

COAL MINE METHANE PROJECT OPPORTUNITY SURFACE DEGASIFICATION AND USE PROJECT AT YANJING #1 UNDERGROUND COAL MINE CHONGQING MUNICIPALITY, PEOPLE'S REPUBLIC OF CHINA

OVERVIEW OF COAL MINE METHANE PROJECT:

Yanjing #1 Mine has coal reserves of 61.5 million tons and is located in southwest China within the Chongqing Municipality. Seven coal seams are being mined using continuous miners to develop longwall faces. Mine managers plan to extract coal from two underground levels, at -150 m and -350m. Emissions of methane gas into the mine's workings present a safety risk to the mine. These emissions are a result of the high gas content of the coal seams, ranging between 5.61 cm³/g to 22.95 cm³/g, as well as the ability of the gas to migrate through the highly fractured coal and surrounding strata from which the coals are being mined. A prefeasibility study was performed to determine the potential for employing directionally-drilled boreholes from the surface into the mineable coal seams to capture gas prior to mining. The study proposes implementing a seven well pilot gas drainage program which would allow for increased coal production and safety by decreasing methane concentration of ventilation air. Drained and recovered methane could be sold into the local gas market. The proposed pilot project could supply 433.3 million cubic meters of methane to the local gas market. The capital costs are estimated to be \$11.45 million USD and carbon emissions would be reduced by 883,895 tons CO₂e over the project's ten year life. Technical assistance is required to assess the technical and economic feasibility of designing and implementing a full-scale commercial drilling program.

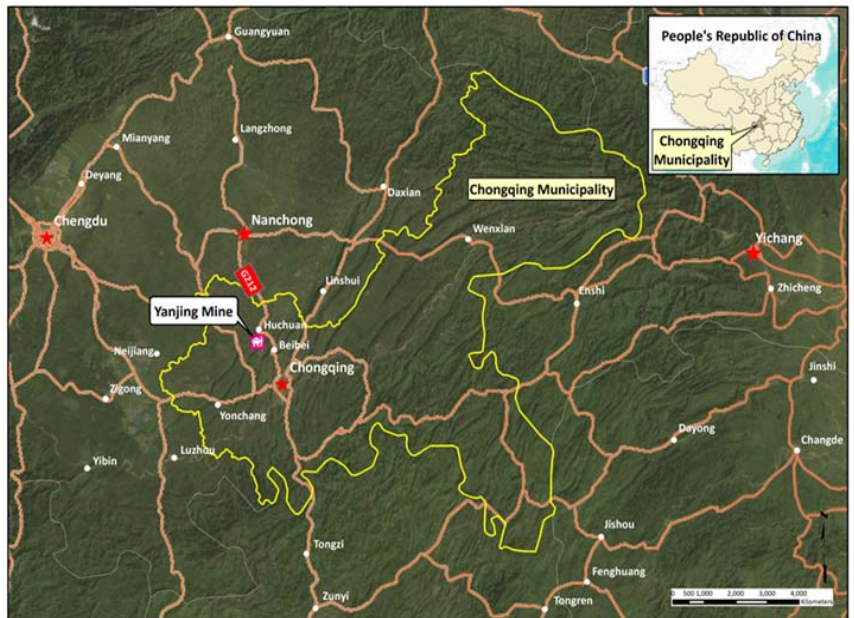
ESTIMATED ANNUAL EMISSION REDUCTIONS: 0.88 MMTCO₂E

PROJECT DETAILS

- Name of Project: Surface Degassing and Use Project
- Name of Mine: Yanjing #1
- Type of Ownership: State owned
- Type(s) of assessments performed: Pre-feasibility
 - When performed: February 2013
 - By whom: Raven Ridge Resources, with Global Methane Initiative funding

MINE INFORMATION

- Mine owner (name of company): Chongqing Tianhong Mineral Co., Ltd
- Percent ownership: 100%
- Parent company: CQEIG (60%) and China Power Investment Corporation (40%)
- Status and type of mine: Active; underground
- Mining Method: Room-and-pillar, longwall
- Service Life of Mine: 53.8 years



PROJECT FINANCES

- Assumptions: 433.3 million cubic meters methane/project life
- Estimated revenue: US\$5.863 million
- Projected capital costs: US\$11.45 million
- Projected operation and maintenance (O&M) costs for fully implemented project: US\$2.86 million/year
- Estimated Return on Investment (ROI): N/A

HISTORICAL AND PROJECTED MINE DATA

HISTORICAL COAL PRODUCTION AND METHANE EMISSIONS

YEAR	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Coal (tonnes/yr)											-	-
Methane (Million m ³ /yr)												
Emitted from ventilation system(s)											3.69	4.67
Liberated from drainage systems											4.94	5.84
Vented to atmosphere											4.94	5.84
Total Methane Emissions											8.6	10.5

PROJECTED COAL PRODUCTION AND METHANE EMISSIONS

YEAR	2013	2014	2015	2016	2017	2018	2019	2020
Coal (tonnes/yr)	50,000	200,000	500,000	700,000	900,000	900,000	900,000	900,000
Methane (Million m ³ /yr)								
Emitted from ventilation system(s)	5.09	5.1	5.2	5.3	6	6	6	6
Liberated from drainage systems	180.8	85.2	40.4	32.2	26.1	21.2	17.3	14.2
Vented to atmosphere	-	-	-	-	-	-	-	-
Total Methane Emissions	5.09	5.1	5.2	5.3	6	6	6	6

GREENHOUSE GAS EMISSION REDUCTIONS

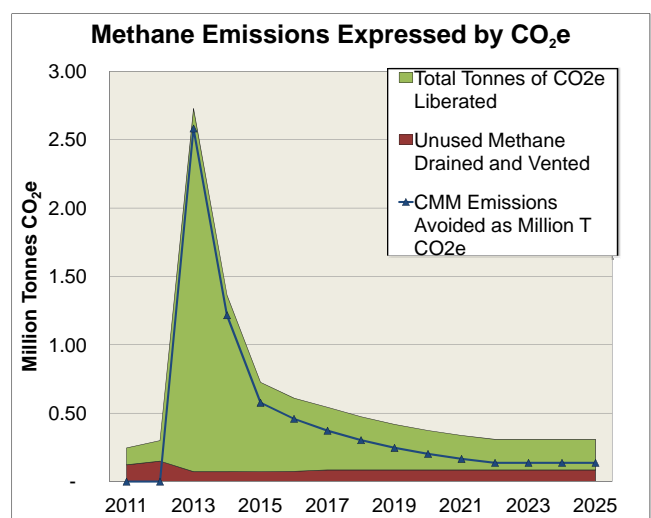
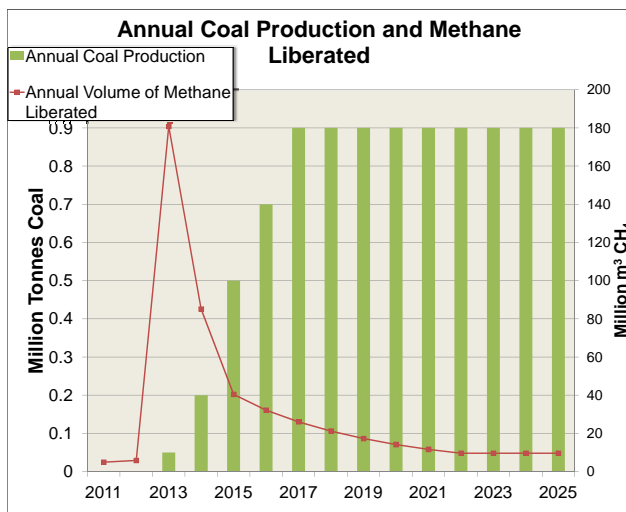
ESTIMATED GHG EMISSION REDUCTIONS AND TOTAL VOLUME OF METHANE ALREADY RECOVERED/UTILIZED

YEAR	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total CH ₄ vented (ave. m ³ /min)											9.4	11.1
Average CH ₄ concentration											14%	14%
Total CH ₄ recovered and utilized (m ³ /year)											-	-

TOTAL VOLUME OF METHANE EXPECTED TO BE RECOVERED/UTILIZED

YEAR	2013	2014	2015	2016	2017	2018	2019	2020
Total CH ₄ recovered and utilized (Million m ³ /year)	180.8	85.2	40.4	32.2	26.1	21.2	17.3	14.2
Total CH ₄ recovered and utilized (Million tonnes CO ₂ e)	2.58	1.22	0.58	0.46	0.37	0.30	0.25	0.20

PROJECTED COAL PRODUCTION AND METHANE EMISSION CHARTS



MARKET ANALYSIS / DEMAND ANALYSIS

Chongqing has one of the oldest and best-developed natural gas distribution infrastructures in China due to its proximity to the Sichuan gas fields. Its total natural gas consumption grew at about 8.5 percent per year to an estimated 5.8 billion cubic meters from 2005-2011, putting it in the top four provincial-level consumers on a per capita basis. The sectoral breakdown of consumption is comparable to the rest of China, with industry accounting for about three quarters of the total, and residential/commercial for about 20-25 percent. Supply has been the most important constraint to more rapid growth in consumption. The municipal government estimates that Chongqing could absorb 15 billion cubic meters by 2015, two and one half times 2011 usage, as urbanization continues and industry expands.

TYPE(S) OF ASSISTANCE SOUGHT

The purpose of the pilot project is to determine the technical feasibility of successfully draining coals in order to facilitate mining. Once the results of this project are evaluated, technical assistance is required to assess the technical and economic feasibility of designing and implementing a full-scale commercial drilling program.

PROPOSED TECHNOLOGIES



Compression system, Songzao Mines, China



10,000 m³ Gas Storage Tank, Yanjing Mine, China

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