

Development of Coal Mine Methane
(CMM) and Coalbed Methane (CBM) in
the People's Republic of China (PRC)
Supported by the Asian Development
Bank (ADB)



ADB

ADB Member Countries

Newly Industrialized Economies (NIEs)

Hong Kong, China
Republic of Korea
Singapore
Taipei, China

Central and East Asia Developing Member Countries (DMCs)

Armenia
Azerbaijan
People's Republic of China
Kazakhstan
Kyrgyz Republic
Mongolia
Tajikistan
Turkmenistan
Uzbekistan

Southeast Asia DMCs

Indonesia
Philippines
Malaysia

Mekong DMCs

Cambodia
Lao PDR
Thailand
Viet Nam

South Asia DMCs

Afghanistan
Bangladesh
Bhutan
India
Maldives
Myanmar
Nepal
Pakistan
Sri Lanka

Pacific DMCs

Cook Islands
Fiji Islands
Kiribati
Marshall Islands
Federal States of Micronesia
Nauru
Papua New Guinea
Samoa

Solomon Islands
Tonga
Timor-Leste
Tuvalu
Vanuatu

Developed Member Countries

Australia
Austria
Belgium
Canada
Denmark
Finland
France
Germany
Italy
Japan
Netherlands
New Zealand
Norway
Portugal
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States

ADB



ADB's Support

- Loans: Repayment Required
- Equity: To Facilitate the Development of Domestic Capital Market
- Technical Assistance (TA): Grant; Repayment Not Required

ADB's Financial Resources

■ Loans

- Ordinary Capital Resources - including: paid-in capital from its members; accumulated reserves; and borrowings from open capital markets
- Asian Development Fund – provided to low per capita GNP member countries with concessional terms

■ Technical Assistance

- Technical Assistance Special Funds
- Japan Special Fund
- Other Bilateral Funds – Canada, Denmark, France, Spain, UK, Netherlands, etc.

Types of ADB Loans and TAs

■ Loans

- Project Loan
- Program Loan
- Sector Loan
- Private Sector Loan

■ Technical Assistance

- Project Preparatory TA (PPTA): Feasibility Study
- Advisory TA (ADTA): Policy Advice, Sector Analysis
- Regional TA (RETA): Involves Two or More Countries
- Small-Scale TA (\$150,000 or less)
- Project Implementation TA

PLANNED ADB ASSISTANCE FOR 2005

- Public Sector Loans: \$6.2 billion
- Private Sector Loans and Equity: \$700 million.
- Grants: \$214 million
- TA Grants: \$177.7 million

ADB's Key Thrusts in Cleaner Energy

- Environment
- Energy Efficiency
- Renewable Energy
- Fuel Switching

PRC Loans for Energy Projects

12 loans for \$1.4 billion

CLOSED LOANS

Shanxi-Liulin Thermal Power Project

Thermal power

Guangzhou Pumped Storage Stage II Project

Pumped storage

Hunan Lingjintan Hydropower Project

Hydropower

Qitaihe Thermal Energy & Environmental Improvement Project

Thermal power

Henan Power Project

Thermal power

Fujian Mianhuatan Hydropower Project

Hydropower

Anhui Fuyang Engineering Technical Assistance Project

Thermal power

Northeast Power Transmission

Transmission line

Yunnan Dachoashan Power Transmission Project

Transmission line

ACTIVE LOANS

Shen-Da Power Transmission and Grid Rehabilitation Project

Transmission line

Hebei Zhanghewan Pumped Storage Project

Pumped storage

Gansu Clean Energy Development Project

Hydropower

PRC Loans for Pollution Abatement

15 loans for \$1.9 billion

Fuel Conversion

Laiwu Iron & Steel Mill Modernization & Expansion

Industrial Energy Conservation and Environment Improvement

Qingdao Environmental Improvement

Fertilizer Industry Restructuring (Sector)

Tangshan and Chengde Environmental Improvement

Ping Hu Oil and Gas Development

Second Industrial Energy Efficiency and Environment Improvement

Anhui Environment Improvement and Industrial Pollution Abatement

Xi'an-Xianyang-Tongchuan Environment Improvement

ACTIVE LOANS

Beijing Environmental Improvement

Shanxi Environment Improvement

Acid Rain Control & Environmental Improvement

Liaoning Environment Improvement

Coal Mine Methane Development

Urban gas and heat

Cleaner production

Cleaner production

Cleaner production

Cleaner production

Urban gas and heat

Urban gas and heat

Cleaner production

Acid rain control

Urban gas and heat

Cleaner production

Cleaner production

Acid rain control

Clean energy supply

Clean energy supply

ADB Interest in CBM/CMM Projects in the PRC

- Considerable potential for capture of CMM and CBM, which is a potent greenhouse gas
- Present technology barrier and potential for opening up of CBM/CMM sector is enormous
- Promotes clean power production
- Urgent need to improve miners safety
- Offers considerable potential for arranging financing under CDM

Barriers to CMM and CBM Development

- Methane treated as 'nuisance product' and emphasis on mining of coal
- Unfamiliarity with determining suitability of coal seams for increased CMM production and inefficient drainage methods
- Inexperience with CBM exploration and development of CBM surface wells
- Absence of ready markets for the methane and inadequate pipeline systems
- Unclear delineation of coal mining and CBM blocks

Requirements for ADB Support of CBM/CMM Projects

- Strong ownership of the project and clear implementation arrangements
- Detailed assessment of CBM/CMM resources and proven technical feasibility
- Well-defined scope of the project with new technologies
- Available market for the CBM/CMM or power to be produced under the project
- Financial and economic viability
- Availability of required equity and local financing

Methane Capture and ERs

- Utilization of CH₄ in 50 MW power generation backing out a coal-fired plant
- Project costs : about \$40 million
- GHG savings over project life : 31 million tons of CO₂ equivalent
 - methane capture & less C intensive power
- NPV of ER revenues over 10 years at \$3/ton of CO₂ : about \$ 39 million

Ongoing ADB Support for CMM and CBM in the PRC

■ CMM Development Project

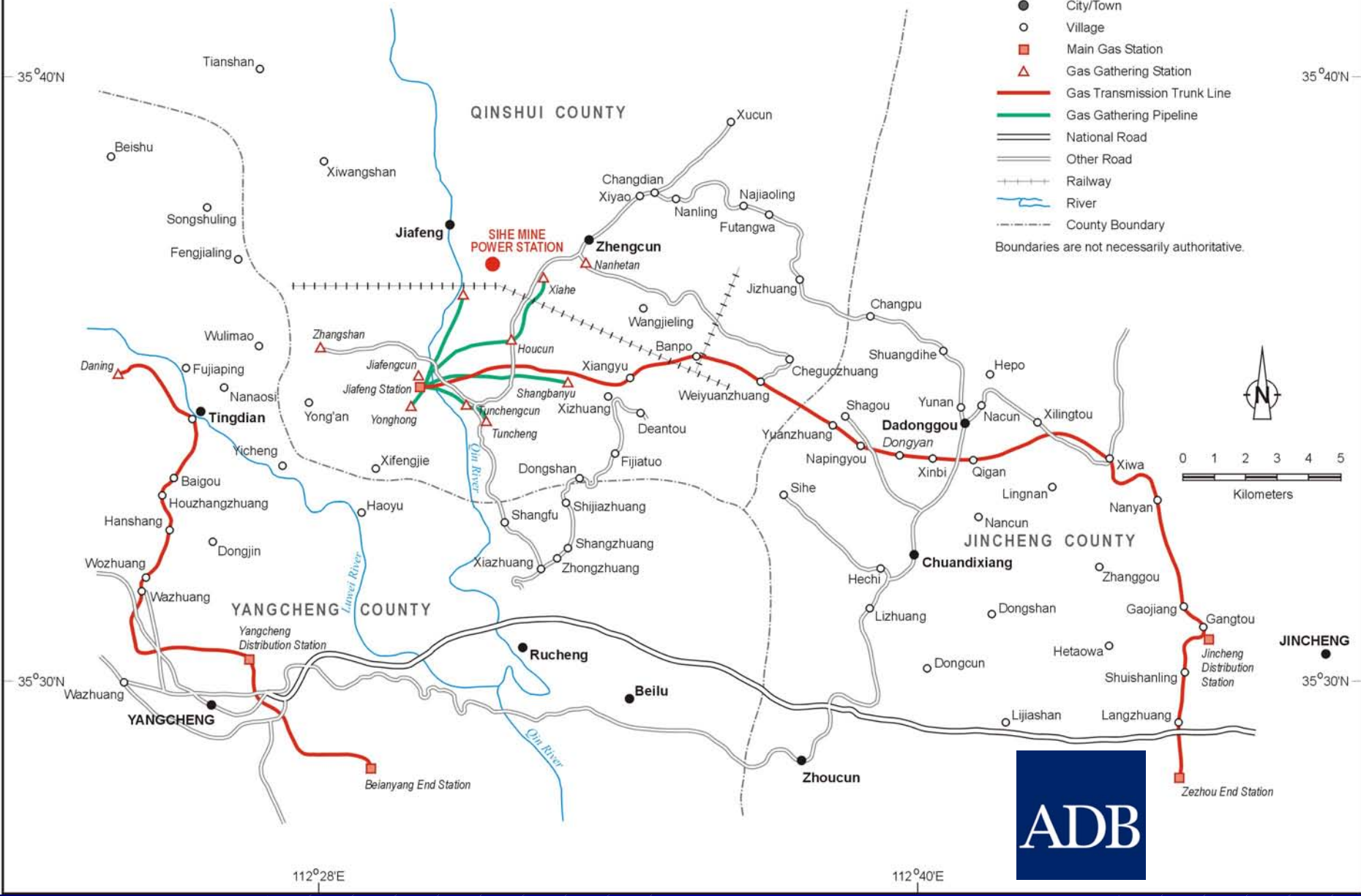
- Location: Jincheng, Shanxi Province
- Major Components: CBM and CMM Production for 120 MW Power Plant; CMM Transmission and Distribution to Consumers in Jincheng; and Institutional Strengthening and Capacity Building
- Cost: \$237 million (FX: \$140 mil. and LC: \$97 mil.)
- External Financiers: ADB - \$117.4 million; JBIC - \$20 million; and USTDA - \$500,000
- More info at:

<http://www.adb.org/Documents/RRPs/PRC/rrp-prc-30403.pdf>

COAL MINE METHANE DEVELOPMENT PROJECT IN THE PEOPLE'S REPUBLIC OF CHINA



COAL MINE METHANE (CMM) DEVELOPMENT PROJECT IN THE PEOPLE'S REPUBLIC OF CHINA



Existing Small Gas Turbines



CMM Power Plant (IC Gas Engines)



Power Plant – Emission Reductions and Impact on the Project

■ Emission Reductions:

- CMM Utilization : 2.0 million tons of CO₂e/annum
- Fuel Displacement : 0.5 million tons of CO₂e/annum

■ Impact of Sales of ERs on the Power Plant Component:

- FIRR of **5.32%** without ER sales
- FIRR of **14.75%** with ER sales (@\$5.00/tCO₂e)
- Sustainable Development Aspects

Ongoing ADB Support for CMM and CBM in the PRC

■ Liaoning Environment Improvement Project

- Location: Six Cities in Liaoning Province
- Major Components: CBM and CMM Production at Fuxin, Improvement of Gas Distribution and District Heating, and Institutional Reforms and Corporate Governance Improvement
- Cost: \$161 million (FX: \$76 mil. and LC: \$85 mil.)
- External Financier: ADB – \$70 million (\$17 mil. for CBM/CMM Component)
- More Info at:

<http://www.adb.org/Documents/RRPs/PRC/rrp-R200-99.pdf>

LIAONING ENVIRONMENTAL IMPROVEMENT PROJECT
IN THE
PEOPLE'S REPUBLIC OF CHINA



CDM Aspects of CMM/CBM Production at Fuxin

- Capture of CMM/CBM from coal mining operation in Liaoning Province, PRC
- Used as a fuel for industrial and residential customers, power generation & residual flared
- Reduces methane release and displaces coal-fired power generation and fossil fuel use for heating (baseline)
- Total volume of ERs expected (7 yrs): 4.5 million tCO₂e
- Negotiations with buyers close to being finalized
- Value of credits expected to exceed \$45 million

For More Information

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THANK YOU

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