

COAL MINE METHANE PROJECT OPPORTUNITY

On-site Heat Generation Using CMM

Closed Joint Stock Company Zhdanovskaya Mine

Donetsk Oblast, Ukraine

OVERVIEW OF COAL MINE METHANE PROJECT:

Ukraine's Zhdanovskaya Mine is seeking to utilize coal mine methane (CMM) for onsite heat generation. The mine currently has 6 coal-fired boilers with a total heating capacity of 20.2 Gcal/hour in the winter and 5.2 Gcal/hour in the summer. According to a preliminary study, re-equipping some of the boilers to use CMM instead of coal will save 2,128 to 2,570 tonnes of coal per year, depending on the year. The project would reduce coal use by 37,826 tonnes and avoid 34.6 million m³ (Mm³) of methane emissions over 16 years.

To enable CMM utilization, the mine seeks financing to install two vacuum pumps and a pipeline between the underground degasification facility, the pump station, and the boiler-houses, as well as an installation to house the instrumentation and control system.

ESTIMATED ANNUAL EMISSION REDUCTIONS: 31,416 TCO₂E

PROJECT DETAILS

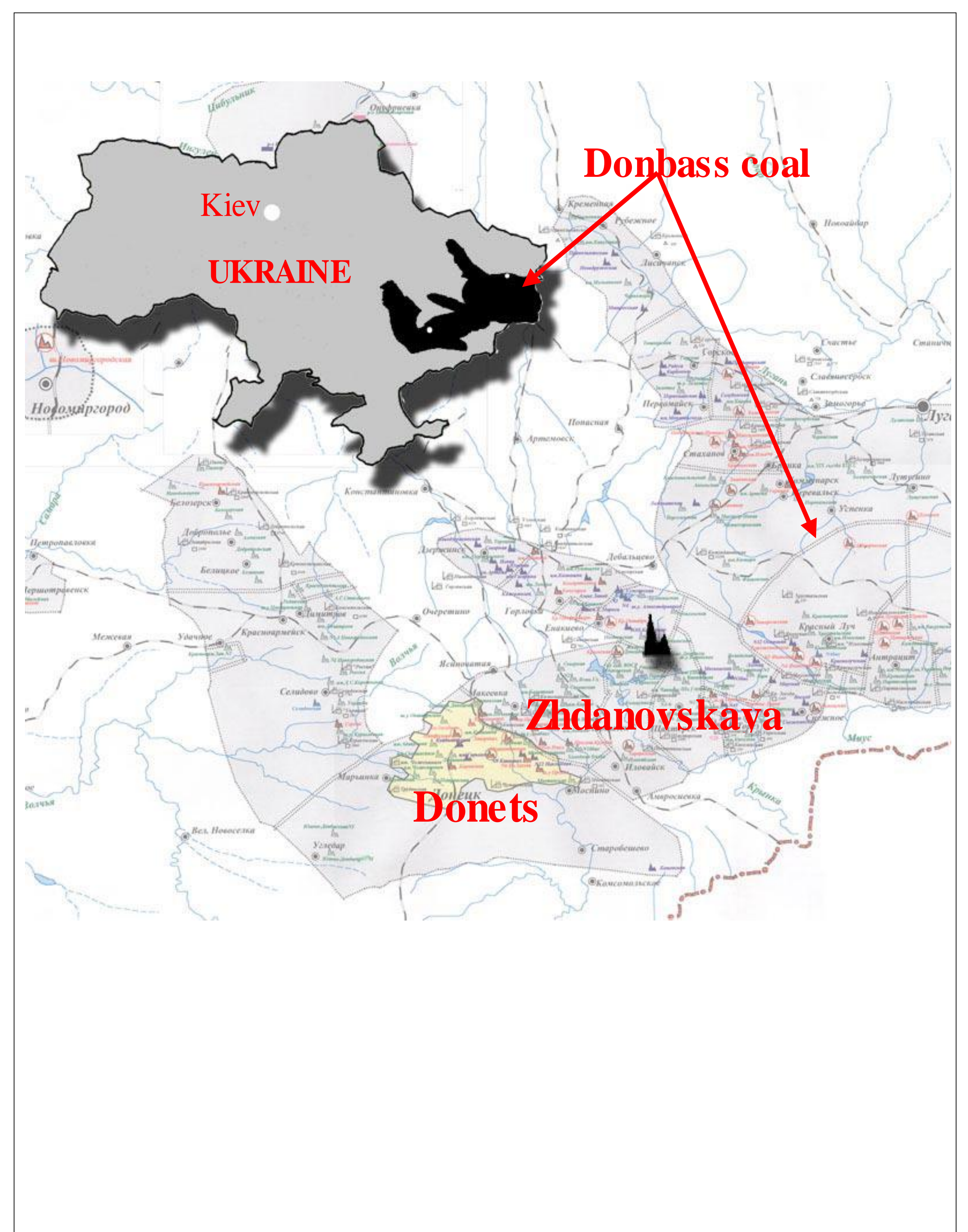
- Name of Project: Onsite Heat Generation Using CMM
- Name of Mine: Zhdanovskaya Mine
- Type of Ownership: State owned, privately leased
- Type(s) of assessments performed: Pre-feasibility
 - When performed: 2012
 - By whom: ARENA-Eco/PNNL, with GMI funding

MINE INFORMATION

- Mine owner (name of company): State-owned
- Parent company: Government of Ukraine
- Status and type of mine: Active, underground
- Mining Method: Longwall

PROJECT FINANCES

- Assumptions: Project duration of 16 years
- Estimated revenue: US\$1.4 million over 16 years
- Projected capital costs: US\$ 1.15 million total
- Projected operation and maintenance (O&M) costs for fully implemented project: Not yet estimated; likely will not change significantly from current O&M costs.
- Estimated Return on Investment (ROI): 5.7 years



HISTORICAL AND PROJECTED MINE DATA

HISTORICAL COAL PRODUCTION AND METHANE EMISSIONS

YEAR	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Coal (tonnes/yr)	503,500	579,900	550,000	777,900	740,100	735,800	830,500	932,000	882,800	901,000
Methane (Mm ³ /yr)										
Emitted from ventilation system(s)	11.9	10.2	13.2	14.9	n.a.	n.a.	7.7	8.3	9.5	13.0
Liberated from drainage systems	0	4.7	4.7	16.9	n.a.	n.a.	1.0	1.0	2.8	3.6
Vented to atmosphere	11.9	14.9	17.9	31.8	13.7	8.0	8.7	9.3	12.3	16.6
Total Methane Emissions	11.9	14.9	17.9	31.8	13.7	8.0	8.7	9.3	12.3	16.6

GREENHOUSE GAS EMISSION REDUCTIONS

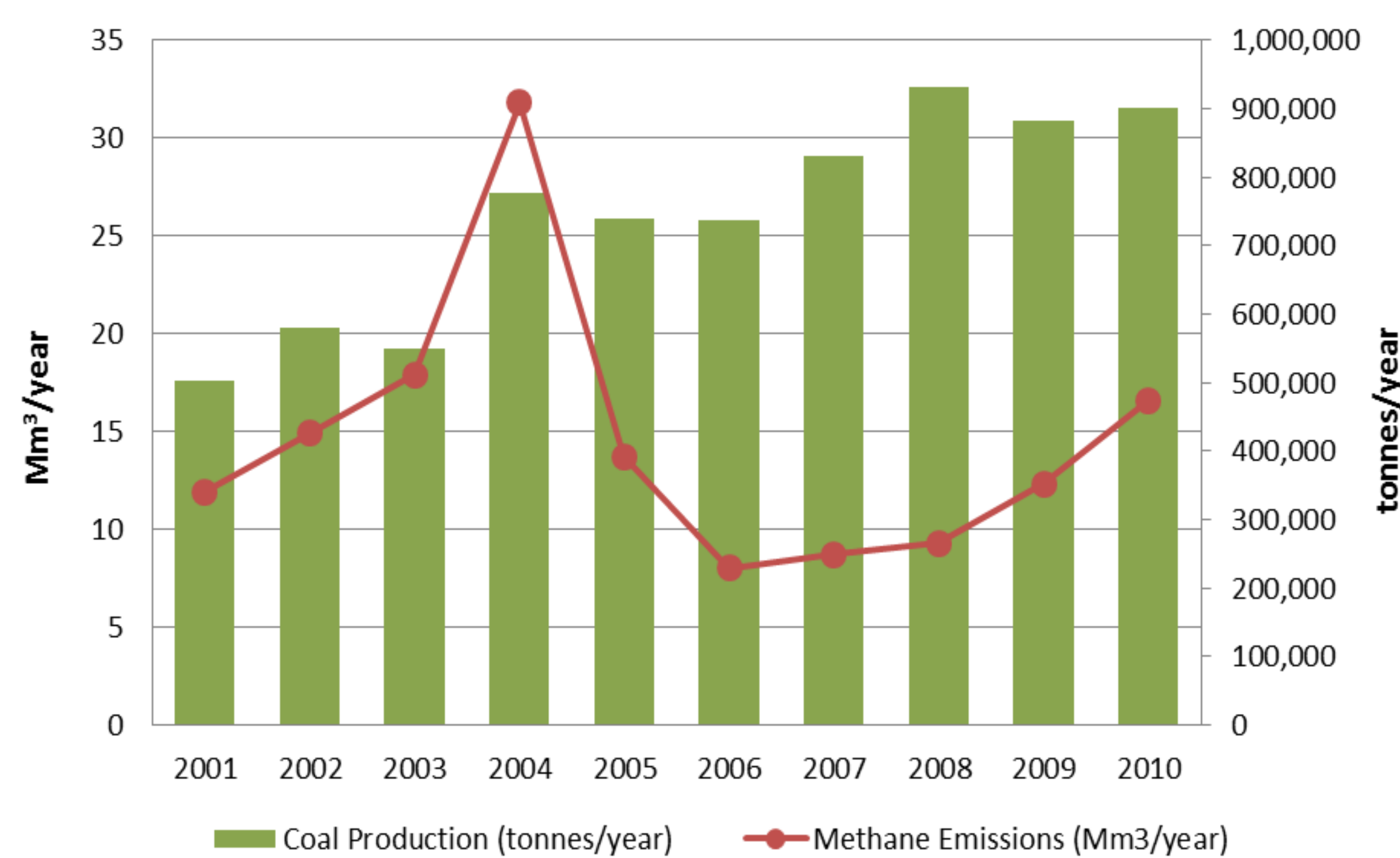
TOTAL VOLUME OF METHANE EXPECTED TO BE RECOVERED/UTILIZED

YEAR	2012	2013	2014	2015	2016	2017	2018	2019
Total CH ₄ to be recovered and utilized (Mm ³ /year)	1.8	2.4	2.4	2.4	2.4	1.9	1.9	1.9

YEAR	2020	2021	2022	2023	2024	2025	2026	2027
Total CH ₄ to be recovered and utilized (Mm ³ /year)	1.8	2.4	2.4	2.4	2.4	1.9	1.9	1.9

COAL PRODUCTION AND METHANE EMISSION CHARTS

Annual Coal Production and Methane Liberated



Project Emissions and Emission Reductions



MARKET ANALYSIS / DEMAND ANALYSIS

Onsite boilers will be switched from coal to gas to utilize recovered CMM at Zhdanovskaya mine. Most of the demand for heat is over the winter months (182 days), and thus, one of the boilers in the winter boiler-house will be switched to utilize up to 2.35 million m³ of methane, recovered through the project over this period. This will meet about 40% of the mine's winter heat demand. Over the summer months the demand is significantly lower, and thus not all of the technically recoverable methane will be utilized.

TYPE(S) OF ASSISTANCE SOUGHT

Financing is sought in the amount of US\$917,000 in the first year, and US\$234,700 in the eighth year to install two vacuum pumps and a pipeline, connecting the underground degasification facility with the pump station and then the boiler-houses. The pipeline will be equipped with valves and measuring devices. In addition, a control station will be built to house instrumentation and controls, and to provide a work space for an operator.

PROPOSED TECHNOLOGIES



Vacuum pump. Photo from: Ukrainemade.com

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