

# COAL MINE METHANE PROJECT OPPORTUNITY

## PILOT PROJECT ON METHANE GAS DRAINAGE IN KHE CHAM COAL MINE

### QUANG NINH PROVINCE, VIETNAM

#### OVERVIEW OF COAL MINE METHANE PROJECT:

Khe Cham Coal Mine is a subsidiary company of the Vietnam National Coal - Mineral Industry Holding Corporation Limited (Vinacomin) with annual coal production of 1.5 million tonnes per year. The mine is located in Quang Ninh province, Vietnam. Khe Cham is one of the gassiest mines in Vietnam and a methane-related explosion causing 11 fatalities occurred in 2009. Installation of a gas drainage system as proposed by Vinacomin - Institute of Mining Science and Technology (IMSAT) in 2012 has reduced the methane concentration of ventilation air by 0.2 to 0.6 percent. Average methane concentration of ventilation air before installation of cross-measure boreholes was 0.8 percent with periods of concentration reaching 1.0 to 1.3 percent. Since implementation of the drainage system, the mine has not had to shut off electricity due to high methane concentration. Ventilation costs have decreased by 30.4 percent and coal production capacity of the mine is increased by 33.4 percent. The success of this project demonstrates a solution to methane-related safety issues at Vinacomin's mines as well as presenting an opportunity for CMM recovery and utilization projects for economical and environmental benefits. The project ultimately plans to produce electricity from drained methane, reducing emissions by over 360 thousand tons of CO<sub>2</sub>e annually.

**ESTIMATED ANNUAL EMISSION REDUCTIONS: 0.36 MMTCO<sub>2</sub>E**

#### PROJECT DETAILS

- Name of Project: Pilot Project on Methane Gas Drainage
- Name of Mine: Khe Cham
- Type of Ownership: State-Owned
- Type(s) of assessments performed: Feasibility
  - When performed: January 2012
  - By whom: Mitsui / Vinacomin-IMSAT

#### MINE INFORMATION

- Mine owner: Vinacomin
- Percent ownership: 100%
- Parent company: N/A
- Status and type of mine: Active; underground
- Mining Method: Longwall
- Service Life of Mine: 14 years



# HISTORICAL AND PROJECTED MINE DATA

## HISTORICAL COAL PRODUCTION AND METHANE EMISSIONS

YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Coal (tonnes/yr)					734,477	824,023	985,507	837,151	1,052,669	1,018,451	1,106,268	1,400,000
<i>Methane (Million m<sup>3</sup>/yr)</i>												
Emitted from ventilation system(s)					8.89	9.97	11.92	10.13	12.74	12.32	13.38	16.93
Liberated from drainage systems					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vented to atmosphere					8.89	9.97	11.92	10.13	12.74	12.32	13.38	16.93
Total Methane Emissions					8.89	9.97	11.92	10.13	12.74	12.32	13.38	16.93

## PROJECTED COAL PRODUCTION AND METHANE EMISSIONS

YEAR	2012	2013	2014	2015	2016	2017	2018	2019
Coal (tonnes/yr)	1,530,000	2,870,000	5,400,000	6,250,000	6,500,000	6,000,000	6,000,000	6,000,000
<i>Methane (Million m<sup>3</sup>/yr)</i>								
Emitted from ventilation system(s)	12.03	14.70	18.32	24.14	51.11	47.18	47.18	47.18
Liberated from drainage systems	6.48	7.92	9.87	13.00	27.52	25.40	25.40	25.40
Vented to atmosphere	18.51	14.70	18.32	24.14	51.11	47.18	47.18	47.18
Total Methane Emissions	18.51	22.62	28.19	37.14	78.63	72.59	72.59	72.59

# GREENHOUSE GAS EMISSION REDUCTIONS

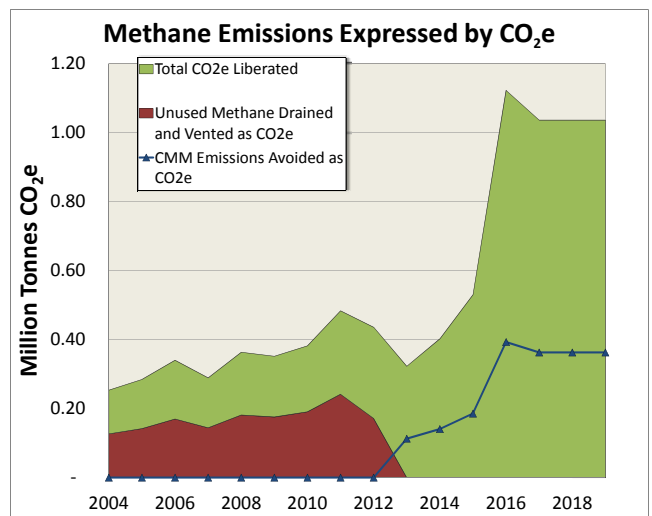
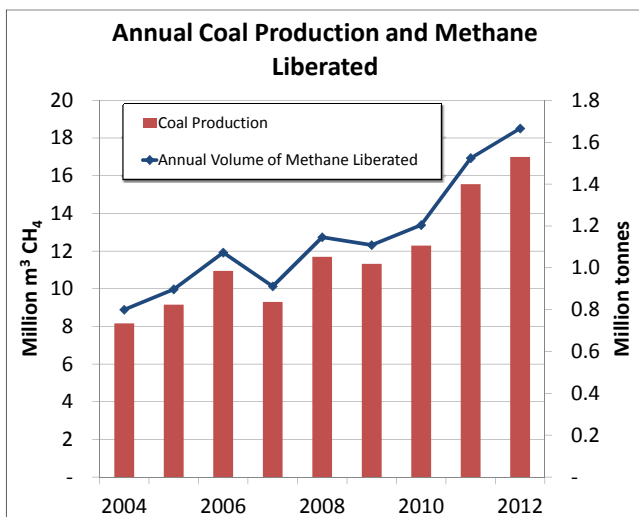
## ESTIMATED GHG EMISSION REDUCTIONS AND TOTAL VOLUME OF METHANE ALREADY RECOVERED/UTILIZED

YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total CH <sub>4</sub> vented (ave. m <sup>3</sup> /min)					16.9	19.0	22.7	19.3	24.2	23.4	25.5	32.2
Average CH <sub>4</sub> concentration					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total CH <sub>4</sub> recovered and utilized (m <sup>3</sup> /year)					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

## TOTAL VOLUME OF METHANE EXPECTED TO BE RECOVERED/UTILIZED

YEAR	2012	2013	2014	2015	2016	2017	2018	2019
Total CH <sub>4</sub> recovered and utilized (million m <sup>3</sup> /year)	N/A	7.92	9.87	13.00	27.52	25.40	25.40	25.40
Total CH <sub>4</sub> recovered and utilized (thousand tons CO <sub>2</sub> e/year)	N/A	113.07	140.88	185.62	393.01	362.78	362.78	362.78

# COAL PRODUCTION AND METHANE EMISSION CHARTS



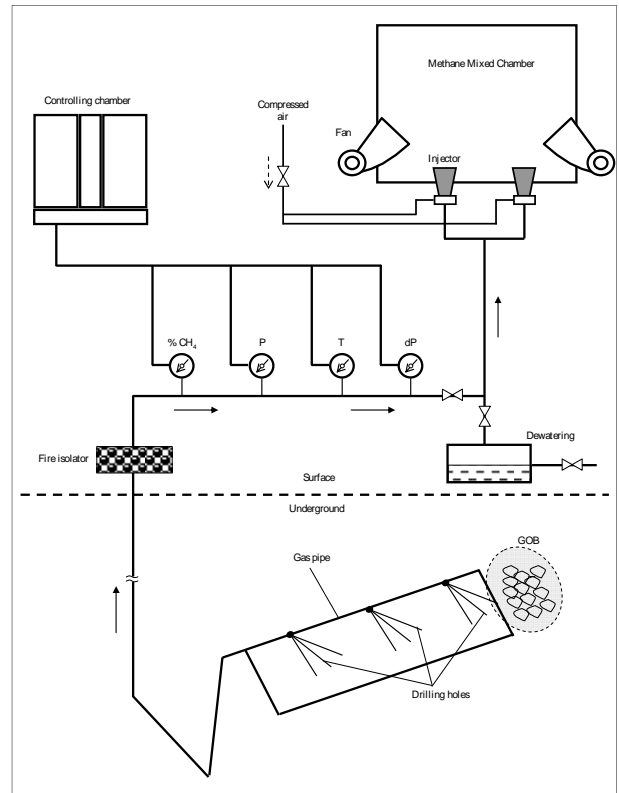
## MARKET ANALYSIS / DEMAND ANALYSIS

Potential electricity produced by recovery and utilization of drained gas at Khe Cham could be used to displace grid-purchased electricity for the mine's use. The mining complex which includes Khe Cham is comprised of four underground coal mines with extensive electricity needs.

## PROPOSED TECHNOLOGIES



Gas Drainage Station, Khe Cham Coal Mine



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