

# COAL MINE METHANE PROJECT OPPORTUNITY PRE-MINE DEGASIFICATION AND USE AT NARYN SUKHAIT SURFACE MINE MONGOLYN ALT (MAK) CORPORATION ÖMNÖGOVI PROVINCE, MONGOLIA

## OVERVIEW OF COAL MINE METHANE PROJECT:

The Naryn Sukhait coal mine is located in remote southwestern Mongolia in the Gurvantes district of Ömnögovi Province, just 57 kilometers north of the Mongolian – Chinese border and has resources of 220 million metric tons of coal. The Naryn Sukhait mine, owned by Mongolyn Alt (MAK) Corporation is bordered by the Ovoot Tolgoi Complex, operated by South Gobi Resources. The rank of the coal is high volatile C bituminous rich in vitrinite macerals, causing this coal deposit to be a significant source of methane with a high potential for storing gas. Gas desorption testing demonstrated that gas is present in depths as shallow as 150m and will be released to the atmosphere as surface mining takes place unless a program for draining the gas prior to mining is adopted by mine operators. Using information and data from a coalbed methane producing basin located in the United States that is analogous to the basin in which the Naryn Sukhait mine is located, it is estimated that the proposed pilot project could produce enough gas to fuel a 6 MW power generation facility. The capital costs are estimated to be \$7.7 million USD with an IRR of 16.1 percent and a payback period of 6.75 years. Carbon emissions would be reduced by 187,900 tons of CO<sub>2</sub>e over the project's 15 year life.

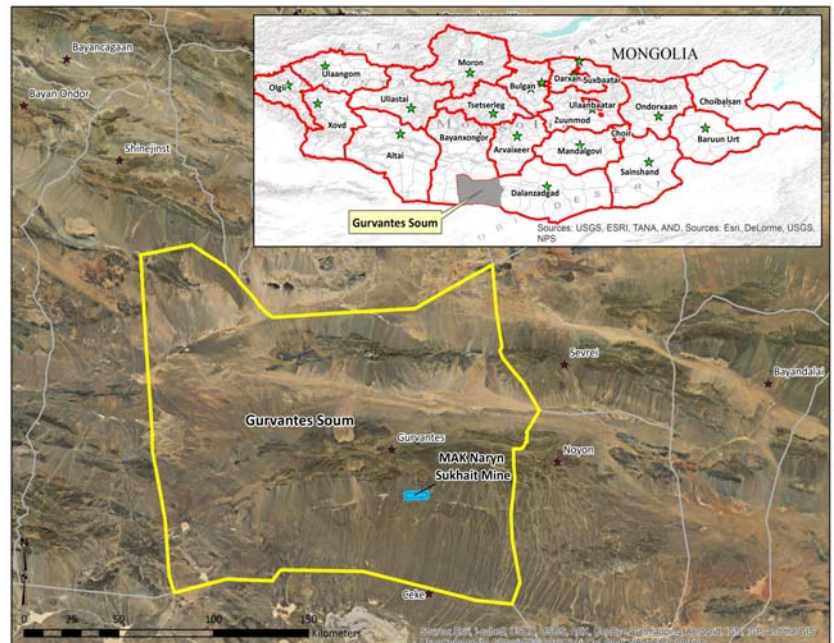
**ESTIMATED ANNUAL EMISSION REDUCTIONS: 0.18 MMTCO<sub>2</sub>E**

## PROJECT DETAILS

- Name of Project: Pre-mine Degasification and Use
- Name of Mine: Naryn Sukhait Surface Mine
- Type of Ownership: Private
- 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: Mongolyn Alt (MAK) Corporation
- Percent ownership: 100%
- Parent company: N/A
- Status and type of mine: Active; surface mine
- Mining Method: Opencast mining
- Service Life of Mine: 40 years



## PROJECT FINANCES

- Assumptions: 128.6 million cubic meters methane over project lifetime
- Estimated revenue: N/A
- Projected capital costs: US\$7.7 million
- Projected operation and maintenance (O&M) costs for fully implemented project: US\$2.026 million/year
- Estimated Return on Investment (ROI): 6.75 years

# PROJECTED MINE DATA

## PROJECTED COAL PRODUCTION AND METHANE EMISSIONS

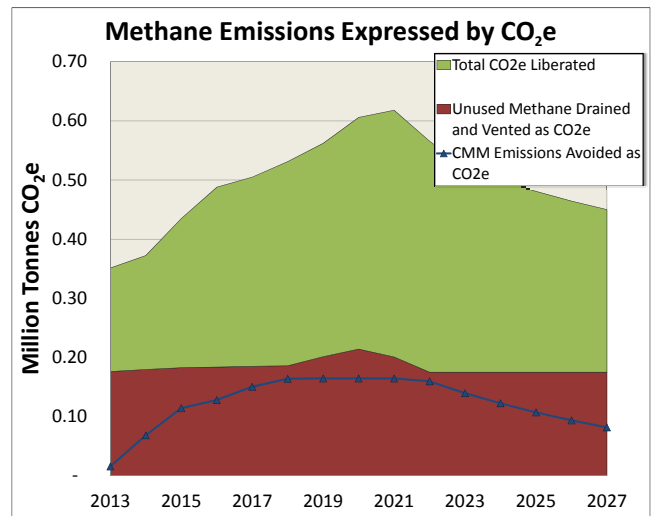
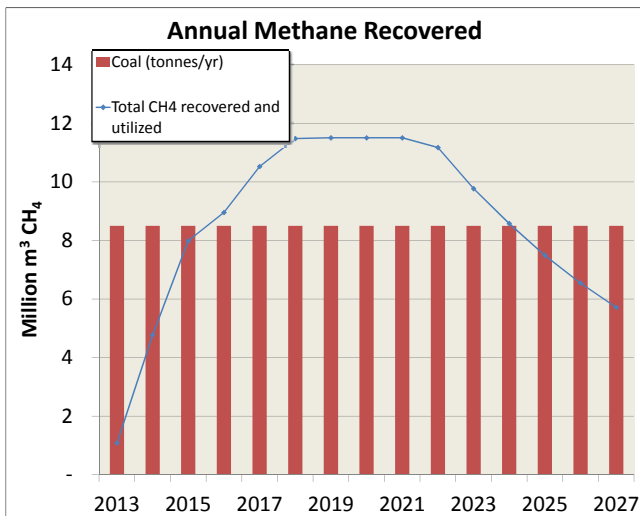
YEAR	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Coal (tonnes/yr)	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
Methane (Million m <sup>3</sup> /yr)															
Emitted to atmosphere	12.27	12.27	12.27	12.27	12.27	12.27	12.27	12.27	12.27	12.27	12.27	12.27	12.27	12.27	12.27
Liberated from drainage systems	N/A	1.16	5.09	8.51	9.55	11.22	12.24	13.34	14.23	13.30	11.91	10.41	9.15	7.99	6.98
Unused Methane Drained and Vented	12.27	0.07	0.31	0.53	0.59	0.69	0.75	1.83	2.73	1.79	0.00	0.00	0.00	0.00	0.00
Total Methane Emissions	12.27	13.50	17.67	21.31	22.40	24.18	25.26	27.44	29.23	27.35	24.18	22.68	21.41	20.25	19.24

## GREENHOUSE GAS EMISSION REDUCTIONS

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

YEAR	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Total CH <sub>4</sub> recovered and utilized (million m <sup>3</sup> /year)	1.09	4.77	7.99	8.96	10.53	11.48	11.51	11.51	11.51	11.18	9.77	8.58	7.49	6.55	5.72
Total CH <sub>4</sub> recovered and utilized (thousand tons CO <sub>2</sub> e/year)	15.50	68.17	114.09	127.93	150.34	163.98	164.33	164.33	164.33	159.60	139.54	122.54	107.02	93.47	81.63

## METHANE EMISSION CHARTS



## MARKET ANALYSIS / DEMAND ANALYSIS

A large part of economic growth in coming years will be created by new mining developments concentrated in the southern province of Ömnögovi. These gold, copper, and coal mines will continue to rapidly increase electricity demand in Southern Mongolia, with consumption reaching 294 MW in 2012 and 650 MW by 2020. MAK plans to construct a 35kV interconnection from Naryn Sukhait to the Chinese grid in order to import electricity to meet growing demand. Production of additional electricity onsite from CMM is attractive provided regulatory and ownership barriers are overcome. The Ministry of Energy has asserted that permission is required to explore for CMM resources; however, it is unclear at present how coal licenses are to be coordinated with gas production sharing contracts (PSCs) made through the Petroleum Authority. It is also unclear what environmental and safety regulations apply to CMM projects.

## TYPE(S) OF ASSISTANCE SOUGHT

A comprehensive data collection program is necessary. Technical assistance is required to perform the following testing:

- Gas desorption testing: currently, there is very little gas content data available. An extension campaign should be designed and carried out to collect gas content data for all coal seams at depths of 150m and greater over the entire license block.
- The desorbed gas from select desorption samples should be tested for gas composition.
- Injection fall-off testing: should be carried out in one or more of the test drillholes to better understand the gas flow capacity (gas producibility) of the coal, average reservoir pressures, and the impacts that drilling and completion related stresses will have on the reservoir permeability.
- All exploration drillholes planned should be rotary drilled, rather than cored, and a full suite of geophysical logs should be run over the entire openhole section for each drillhole.
- A 3-D seismic acquisition program should be designed and carried out over the entire mine lease to identify and determine the extent and impact of faulting, fracturing, and folding on the coal-bearing strata.
- Once this data is collected and integrated into the existing geologic model and interpreted, a methane recovery program can be carried out with a higher degree of certainty of success.

## PROPOSED TECHNOLOGIES



Jenbacher Gensets, Yanjing Mine



Surface Drilling Rig, Guizhou Province

## FOR MORE INFORMATION, CONTACT:

### **Gendeekhuu Davaatseren**

Vice President for Technology & Research

Mongolyn Alt (MAK) Corporation

Building 14, XIII Microdistrict, Bayanzurkh

District, PO Box – 237

Ulaanbaatar 210348-a, Mongolia

+976-11-455352

Email: [gedavaa@mak.mn](mailto:gedavaa@mak.mn)

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