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 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’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
- Guangzhou Pumped Storage Stage II Project
- Hunan Lingjintan Hydropower Project
- Qitaihe Thermal Energy & Environmental Improvement Project
- Henan Power Project
- Fujian Mianhuatan Hydropower Project
- Anhui Fuyang Engineering Technical Assistance Project
- Northeast Power Transmission
- Yunnan Dachoashan Power Transmission Project

## ACTIVE LOANS
- Shen-Da Power Transmission and Grid Rehabilitation Project
- Hebei Zhanghewan Pumped Storage Project
- Gansu Clean Energy Development Project
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
X'ian-Xianyang-Tongchuan Environment Improvement

ACTIVE LOANS
Beijing Environmental Improvement
Shanxi Environment Improvement
Acid Rain Control & Environmental Improvement
Liaoning Environment Improvement
Coal Mine Methane Development
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
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 CO$_2$e/annum
- Fuel Displacement: 0.5 million tons of CO$_2$e/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 (@$5.00/tCO$_2$e)
- 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:
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 tCO$_2$e
- Negotiations with buyers close to being finalized
- Value of credits expected to exceed $45 million
For More Information

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THANK YOU