCUS), to promote knowledge sharing and dissemination in areas of key-importance for CCUS deployment in the PRC. In this regard the output will focus on (i) the establishment of two knowledge products; and (ii) the planning and implementation of trainings, workshops and study tours. The two knowledge products to be published, will focus on (i) the development of a long-term CCUS industrialization strategy and (ii) policy recommendations on the regulation of

[1] Financing partners: Global Carbon Capture and Storage Institute and the Government of the United Kingdom.
[2] The TA first appeared in the business opportunities section of ADB's website on 26 November 2015.
[3] In the scope of this TA the term carbon capture, utilization and sequestration (CCUS) also covers the technology of carbon capture and storage (CCS).

CO_2-EOR and CO_2-storage.[4] The subproject output promotes CCUS as key-high-level technology and directly supports output 1 of the TA cluster.

5. **Output 3: Evaluation and suggestions for the implementation of large-scale integrated CCUS projects in coal-fired power plants established.** This output will focus on the promotion of large-scale integrated CCUS projects in the coal-fired power subsector. Key activities will include (i) the establishment of a comprehensive overview and assessment of previous studies on large-scale CCUS in coal-fired power subsector; (ii) the development of an evaluation and selection method for potential CCUS demonstration projects at coal-fired power plants; (iii) the evaluation of existing candidate projects, based on a readiness assessment and recommendation report; and (iv) the establishment of a business model and financing plan for the implementation of large-scale CCUS projects in coal-fired power plants. The subproject output actively promotes the long-term establishment of innovative low-carbon technologies in the field of climate change mitigation and raises ADB's strategic engagement in the field of high level technology projects. The subproject output supports output 2 of the TA cluster.

D. Subproject Cost and Financing

6. The subproject is estimated to cost $1,200,000, which will be financed on a grant basis by the Carbon Capture and Storage Fund under the Clean Energy Financing Partnership Facility, which is administered by ADB. The key expenditure items are listed in Appendix 2.

7. NLJERC-CCUS will provide counterpart support in the form of (i) remuneration and per diems for counterpart staff, including counterpart staff's time and travel expenses; (ii) office facilities and meeting rooms; (iii) logistical support in arranging workshops and conferences; (iv) facilitation of contact of consultants with project developers and other stakeholders for the implementation of the consultant's tasks; (v) provision of available relevant government data and studies for the TA consultants' use; and (vi) other in-kind contributions.

E. Subproject Implementation Arrangements

8. Asian Development Bank (ADB) will administer the TA. The implementing agency for the subproject will be NLJERC-CCUS, with the Department of Climate Change of the National Development and Reform Commission (NDRC) acting as executing agency. NLJERC-CCUS will be responsible for the coordination and implementation of the activities and the delivery of the outputs of the subproject. In this regard the NLJERC-CCUS will (i) provide project management and interagency coordination; (ii) organize peer reviews and comments on consultants' reports; and (iii) support consultants to produce reports with direct relevance and guidance for CCUS activities in the PRC and Shaanxi Province.

9. The Energy Division of ADB's East Asia Department (EAEN) will be responsible for the TA administration and will (i) engage TA consultants; (ii) oversee procurement by consultants; (iii) review TA consultants' reports; (iv) facilitate the exchange of information and dialogue between the implementing agency, NDRC, Yanchang Petroleum Group (YPG), Shaanxi Development and Reform Commission (SDRC), the Ministry of Environmental Protection, and other agencies; and (v) facilitate tripartite meetings and TA workshops. ADB will engage a TA project manager who will be responsible for TA administration and management from ADB side. To facilitate TA

[4] The topics of knowledge products may be subject to later adjustment, to consider emerging needs of the PRC Government.

management on the side of the executing agency an additional project manager will be hired, who will be supported by two national project coordinators.

10. To ensure that relevant stakeholders benefit widely from TA outputs, NLJERC-CCUS consultants will establish a network of key industrial partners, project developers, local and national government agencies and ministries as well as non-government organizations (NGOs), involved in the field of low-carbon development. NLJERC-CCUS and TA consultants will ensure that relevant stakeholder organization will be consulted on TA outputs.[5] High-level roundtables, workshops, and seminars will be organized to share information on and discuss interim and final TA results. EAEN, the executing and implementing agency will cooperate closely with the team of engaged consultants in organizing and managing these gatherings.

11. **Knowledge Product Dissemination.** To maximize readership, knowledge products and reports under the TA, will be delivered by NLJERC-CCUS in the form of digital as well as printed external publications. While the exact number of hard copies will be determined during TA implementation, final knowledge products will be disseminated electronically, as well as in the form of print editions during workshops, conferences, and trainings. The target audience will be relevant stakeholders within National Energy Administration (NEA), Ministry of Industry and Information Technology (MIIT), Ministry of Science and Technology (MOST), NDRC, as well as private sector companies, and NGOs in the field of low-carbon development.

Table 1: Subproject Implementation Arrangements

Aspects	**Arrangements**		
Indicative implementation period	March 2018–October 2020		
Executing agency	Department of Climate Change, National Development and Reform Commission		
Implementing agency	National and Local Joint Engineering Research Center of Carbon Capture and Storage Technology at Northwest University		
Consultants	To be selected and engaged by ADB		
	Individual consultant selection method	13 person-months (International Consultants)	$350,000.00
	Individual consultant selection method	69 person-months (National Consultants)	$650,000.00
Procurement	To be procured by consultants. All procurement will be carried out in accordance with ADB's Procurement Policy (2017, as amended from time to time). All equipment purchased under the TA will be turned over to the implementing agency after completion of TA activities.		
	Shopping Method	Number of contracts to be confirmed	$20,000.00
Disbursement	The TA resources will be disbursed following ADB's *Technical Assistance Disbursement Handbook* (2010, as amended from time to time).		

ADB = Asian Development Bank, TA = technical assistance.
Source: Asian Development Bank.

12. **Consulting services.** The TA will engage widely respected experts in the field of (i) CO_2 capture and storage; (ii) environmental policy and safeguards; (iii) energy regulation; (iv) industrial policy; (v) energy economics; and (vi) carbon markets. Consulting services under the TA will be

[5] The key agencies in addition to the NDRC will include Ministry of Environmental Protection, Ministry of Finance, and Ministry of Science and Technology, etc.

engaged on an output-based contract. ADB will engage individual consultants in accordance with ADB Procurement Policy (2017, as amended from time to time) and the associated project administration and TA staff instructions. During project implementation, consultants on behalf of NLJERC-CCUS will procure equipment. Key expenditure items are listed in Appendix 2.

13. **Cofinancier requirements.** The proposed TA subproject is financed by the Carbon Capture and Storage Fund (CCSF)[6] under the Clean Energy Financing Partnership Facility and in this regard, has to comply with the following monitoring and reporting requirements. According to CCSF stipulations, the project officer on a 6-month basis will have to deliver semi-annual progress updates, which will be included in the semi-annual progress report and annual report of the Clean Energy Financing Facility. In addition, CCSF will conduct routine disbursements reviews, which besides others may request information on (i) project status, (ii) project and disbursement impeding factors, (iii) remedying measures, (iv) potential changes in scope, and (v) follow-on activities.

[6] Financing partners: Global Carbon Capture and Storage Institute and the Government of the United Kingdom. Administered by the Asian Development Bank.

SUBPROJECT DESIGN AND MONITORING FRAMEWORK

Impact of the TA is Aligned with Innovative climate change mitigation technology of CCUS successfully demonstrated for further deployment in the PRC (Energy Technology Revolution Innovation Action Plan [2016–2030])[a]			
Results Chain	**Performance Indicators with Targets and Baselines**	**Data Sources and Reporting**	**Risks**
Outcome Enabling environment for large-scale CCUS in the coal-chemical and coal-fired power subsector improved	By 2020: a. At least one supportive policy, regulation or incentive on CCUS demonstration developed in cooperation with NLJERC-CCUS and submitted to NDRC (2017 baseline: 0)	a. CCUS regulations, and guidelines announced by government	High costs may inhibit CCUS in coal-fired power plants. Implementation delays or operational issues weaken the confidence in CCUS.
Outputs 1. Draft strategies and policy recommendations for enabling environment of CCUS demonstration prepared	By 2020: 1a. Commercialization and industrialization strategy for the CCUS demonstration discussed with stakeholders (2017 baseline: 0) 1b. Comprehensive regulatory and risk reduction framework and industrial standards for CO_2 transport, CO_2-EOR, and CO_2 storage developed and discussed with focus groups (2017 baseline: N/A) 1c. At least one policy recommendation in the field of CO_2-EOR and CO_2-storage developed and discussed with NLJERC-CCUS, NDRC and other stakeholders (2017 baseline: N/A) 1d. Comprehensive report on strengthening the enabling environment for CCUS demonstration in the PRC completed (2017 baseline: 0)	1a. Consultant reports, published reports, and workshop reports 1b. Consultant reports, published policies, notices, guidance notes 1c. Consultant report 1d. Consultant report	Given the diverse and multiple stakeholders, the government may take much longer to approve the necessary rules and regulations, delaying CCUS demonstration.
2. Knowledge and lessons from CCUS deployment in Shaanxi Province shared and disseminated	By 2020: 2a. Two knowledge products published (2017 baseline: 0) 2b. At least five participants report improved knowledge and skills on CCUS (2017 baseline: 0)	2a. Published knowledge product by the NLJERC-CCUS at Northwest University 2b. Training and study tour reports	

Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting	Risks
3. Evaluation and suggestions for the implementation of large-scale integrated CCUS projects in coal-fired power plants established	By 2019: 3a. Overview and assessment of previous studies on large-scale CCUS project in coal-fired power plants completed (2017 baseline: N/A) 3b. Evaluation method for the selection of large-scale CCUS project in coal-fired power sector established (2017 baseline: N/A) By 2020: 3c. Evaluation of existing and candidate CCUS projects finalized (2017 baseline: N/A) 3d. Business model and financing plan for the implementation of large-scale CCUS project in coal-fired power plants established (2017 baseline: 0)	3a-b. Consultant reports 3c. Workshop reports 3d. Consultant reports	

Key Activities and Milestones:

1. Draft strategies and policy recommendations for enabling environment of CCUS demonstration prepared

1.1 Formulate proposal on CCUS commercialization strategy (Q1 2020).
1.2 Formulate international CCUS collaboration strategy and facilitate international collaborations on CCUS (Q1 2020).
1.3 Develop comprehensive regulatory and risk reduction framework, which shall include EOR and storage policy recommendations as well as industrial standards (Q2 2020).
1.4 Determine CCUS project approval procedures, permits, and institutions involved (Q2 2020).
1.5 Develop fiscal and financial support strategy for CCUS demonstration projects (Q2 2020).
1.6 Prepare accounting and verification report on CO_2 emissions of key industries and enterprises in North Shaanxi region from 2013 to 2016 (Q3 2020).
1.7 Develop a comprehensive report on strengthening the enabling environment for CCUS demonstration in the PRC (Q3 2020).

2. Knowledge and lessons from CCUS deployment in Shaanxi Province shared and disseminated

2.1 Organize study tour for Northwest University, National Development and Reform Commission, National Energy Agency, Shaanxi Development and Reform Commission, and other stakeholder organization staff (Q1 2020).
2.2 Organize up to five stakeholder workshops between Q2 2018 and Q1 2020 (Q1 2020).
2.3 Publish at least two knowledge products identified and agreed with the local and central governments and acceptable to the Asian Development Bank (Q3 2020).
2.4 Organize international study tours, workshops, and training involving relevant institutions and stakeholders (Q1 2020).
2.5 Publish knowledge products and training materials in cooperation with local and national counterparts (Q3 2020).

3. Evaluation and suggestions for the implementation of large-scale integrated CCUS projects in coal-fired power plants established

3.1 Prepare the overview report of previous studies on large-scale CCUS projects in coal-fired power plants (Q1 2019)
3.2 Develop project evaluation and selection methodology for CCUS candidate demonstration projects within the coal-fired power subsector (Q1 2019).
3.3 Prepare the evaluation report on large-scale CCUS projects in coal-fired power plants (Q3 2019).
3.4 Conduct in-depth stakeholder discussion on large-scale CCUS project implementation in coal-fired power plant (Q1 2020).
3.5 Formulate policy recommendation for promotion of large-scale CCUS projects in coal-fired power plants (Q1 2020).
3.6 Formulate business model and financing plan for promotion of large-scale CCUS projects in coal-fired power plants (Q1 2020).

Inputs
Carbon Capture and Storage Fund under the Clean Energy Financing Partnership Facility: $1,200,000

CCUS = carbon capture, utilization, and sequestration; CO_2 = carbon dioxide; EOR = enhanced oil recovery; NLJERC-CCUS = National and Local Joint Engineering Research Center for Carbon Capture, Utilization, and Sequestration; PRC = People's Republic of China, TA = technical assistance.

[a] National Development and Reform Commission and the National Energy Administration. 2016. *Energy Technology Revolution Innovation Action Plan (2016–2030).* Beijing.

Source: Asian Development Bank.

SUBPROJECT COST ESTIMATES AND FINANCING PLAN

($'000)

Item	Amount
Carbon Capture and Storage Fund under the Clean Energy Financing Partnership Facility[a]	
1. Consultants	
a. Remuneration and per diem	
i. International consultants (13 person-months)	350.0
ii. National consultants (69 person-months)	650.0
b. Out-of-pocket expenditures	
i. International and local travel	54.0
ii. Training, seminars, workshops, forum and conferences[b]	20.0
iii. Reports and communications[c]	27.0
iv. Printed external publications	3.0
v. Miscellaneous administration and support costs	10.0
2. Equipment[d]	20.0
3. Contingencies	66.0
Total[e]	**1,200.0**

[a] Established by the Global Carbon Capture and Storage Institute and administered by the Asian Development Bank (ADB).

[b] Workshops, seminars and conferences under this TA will be conducted in ADB member countries. Includes interpretation and translation costs.

[c] Includes costs for the translation and editing of documents and the preparation of knowledge products.

[d] Includes five laptops, two working station laptops, office software, one digital projector, one photocopier, fax machine and printer, one printer, one digital camera, and other miscellaneous office equipment, which will be used for the TA. All equipment will be turned over to the executing agency upon completion of TA activities.

[e] Expenditures incurred under this TA fulfill the eligibility criteria of the Carbon Capture and Storage Fund.

Source: Asian Development Bank estimates.

LIST OF LINKED DOCUMENTS

1. Terms of Reference for Consultants