



# Addressing Barriers to CMM Project Development in Ukraine: Four Coal Mine Profiles

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**AGENCY FOR RATIONAL ENERGY USE AND ECOLOGY**

**Addressing Barriers to CMM Project Development in Ukraine**

**FOUR MINE PROFILES**

**Prepared for the U.S. Environmental Protection Agency  
By the Agency for Rational Energy Use and Ecology  
and Pacific Northwest National Laboratory**

**May 2010**

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## INTRODUCTION

This document has been prepared according to the scope of work for the project, *Addressing Barriers to CMM Project Development in Ukraine*. This document replaces the outdated mine profiles presented in the handbook, *Coal Mine Methane in Ukraine: Opportunities for Production and Investment in the Donetsk Coal Basin*, published in January 2001. The updated information will provide potential investors, project developers and other stakeholders with more reliable information about existing opportunities in recovery and utilization of methane from coal mines. The mines described in the document have been determined to be the most promising candidates for implementation projects considering existing technical potential, interest from the mines, and support from the Ministry of Coal Industry of Ukraine and state coal associations.

# 1 GORSKAYA MINE

## General Overview

The Gorskaya mine's coal reserves are located in the Almazno-Marievsky geologic/industrial district that lies in the northern section of the Donetsk Coal Basin (Figure 1.1). In geologic terms, the mine is in an element of the northeastern slope of the Bakhmut Depression that is complicated by second-order folding represented by the Gorsky Syncline and the Karbonit Anticline. Those structures are further complicated by flexural bends and continuity disturbances that include several thrusts (Mirnodolinsky, Yuzhny, and Vrubovsky) and a diagonal upthrow fault.

Gorskaya mine became operational in 1898. Now the mine is part of the Pervomayskugol Coal Association. Currently, the mine is state-owned but it is on the list of coal mines to be privatized according to government resolution #430 issued on April 2, 2009<sup>1</sup>.

The mine property is bounded by the unassigned Mirnodolinsky tract in the northwest and by the Karbonit Mine property in the south. The explored coal seams of the Gorsky Gluboky section within the interval of 800 to 1,500 meters are estimated to contain 45.4 million tonnes of mineable reserves. Considering their low lithification, the coal seams and surrounding rock strata in this area tend to store significant amounts of gas.

The surface area is mostly used for farming with some planted forest areas. Within a 30-km range from the mine, the nearest industrial towns are Lisichansk, Rubezhnoye and Severodonetsk to the east and Pervomaysk and Popasnaya to the west. The mining property itself includes the town of Gorsk and other smaller towns. The property is crossed by several asphalt roads and railroad tracks. In the northern and southern sections of the property, the mine has a stationary degasification station with two NV50 vacuum pumps installed (each have a capacity of 50 m<sup>3</sup>/min). The mine employs a total of about 800 workers.

### Mine Contact Information:

Mailing address: Gorskaya Mine, 21 Kuybisheva Street, Gorsk, Lugansk Oblast 49975, Ukraine

Telephone number (main office): +(06455) 33654.

A summary of the mine's technical potential, general geologic data, and existing geologic and mining conditions is provided in Tables 1.1, 1.2 and 1. 3, respectively. Yearly coal production

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<sup>1</sup> On April 21, 2010, resolution #430 was abolished by the new government. The reason of its abolishment is formal (non-conforming with the Constitution of Ukraine). According to the Constitution, all issues concerning privatization in any sector of the economy are to be regulated by the law of Ukraine adopted by Verhovna Rada (parliament). This is why the Constitutional Court of Ukraine deemed resolution #430 to be non-conforming with the Constitution. Thus, formally there are no coal mines to be privatized at present, but strategically, government plans to privatize coal mines have not changed. It is expected that in the near future the appropriate law will be adopted by Verhovna Rada with the same list of coal mines to be sold at public auction.

and coal mine methane (CMM) emissions are presented in Table 1.4, and Figures 1.2 and 1.3. Current parameters and conditions of the mine’s degasification system are provided in Table 1.5.



Figure 1.1 Location of Gorskaya mine

**Table 1.1. General Information, Gorskaya Mine**

1	Total Mineable Reserves, thousand tonnes	45,402
2	Mineable Reserves, Active Mine Levels, thousand tonnes	23,233
3	Total Mining Area, km <sup>2</sup>	45.8
4	Depth of Shafts, m	670
		626
		860
		655
		912
5	Mining Capacity, tonnes/day	1,320
6	Annual Electricity Consumption, MWh	45,400
7	Coal Consumers	SE «Vygillya Ukrainy»
8	Annual Heat Consumption, Gcal	25,334
9	Type(s) of Boilers	DKVR 10/13
10	Boilers Fueled with	Coal
11	Fuel consumption, tonnes	7,709
12	Covered Fuel Demand, percent	100

**Table 1.2. General Geologic Information, Gorskaya Mine**

1	Coal Seam Gas Content, Range, m <sup>3</sup> /tonne	5 - 18
2	Geothermal and Pressure Gradients:	
	Geothermal, °C/100 m	2.83
3	Overburden Composition:	
	Sandstone, percent	36.0
	Shale, percent	57.0
	Limestone, percent	4.5
4	Number of Coal Seams Above Currently Mined	11
5	Aggregate Thickness of Seams Above Currently Mined, m	8.91
6	Geologic Phenomena	Faults: Maryevsky, Karbonitsky, Brubovsky, Southern, multiple small-amplitude faults (0.5-5 m)
7	Gas Pressure in Surrounding Rock Strata, MPa	13.5
8	Porosity and Permeability, Sandstone:	
	Porosity, percent	14
	Permeability, mD	2.2
9	Total Methane Resource, billion m <sup>3</sup> , including:	
	Coal Seams, billion m <sup>3</sup>	1.179
	Satellite Seams, billion m <sup>3</sup>	0.544
	Sandstone, billion m <sup>3</sup>	Not evaluated

**Table 1.3. Geologic and Mining Conditions, Gorskaya Mine**

#		Coal Seam <i>k<sub>g</sub></i>
1	Rank of Coal	High-vol bituminous coal C, B
2	Seam Thickness, m	1.8
3	Pitch, degrees	6 - 20
4	Depth of Mining, m	1000
5	Ash Content:	
	Coal in Place, percent	6.6 - 24.0
	Run of Mine Coal, percent	40.0
6	Moisture, percent	4.6
7	Sulfur Content, percent	3.9
8	Gas Content, m <sup>3</sup> per tonne of daf coal	16.0
9	Mining Method	Combined
10	Roof Control Method	Complete caving
11	Panel Width, m	250 - 300
12	Mining Equipment	Mechanized complexes 3KD-80T

**Table 1.4. Coal Production, Methane Emission and Degasification, Gorskaya Mine**

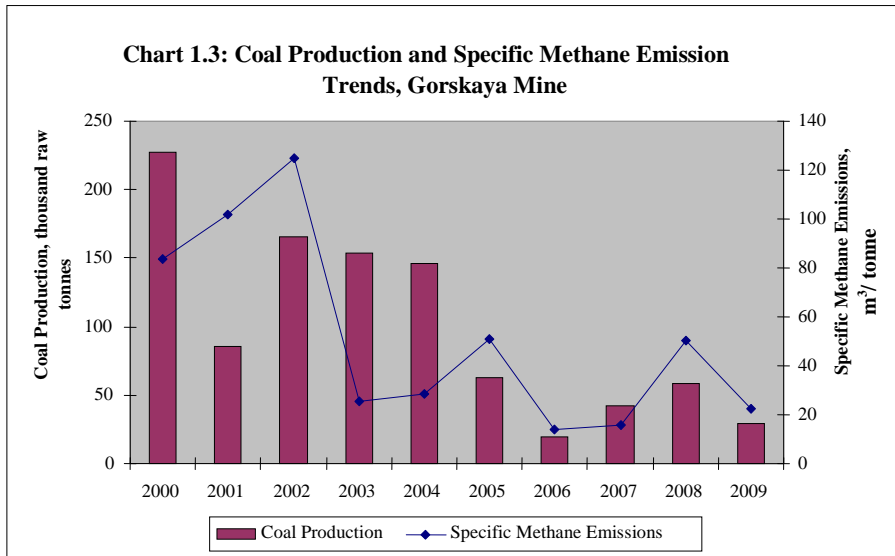
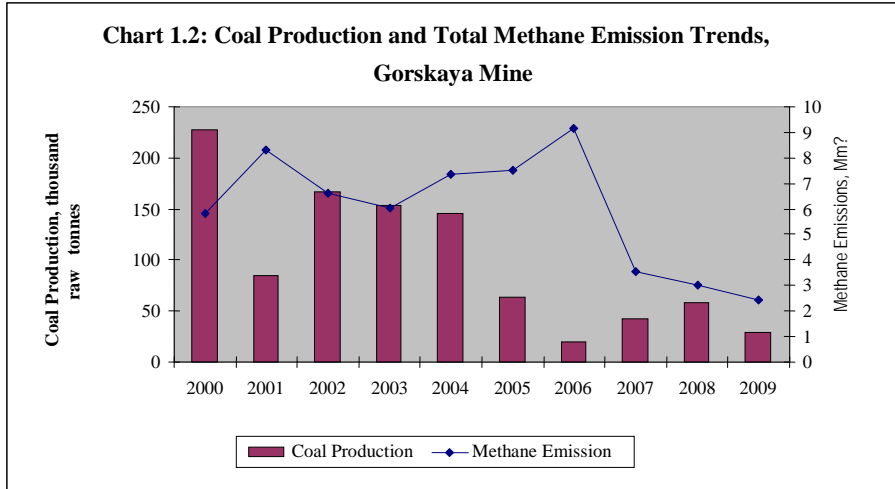
Year	Methane Liberated by Mining, million m <sup>3</sup> /year			Methane Utilized, million m <sup>3</sup> /year	Methane Content in Captured Gas, percent	Specific Methane Emissions, m <sup>3</sup> /tonne	Coal Production, thousand tonnes/year
	Ventilation	Degasification	Total Emissions				
2000	5.80	0	5.80	0	-	83.4	227.3
2001	8.30	0	8.30	0	-	101.6	85.2
2002	6.63	0	6.63	0	-	124.6	166.1
2003	6.05	0	6.05	0	-	25.33	153.4
2004	7.34	0	7.34	0	-	28.57	146.1
2005	7.50	0	7.50	0	-	50.83	63.1
2006	9.13	0	9.13	0	-	13.68	19.2
2007	3.52	0	3.52	0	-	15.46	42.1
2008	3.03	0	3.03	0	-	50.45	58.5
2009	2.45	0	2.45	0	-	22.7	29.4

( - ) Indicates information is not applicable

**Table 1.5. Projected Degasification Parameters for 2010, Gorskaya Mine**

1	Number of Pumping Stations	1
2	Number of Pumps, 150 m <sup>3</sup> /min Capacity	0
3	Number of Pumps, 50 m <sup>3</sup> /min Capacity	2
4	Number of Longwalls Degassed	1
5	Average Degasification Statistics	
	Methane–air Mixture Consumed, m <sup>3</sup> /min	36.4
	Methane Content, percent	33
	Methane Capture Rate, m <sup>3</sup> /min	8.37
	Methane Utilization Rate by Season, m <sup>3</sup> /min	0
	Winter	0
	Summer	0
6	Length of Pipeline, m	3600





Figures 1.2 and 1.3 Trends in Coal Production and Methane Emissions at Gorskaya Mine

## 2 VERGELEVSKAYA MINE

### General Overview

The Vergelevskaya mine is located near the town of Bryanka (Figure 2.1), which is located in the southwestern section of the Donetsk Basin in the Lugansk Oblast, 58 km from Lugansk City (oblast center).

The mine became operational in 1956 and is now part of the Luganskvugol State Coal Association. Currently, the mine is state-owned, but is on the list of coal mines to be privatized according to government resolution #430 issued on April 2, 2009.

The mine's design capacity is 390 thousand tonnes. From 2001 through 2009, the mine operated at 66 to 96 percent of its original production capacity. In 2009, coal production was 353 thousand tonnes.

Currently, the Vergelevskaya mine is operating at the  $l_5$  coal seam, which is 0.91 meters thick and is generally considered prone to outbursts. As of January 1, 2009, the mine's total coal reserves were estimated at 30.9 million tonnes with an ash content (run of mine coal) of 39.4 percent and a sulfur content of 3.4 percent. The mine has three adjacent coal blocks with a maximum depth of 490 meters. The mine employs a total of 1,600 workers including 1,200 workers with underground mining experience.

### Mine Contact Information:

Mailing address: Vergelevskaya Mine, 16, Tsentralnaya, Vergelevka, Bryanka Rayon, Lugansk Oblast 94195, Ukraine.

Telephone number (main office): +(06443) 5-73-61

Fax: +(06443) 5-70-14.

A summary of the of mine's technical potential, general geologic data, and existing geologic and mining conditions are provided in Tables 2.1, 2.2 and 2.3, respectively. Yearly coal production and CMM emissions are presented in Table 2.4 and Figures 2.2-2.4. Current parameters and conditions of the mine's degasification system are provided in Table 2.5.

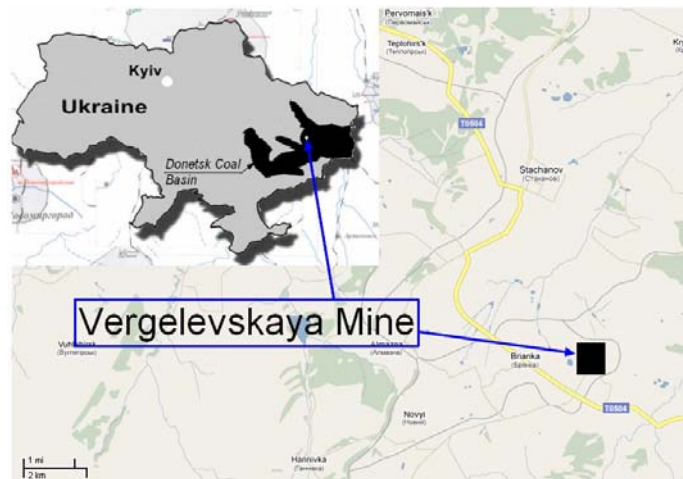


Figure 2.1 Location of Vergelevskaya mine

**Table 2.1. General Information, Vergelevskaya Mine**

1	Total Mineable Reserves, thousand tonnes	30,876
2	Mineable Reserves, Active Mine Levels, thousand tonnes	10,582
3	Total Mining Area, km <sup>2</sup>	22
4	Depth of Shafts, m	342 340
5	Mining Capacity, tonnes/day	1,045
6	Annual Electricity Consumption, MWh	26,479
7	Coal Consumers	JSC « Zapadnaya energeticheskaya upravlyayushchaya kompaniya»
8	Annual Heat Consumption, Gcal	26,849
9	Type(s) of Boilers	DKVR 4.5/13 - 3 units “Lancashire” - 2 units
10	Boilers Fueled with	lean coal, gas coal
11	Fuel consumption, tonnes	6,400
12	Covered Fuel Demand, percent	97.5

**Table 2.2. General Geologic Information, Vergelevskaya Mine**

1	Coal Seam Gas Content, Range, m <sup>3</sup> /tonne	23.94
2	Geothermal and Pressure Gradients: Geothermal, °C/100 m Pressure, MPa/1,000 m	2.85 N/A
3	Overburden Composition: Sandstone, percent Shale, percent Limestone, percent	37.0 47.0 9.0
4	Number of Coal Seams Above Currently Mined	8
5	Aggregate Thickness of Seams Above Currently Mined, m	6.7
6	Geologic Phenomena	Faults Nikanorovsky, Borzhikovsky
7	Gas Pressure in Surrounding Rock Strata, MPa	N/A
8	Porosity and Permeability, Sandstone: Porosity, percent Permeability, mD	4.32 – 5.09 N/A
9	Total Methane Resource, billion m <sup>3</sup> , including: Coal Seams, billion m <sup>3</sup> Satellite Seams, billion m <sup>3</sup> Sandstone, billion m <sup>3</sup>	0.95 Not evaluated Not evaluated

**Table 2.3. Geologic and Mining Conditions, Vergelevskaya Mine**

		Coal Seams		
		$l_6^B$	$l_5$	$l_4^B$
1	Rank of Coal	High-vol bituminous coal C, B, Low-vol bituminous coal	High-vol bituminous coal C, B, Low-vol bituminous coal	High-vol bituminous coal C, B, Low-vol bituminous coal
2	Seam Thickness, m	1.06	0.91	1.01
3	Pitch, degrees	0-12	0-12	0-12
4	Depth of Mining, m	N/A	490	N/A
5	Ash Content:			
	Coal in Place, percent	2.7-18.9	8.6-31.5	4.1-23.6
	Run of Mine Coal, percent	22.4	39.4	21.0
6	Moisture, percent	N/A	3.5 - 3.8	N/A
7	Sulfur Content, percent	1.7 – 5.2	3.4	1.7 – 4.59
8	Gas Content, m <sup>3</sup> per tonne of daf coal	N/A	20 - 22	N/A
9	Mining Method	Not mining in 2010	Longwall	Not mining in 2010
10	Roof Control Method	N/A	Complete caving	N/A
11	Panel Width, m	N/A	250	N/A
12	Mining Equipment	N/A	Mechanized complexes KDN/A80, UKDN/A200/250	N/A

**Table 2.4. Coal Production, Methane Emissions and Degasification, Vergelevskaya Mine**

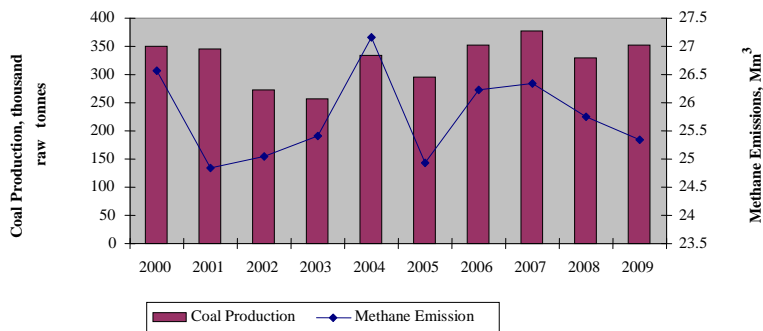
Year	Methane Liberated by Mining, million m <sup>3</sup> /year			Methane Utilized, million m <sup>3</sup> /year	Methane Content in Captured Gas, percent	Specific Methane Emissions, m <sup>3</sup> /tonne	Coal Production, thousand tonnes/year
	Ventilation	Degasification	Total emissions				
2000	24.85	1.71	26.56	0	15	24.87	349.3
2001	N/A	N/A	24.85	0	N/A	24.70	345.5
2002	24.18	0.87	25.04	0	17	25.42	273.3
2003	24.70	0.71	25.41	0	15	24.48	256.6
2004	24.18	2.99	27.17	0	14	25.23	333.5
2005	23.65	1.28	24.93	0	16	25.12	296.0
2006	24.44	1.78	26.22	0	16	24.80	351.3
2007	23.91	2.42	26.33	0	15	24.87	376.2
2008	24.01	1.73	25.75	0	15	25.68	329.3

2009	24.80	0.54	25.35	0	7	23.94	352.8
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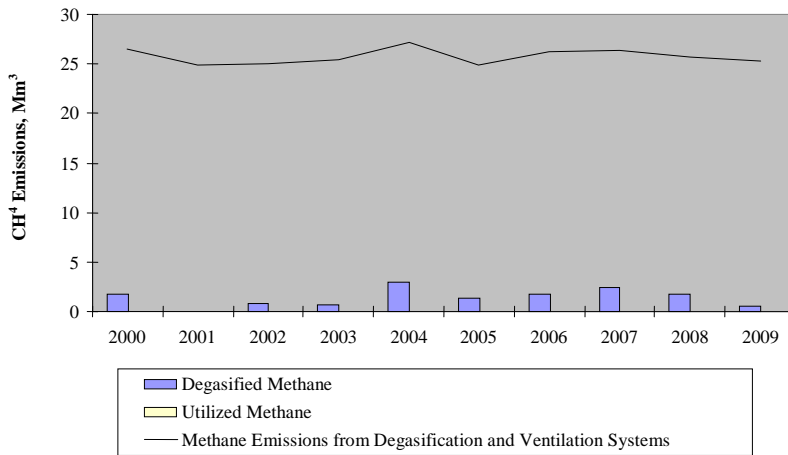
**Table 2.5. Degasification Parameters, Vergelevskaya Mine**

#	Indicator	Values
1	Number of Pumping Stations	1
2	Number of Pumps, 150 m <sup>3</sup> /min Capacity	0
3	Number of Pumps, 50 m <sup>3</sup> /min Capacity	1
4	Number of Longwalls Degassed	1
5	Average Degasification Statistics	
	Methane–air Mixture Consumed, m <sup>3</sup> /min	22.0
	Methane Content, percent	15.0
	Methane Capture Rate, m <sup>3</sup> /min	3.3
	Methane Utilization Rate by Season, m <sup>3</sup> /min	0
	Winter	0
	Summer	0
6	Length of Pipeline, m	270

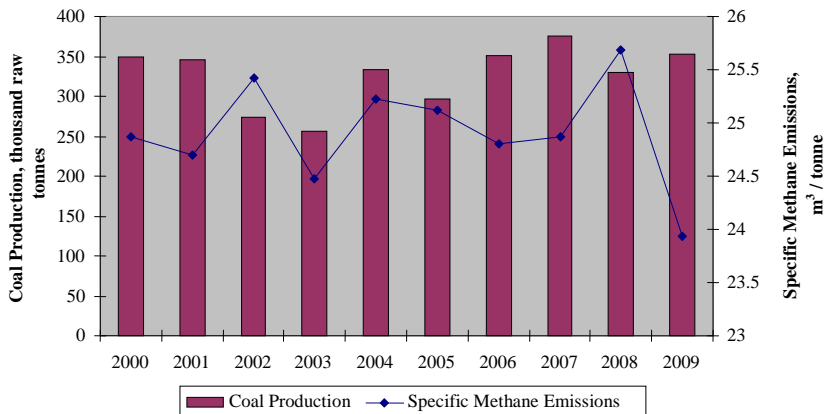
**Chart 2.2: Coal Production and Total Methane Emission Trends, Vergelevskaya Mine**



**Chart 2.3: Methane Emission Trends, Vergelevskaya Mine**



**Chart 2.4: Coal Production and Specific Methane Emission Trends, Vergelevskaya Mine**



Figures 2.2-2.4 Trends in Coal Production and Methane Emissions at Vergelevskaya Mine

### 3 MINE NAMED AFTER GAYOVY

#### General Overview

The mine Named After Gayovy is located within the city limits of Gorlovka, 48 km from Donetsk City, an oblast center (Figure 3.1). Gorskaya mine became operational in 1898. The mine is part of the Artemugol Coal Association. Currently, the mine is state-owned, but is included on the list of coal mines to be privatized according to government resolution #430 issued on April 2, 2009.

Edge seam mining at a significant depth of 1,125 meters is a particular feature of this coal mine. A VCD 47u fan is installed in the mine, which provides efficient ventilation of all mine operations. Applied mining technology is based on use of compressed air.

Because only upper coal in place is extracted, which is not choked up by in-situ rock, the percentage of ash content in produced coal is low.

As of January 1, 2009, the mine's total coal reserves were estimated at about 15.9 million tonnes with an ash content (in run of mine coal) of 1-6 percent and a sulfur content of 2 percent, on average.

#### Mine Contact Information:

Mailing address: 39, Vavilova str., Gorlovka, Donetsk Oblast, 84613, Ukraine

Telephone number (main office): +380 (6242) 9-02-54, +380 (6242) 4-23-16, +380 (6242) 9-04-00, +380 (6242) 9-04-60

Fax: +380 (6242) 4-23-16

E-mail: [gaevogo@ditek.dn.ua](mailto:gaevogo@ditek.dn.ua)

A summary of the mine's technical potential, general geologic data, and existing geologic and mining conditions are provided in Tables 3.1, 3.2 and 3.3, respectively. Yearly coal production and CMM emissions are presented in Table 3.4, and Figures 3.2 and 3.3.



Figure 3.1 Location of Mine Named After Gayovy

**Table 3.1. General Information, Mine Named After Gayovy**

1	Total Mineable Reserves, thousand tonnes	15,873
2	Mineable Reserves, Active Mine Levels, thousand tonnes	5,672
3	Total Mining Area, km <sup>2</sup>	11.32
4	Depth of Shafts, m	1,125
5	Mining Capacity, tonnes/day	520
6	Annual Electricity Consumption, MWh	62,200
7	Coal Consumers	SE «Vygillya Ukrainy»
8	Annual Heat Consumption, Gcal	591
9	Type(s) of Boilers	DKVR 4.5/13, KE-14, KSVG-3
10	Boilers Fueled with	Natural gas
11	Fuel consumption, m <sup>3</sup>	83,465
12	Covered Fuel Demand, percent	100

**Table 3.2. General Geologic Information, Mine Named After Gayovy**

1	Coal Seam Gas Content, Range, m <sup>3</sup> /tonne	25.6
2	Geothermal and Pressure Gradients: Geothermal, °C/100 m Pressure, MPa/1,000 m	2.0 N/A
3	Overburden Composition: Sandstone, percent Shale, percent Limestone, percent	30.0 60.0 20.0
4	Number of Coal Seams Above Currently Mined	24
5	Aggregate Thickness of Seams Above Currently Mined, m	1.16
6	Geologic Phenomena	Gorlivskyy fault
7	Gas Pressure in Surrounding Rock Strata, MPa	N/A
8	Porosity and Permeability, Sandstone: Porosity, percent Permeability, mD	N/A N/A
9	Total Methane Resource, billion m <sup>3</sup> , including: Coal Seams, billion m <sup>3</sup> Satellite Seams, billion m <sup>3</sup> Sandstone, billion m <sup>3</sup>	N/A N/A N/A



**Table 3.3. Geologic and Mining Conditions, Mine Named After Gayovy**

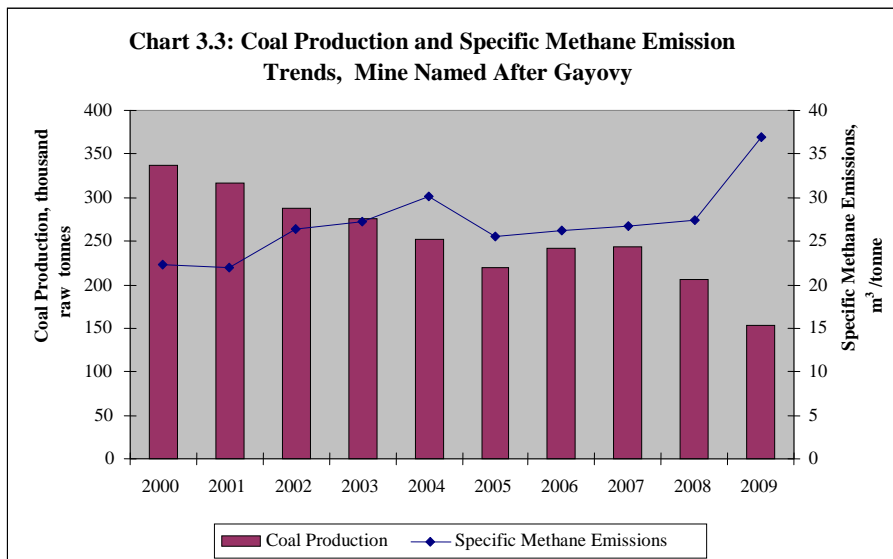
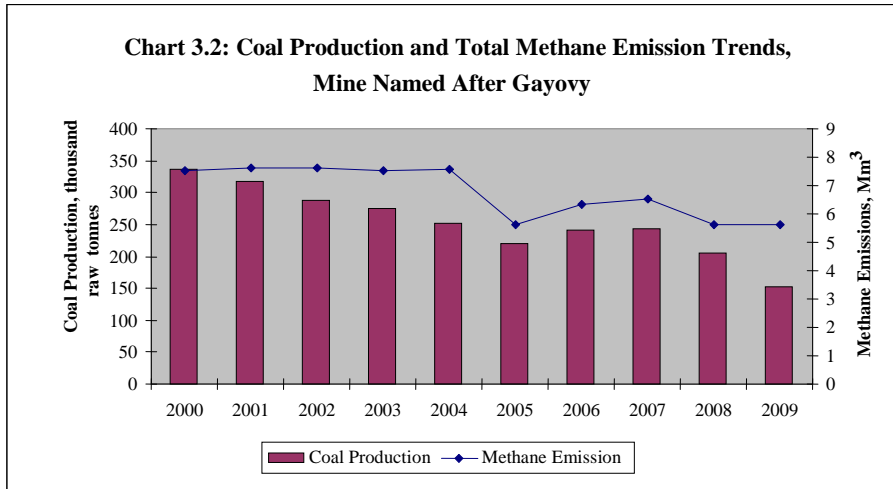
#		Coal Seams				
		$m_{13}$	$m_{10}^1$	$m_3$	$k_3^H$	$k_2$
1	Rank of Coal	High vol. bituminous A	High vol. bituminous A	High vol. bituminous A	High vol. bituminous A	High vol. bituminous A
2	Seam Thickness, m	0.60	1.15	1.10	1.70	0.75
3	Pitch, degrees	60	60	62	65	65
4	Depth of Mining, m	975	975	975	975	975
5	Ash Content:	1	4	1	6.0	2
	Coal in Place, percent	1	4	1	6.0	2
	Run of Mine Coal, percent	1	4	1	6.0	2
6	Moisture, percent	2.5	2.4	2.3	3.0	1.4
7	Sulfur Content, percent	1.2	1.7	1.0	1.4	2.9
8	Gas Content, m <sup>3</sup> per tonne of daf coal	58.1	31.9	27.4	26.1	15.9
9	Mining Method	Longwall	Combined	Longwall	Longwall	Longwall
10	Roof Control Method	Chock support	Chock support	Chock support	Complete caving	Chock support
11	Panel Width, m	120	120	120	50	120
12	Mining Equipment	Pneumatic chipper	Pneumatic chipper	Pneumatic chipper	Mechanized complexes	Pneumatic chipper

**Table 3.4. Coal Production, Methane Emissions and Degasification, Mine Named After Gayovy**

Year	Methane Liberated by Mining, million m <sup>3</sup> /year			Methane Utilized, million m <sup>3</sup> /year	Methane Content in Captured Gas, percent	Specific Methane Emissions, m <sup>3</sup> /tonne	Coal Production, thousand tonnes/year
	Ventilation	Degasification	Total Emissions				
2000	7.537	0	7.537	0	-	22.38	336.8
2001	7.621	0	7.621	0	-	21.99	316.5
2002	7.605	0	7.605	0	-	26.45	287.5
2003	7.516	0	7.516	0	-	27.28	275.5
2004	7.590	0	7.590	0	-	30.07	252.4
2005	5.623	0	5.623	0	-	25.50	220.2
2006	6.329	0	6.329	0	-	26.17	241.8
2007	6.503	0	6.503	0	-	26.78	242.8

2008	5.618	0	5.618	0	-	27.36	205.3
2009	5.634	0	5.634	0	-	36.90	152.7

( - ) Indicates information is not applicable.



Figures 3.2 and 3.3 Trends in Coal Production and Methane Emissions at Mine Named After Gayovy

## 4 MINE NAMED AFTER KALININ

### General Overview

The state-owned Mine Named After Kalinin is located within the city limits of Donetsk in the Krasnogvardeysky Rayon, which is part of the city of Makeyevka. The surface of the mining area is a mildly undulating plain on which numerous structures were built by the city of Donetsk (Figure 4.1).

The mine became operational in 1963 and is now part of the State Coal Association “Donetskaya Ugolnaya Energeticheskaya Kompaniya.” The mine has been issued a license (#1314 as of April 9, 1998) with a 20-year duration, which permits the extraction of coal, methane and drainage water. The mine is included on the list of coal mines to be privatized according to government resolution #430 issued on April 2, 2009.

The mine’s design capacity is 1,200 thousand tonnes. From 2001 through 2009, the mine operated at 8 to 43 percent of its original production capacity. In 2009, 141 thousand tonnes of coal were produced. The mine employs a total of about 1,560 workers.

At present, the mine is operating at the  $h_{10}$  coal seam, which is about 1.27 meters thick. Mining of this coal seam is considered particularly dangerous because of the risk of methane gas explosions and pulverized coal ash outbursts.

As of January 1, 2009, the total mine’s coal reserves were estimated at 12 million tonnes with an ash content (in run of mine coal) of 30.5 percent and a sulfur content of 3.5 percent, on average.

### Mine Contact Information:

Mailing address: Kalinin Mine, 44 Prospekt Mira, Donetsk 83017, Ukraine.

Telephone: +(062) 94-94-08, 90-10-01, 90-30-55

Fax: 94-98-39

E-mail: kln@ivcdu.dn.ua

A summary of the mine’s technical potential, general geologic data, and existing geologic and mining conditions are provided in Tables 4.1, 4.2 and 4.3, respectively. Yearly coal production and CMM emissions are presented in Table 4.4 and Figures 4.2-4.4. Current parameters and conditions of mine’s degasification system are provided in Table 4.5.

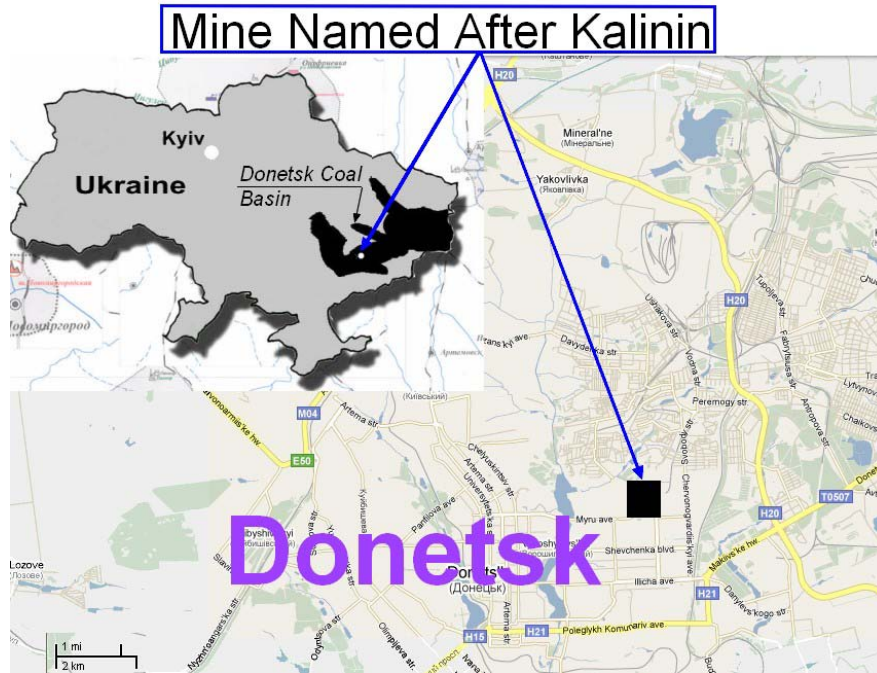


Figure 4.1 Location of Mine Named After Kalinin

**Table 4.1. General Information, Mine Named After Kalinin**

1	Total Mineable Reserves, thousand tonnes	12,079
2	Mineable Reserves, Active Mine Levels, thousand tonnes	12,079
3	Total Mining Area, km <sup>2</sup>	35
4	Depth of Shafts, m	782
		229
		1,110
		799
		774
5	Mining Capacity, tonnes/day	350
6	Annual Electricity Consumption, MWh	n/a
7	Coal Consumers	Central washing-house "Uzlovskaya," Avdeevsky coke plant
8	Annual Heat Consumption, Gcal	591
9	Type(s) of Boilers	Natural gas boilers
10	Boilers Fueled with	Methane, Natural gas
11	Fuel consumption, m <sup>3</sup>	n/a
12	Covered Fuel Demand, percent	100

**Table 4.2. General Geologic Information, Mine Named After Kalinin**

1	Coal Seam Gas Content, Range, m <sup>3</sup> /tonne	20-24
2	Geothermal and Pressure Gradients: Geothermal, °C/100 m Pressure, MPa/1,000 m	3.4 4 - 12
3	Overburden Composition: Sandstone, percent Shale, percent Limestone, percent	30.0 68.2 0.8
4	Number of Coal Seams Above Currently Mined	3
5	Aggregate Thickness of Seams Above Currently Mined, m	0.9
6	Geologic Phenomena	Faults: Kalininsky (amplitude 250–270 m), Francuzsky (500–580 m), Centralny (5–15 m), Mushketovsky (150 m)
7	Gas Pressure in Surrounding Rock Strata, MPa	3 - 5
8	Porosity and Permeability, Sandstone: Porosity, percent Permeability, mD	1.08-4.33 0.02
9	Total Methane Resource, billion m <sup>3</sup> , including: Coal Seams, billion m <sup>3</sup> Satellite Seams, billion m <sup>3</sup> Sandstone, billion m <sup>3</sup>	0.6539 1.1 1.8

**Table 4.3. Geologic and Mining Conditions, Mine Named After Kalinin**

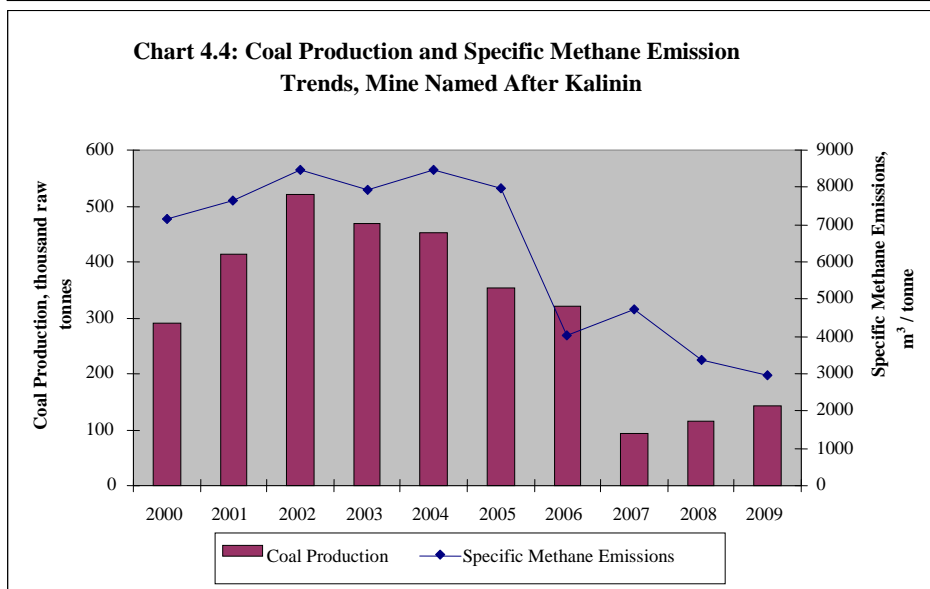
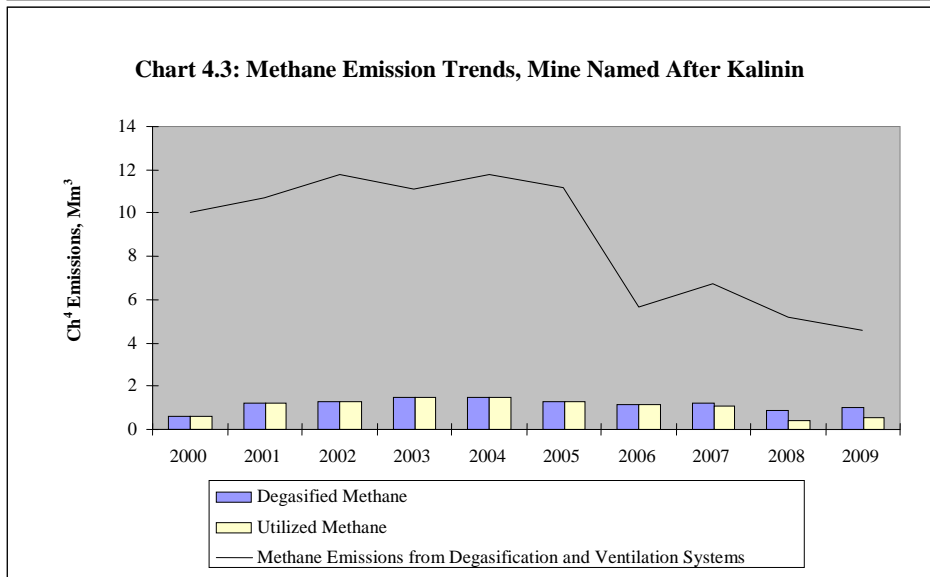
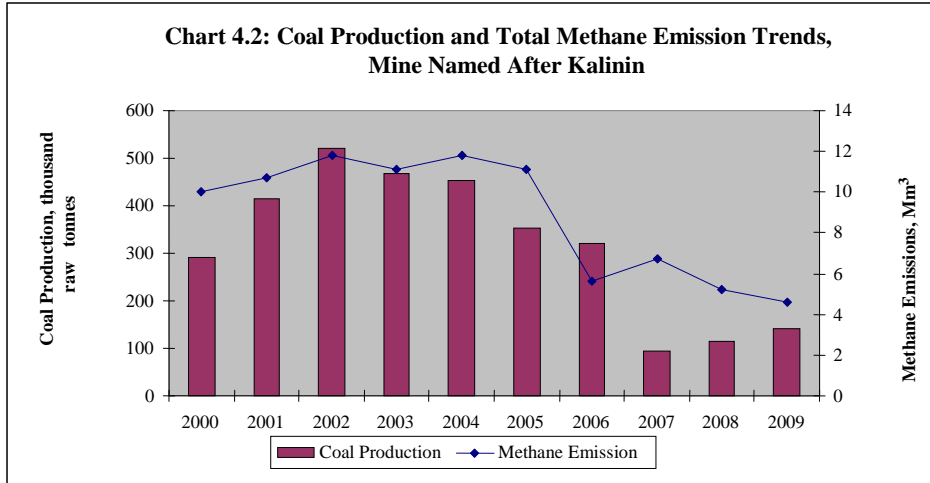
#	Indicator	Coal Seam
		$h_{10}$
1	Rank of Coal	High vol. bituminous A, B; Mid.-vol. bituminous
2	Seam Thickness, m	1.25 - 1.30
3	Pitch, degrees	16 - 32
4	Depth of Mining, m	1230 - 1350
5	Ash Content: Coal in Place, percent Run of Mine Coal, percent	10.3 30.5
6	Moisture, percent	1.8 - 2.2
7	Sulfur Content, percent	2.5 - 4.4
8	Gas Content, m <sup>3</sup> per tonne of daf coal	20 - 24
9	Mining Method	Longwall
10	Roof Control Method	Complete caving
11	Panel Width, m	280
12	Mining Equipment	Mechanized complexes 2KD-90, 1K-101

**Table 4.4. Coal Production, Methane Emission and Degasification, Mine Named After Kalinin**

Year	Methane Liberated by Mining, million m <sup>3</sup> /year			Methane Utilized, million m <sup>3</sup> /year	Methane Content in Captured Gas, percent	Specific Methane Emissions, m <sup>3</sup> /tonne	Coal Production, thousand tonnes/year
	Ventilation	Degasification	Total emission				
2000	9.4	0.6	10	0.6	25	7160	291.7
2001	9.5	1.2	10.7	1.2	26	7660	414.8
2002	10.5	1.3	11.8	1.3	27	8448	521.9
2003	9.6	1.5	11.1	1.5	28	7947	468.4
2004	10.3	1.5	11.8	1.5	30	8448	453.2
2005	9.9	1.25	11.15	1.25	32	7983	352.5
2006	4.5	1.15	5.65	1.15	36	4045	319.5
2007	5.5	1.2	6.7	1.1	28	4725	93.4
2008	4.3	0.9	5.2	0.43	25	3387	114.5
2009	3.6	0.99	4.59	0.54	25	2964	141.2

**Table 4.5. Degasification Parameters, Mine Named After Kalinin**

#	Indicator	Parameter
1	Number of Pumping Stations	1
2	Number of Pumps, 150 m <sup>3</sup> /min Capacity	0
3	Number of Pumps, 50 m <sup>3</sup> /min Capacity	2
4	Number of Longwalls Degassed	1
5	Average Degasification Statistics	
	Methane–air Mixture Consumed, m <sup>3</sup> /min	8.0
	Methane Content, percent	25.0
	Methane Capture Rate, m <sup>3</sup> /min	2.0
	Methane Utilization Rate by Season, m <sup>3</sup> /min	
	Winter	2.0
	Summer	0.2
6	Length of Pipeline, m	13,700



Figures 4.2-4.4 Trends in Coal Production and Methane Emissions at Mine Named After Kalinin.