

# The Global Methane Initiative

## LFG Projects Development within the Global Methane Initiative Program in Ukraine

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# Presentation structure

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- Ukrainian landfills
- LFG capture and utilization potential
- GMI projects
  - Landfill gas assessment (Khmelnitskiy, Lutsk), pump tests (Chernivtsy, Mariupol)
  - Infrared heaters at Ukrainian landfills (Khmelnitskiy)
  - Landfill gas recovery and flaring (Rivne)
- Problems and prospects of LFG technology development in Ukraine

# Ukrainian landfill and waste dumps

Town	Population	Starting year	MSW, t/year	MSW in place, mill tones	Area, hectares	Depth, meters
Kiev	2,642,000	1986	500,000	7,5	35.5	15-20
Kharkiv	1,622,000	1975	200,000	2.2	20.8	30
Dnipropetrovsk	1,050,000	1998	85,000	0.5	7.5	15
Odessa	1,005,000	1972	250,000	5.3	30	22-25
Donetsk	1,000,000	1991	150,000	2.5	21.5	10-15
Zaporizhzhia	800,000	1952	270,000	8-12	47	25
Lviv	730,000	1959	230,000	8,4	33.3	35
Mariupol	480,000	1967/76	100,000	2.5+2.5	12+12	30/20
Luhansk	450,000	1979	80,000	2.5	8.4	20-25
Khmelnitskiy	250,000	1956	75,000	3,0	8.8	35

# Ukrainian landfill and waste dumps



- Steep slopes (up to bottom waste loading)
- Fire events
- Improper covering (big active spot)
- Leachate flooding

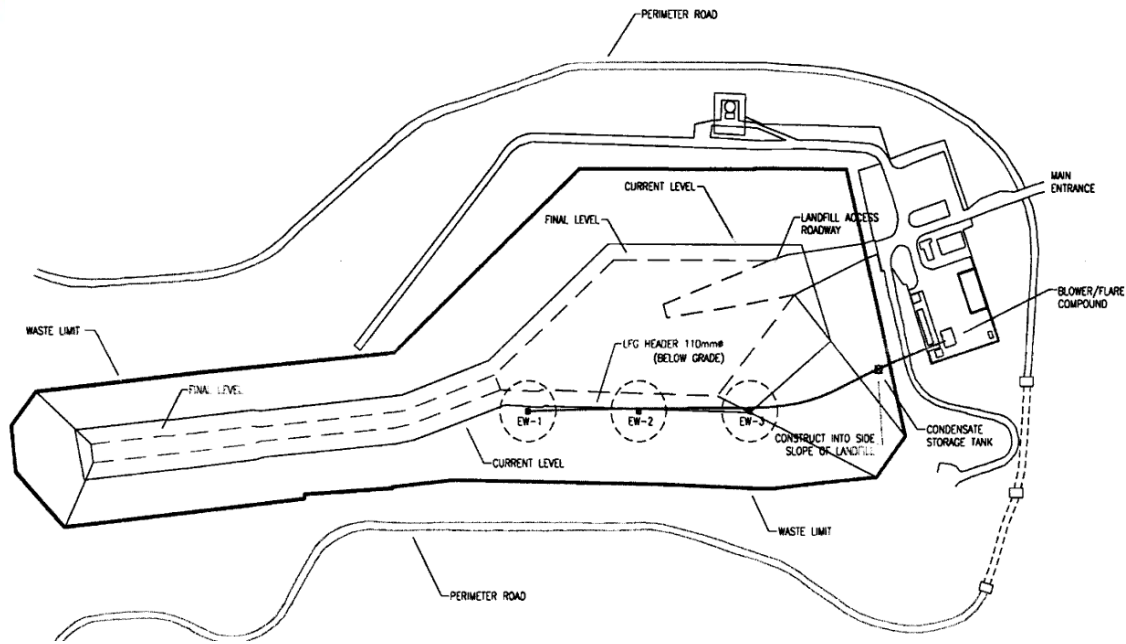
# Landfill gas potential



- Ukrainian towns generate **10-12 mill tones** of MSW per year
- More than **95%** of MSW is disposed at the landfills. There are **700** landfills located around the towns.
- Only **100** of them can be considered as potential candidates for recovery and utilization of landfill gas.

- Based on this facts, potential of landfill gas available for energy production comes to about **400 mill m<sup>3</sup>/year** that is equivalent to **0.21 mill toe** or **6.0 mill CO<sub>2</sub>e**

# Luhansk landfill



First experience –  
demonstration wells (2003-2006)

60 m<sup>3</sup>/h of LFG (50% of CH<sub>4</sub>)

# GMI projects

## LFG assessment reports

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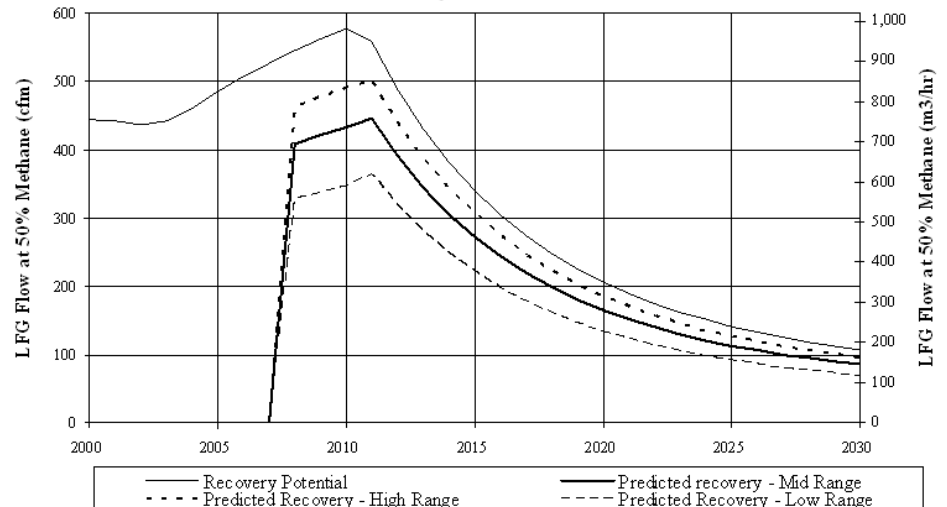
- Khmelnytskyi
- Lviv
- Lutsk
- Chernivtsy
- Mariupol
- Sumy
- etc.

# GMI projects

## LFG assessment - Khmelnytskyi



**Figure 2. LFG Recovery Projection**  
**Khmelnytsky Landfill, Ukraine**



- Landfill
  - Starting year - 1956
  - MSW – 75,000 tones/year
  - Area – 8.8 hectares
  - Depth - 35 meters
  - Waste in place – 3.0 mill tones



# GMI projects

## LFG projection based on pump test - Chernivtsy



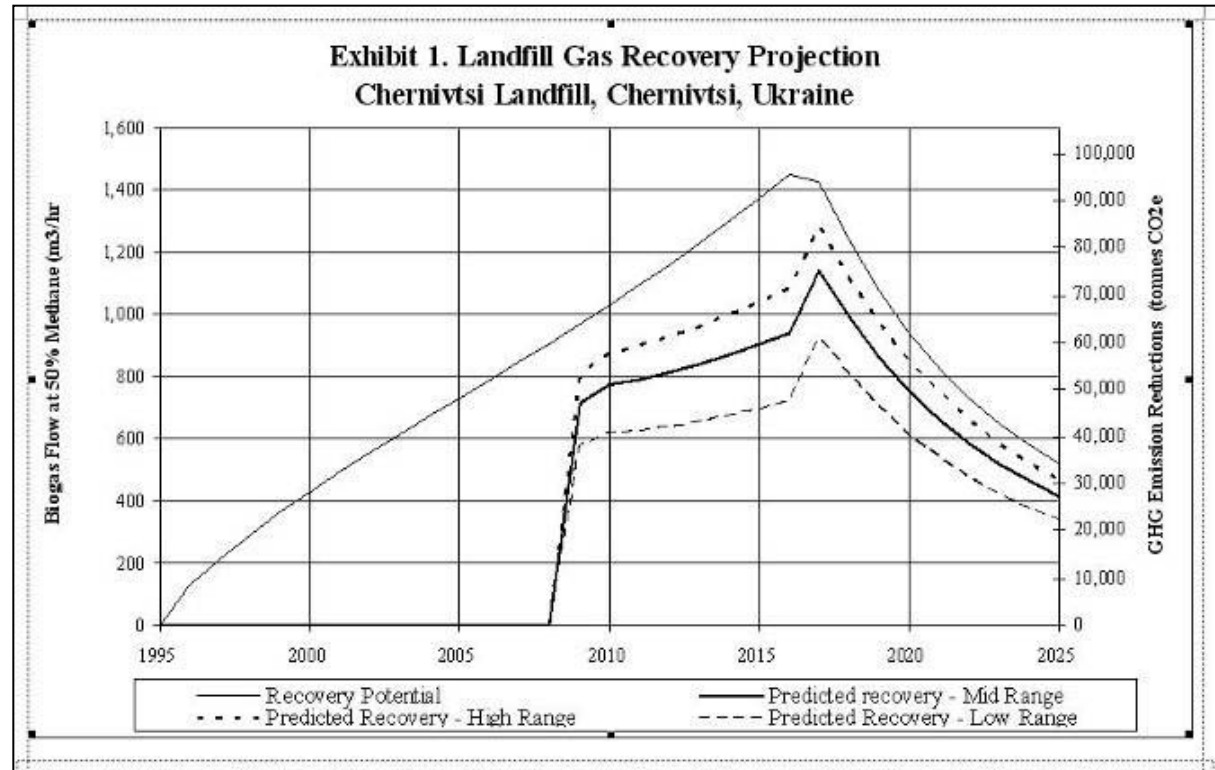
- Landfill
  - Starting year - 1995
  - MSW - 70-80,000 tones/year
  - Area - 25 hectares
  - Depth - 15-18 meters
  - Waste in place – 0.8 mill tones



- Pump test
  - Duration – two weeks in July 2007
  - Three wells and four pressure probes
  - Methane flow – 75-25 m<sup>3</sup>/h
  - Methane content – 55-40%
  - Oxygen content – < 0.6%

# GMI projects

## LFG projection based on pump test - Chernivtsy



Lo total = 118.0 m<sup>3</sup>/Mg

k (fast-decay) = 0.180/year

k (medium-decay) = 0.036/year

k (slow-decay) = 0.009/year

# GMI projects

## LFG projection based on pump test - Mariupol



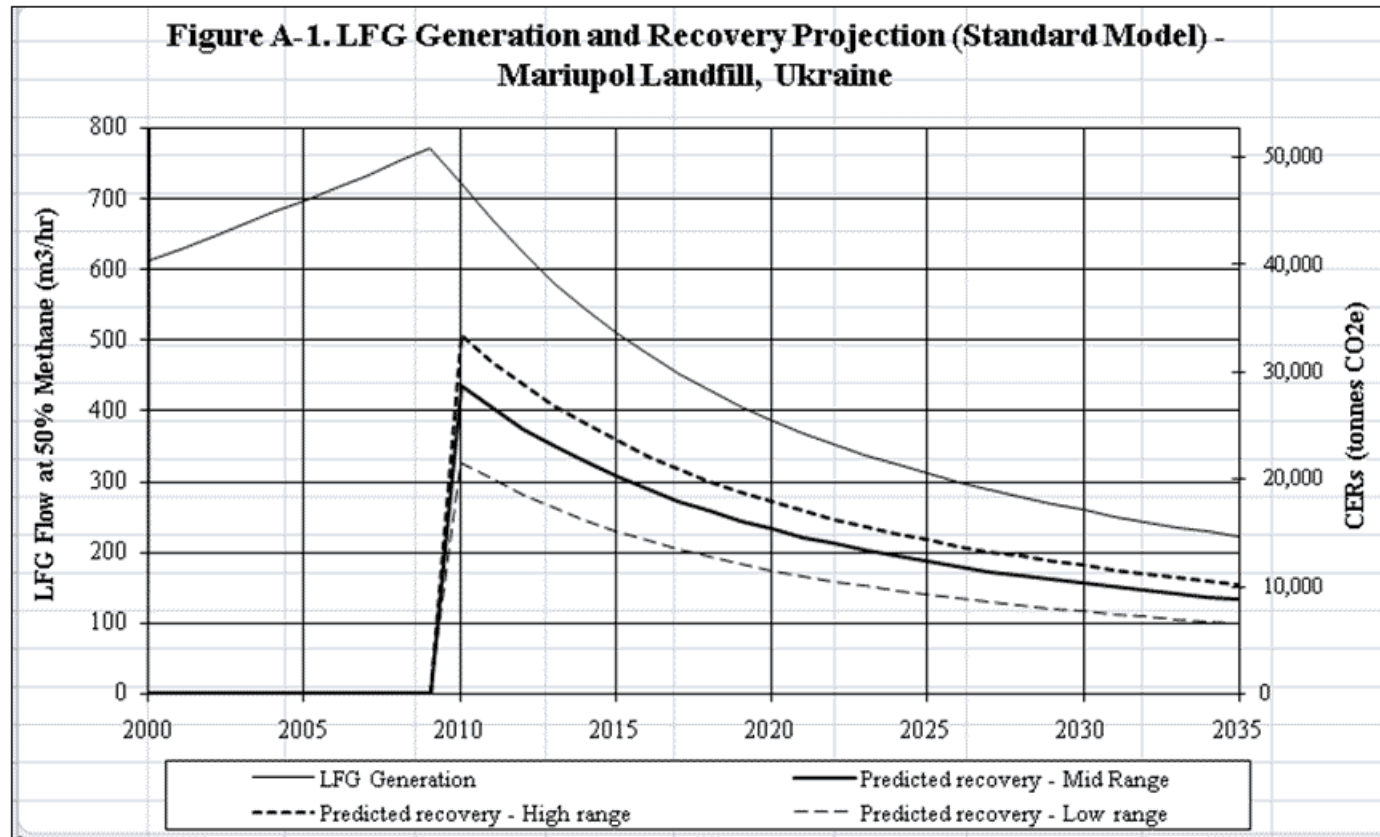
- Landfill
  - Starting year – 1967
  - Closure - 2009
  - MSW – 75,000 tones/year
  - Area - 12 hectares
  - Depth – 25-30 meters
  - Waste in place – 2.5 mill tones



- Pump test
  - Duration – four weeks in August-September 2008
  - Three wells and nine pressure probes
  - Methane flow – 50-45 m<sup>3</sup>/h
  - Methane content – 65-35%
  - Oxygen content – < 0.8%

# GMI projects

## LFG projection based on pump test - Mariupol



Lo total = 84.0 m<sup>3</sup>/Mg

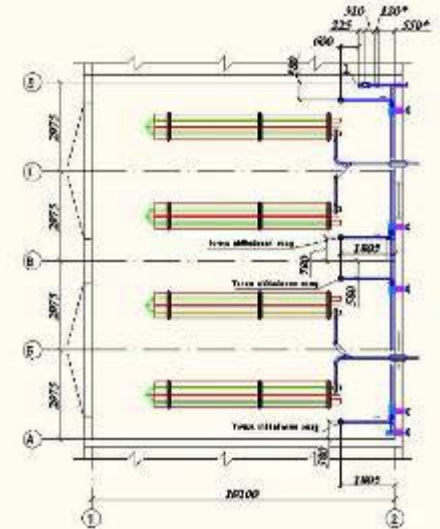
k (fast-decay) = 0.140/year

k (medium-decay) = 0.028/year

k (slow-decay) = 0.007/year

# GMI projects

## Infrared heaters based on LFG

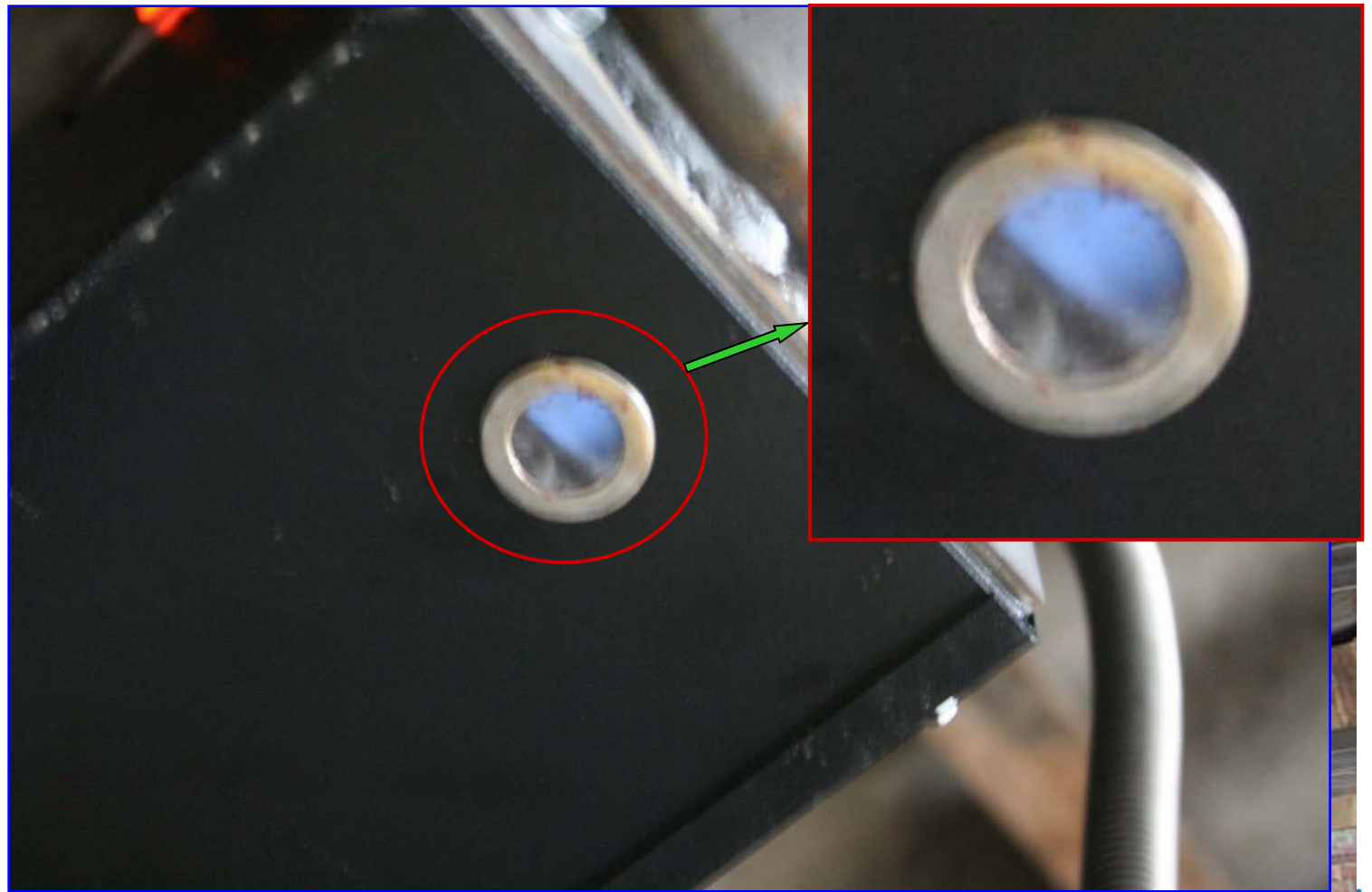


- Heated area – 2 x 126 m<sup>2</sup>
- Type of IR-heater – *Roberts Gordon Black Heat U30*
- Capacity – 30 kW
- Number of heaters - 4



# GMI projects

Infrared heaters based on LFG



# GMI projects

Infrared heaters based on LFG



# GMI projects

## LFG recovery and flaring (Rivne/Chernigov landfill)



- Landfill
  - Starting year - 1959
  - MSW – 120,000 tones/year
  - Area – 22 hectares
  - Depth – 15-25 meters
  - Waste in place – 2.0 mill tones
  
- Pump test
  - Duration – May 9-20 and July 29-August 05, 2009
  - Three wells and twelve pressure probes
  - Methane flow – 55-20 m<sup>3</sup>/h
  - Methane content – 50-35%
  - Oxygen content – < 1.2%



# GMI projects

## LFG recovery and flaring (Rivne/Chernigov landfill)



### Future pump test

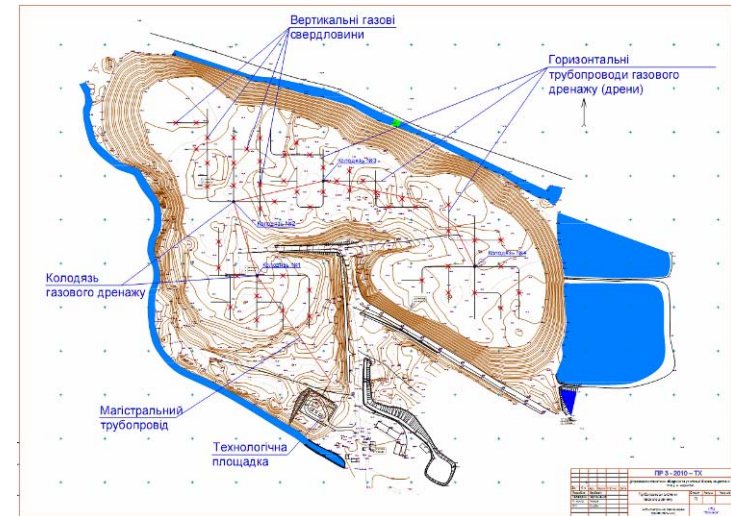
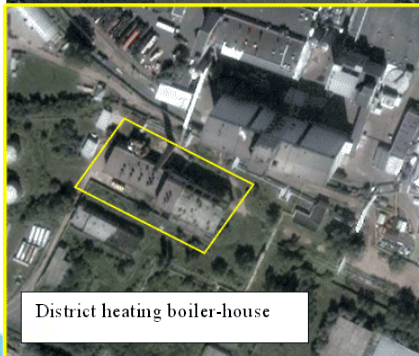
- Duration – end of December – April ,2011
- Three gas extraction wells

### Landfill

- Population – 300 000
- Starting year - 1961
- MSW – 120,000 tones/year
- Area – 14 hectares
- Depth – 15-20 meters
- Waste in place – 2.0-2.5 mill tones

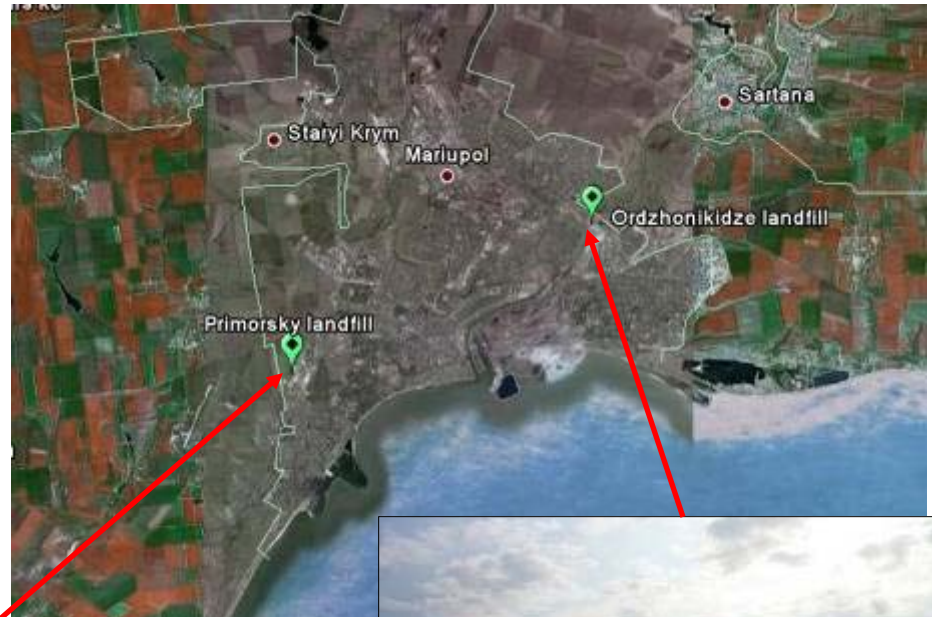
# Chernigov landfill

LFG collection and transportation to boiler house (District heating and hot water supply)



- Well number - 56
- LFG flow – 300-500 m<sup>3</sup>/h
- GHG emission reduction – 20-35,000 t CO<sub>2</sub>-eq/year

# LFG project in Mariupol (Joint Implementation)



# LFG project in Mariupol (Joint Implementation)



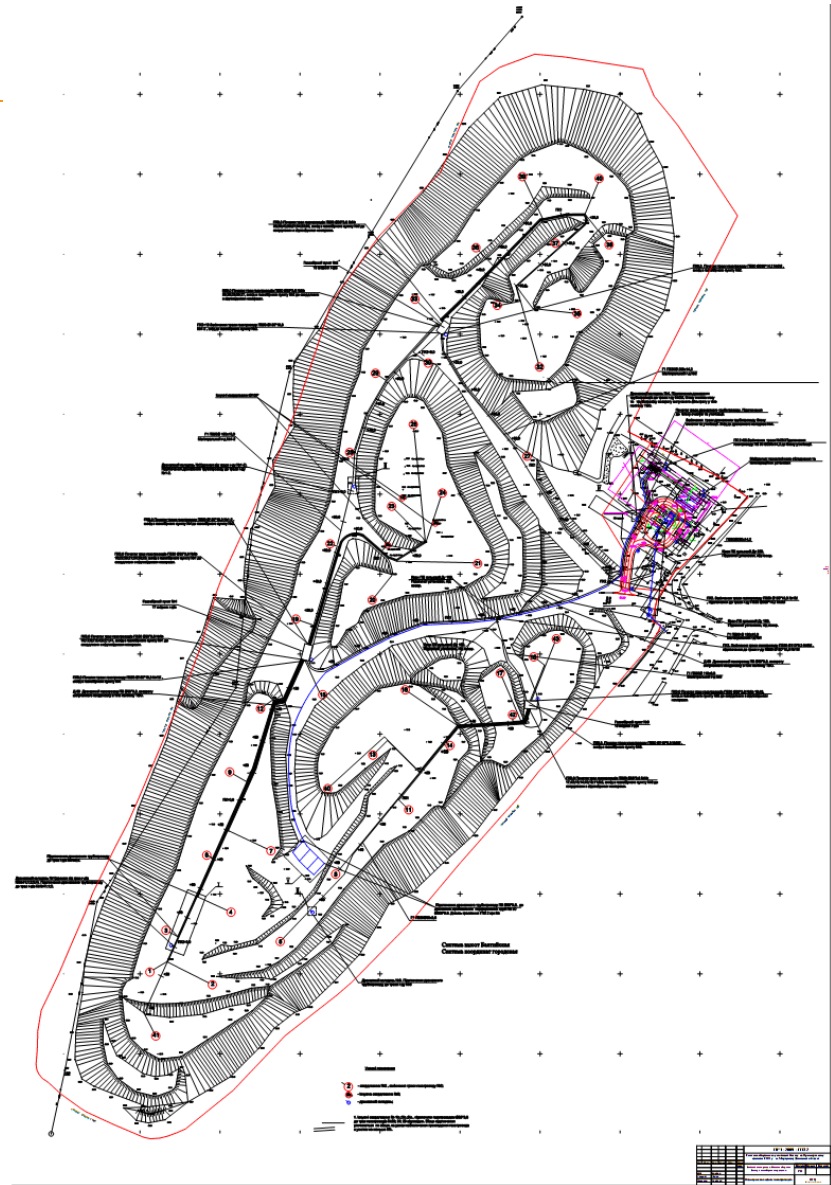
- Population – 480,000
- Starting year – 1967/1976
- Closure – 2009/2011
- MSW – 120,000 tones/year
- Area – 12+12 hectares
- Depth – 30/20 meters
- Waste in place – 2.5+2.5 mill tones

# LFG project in Mariupol

## Landfill #1 – design



52 wells,  
3 gas collection points,  
total piping – 6.4 km



# LFG project in Mariupol

## Landfill #1 - construction



# LFG project in Mariupol

## Landfill #1 – LFG utilization options

Start up – February 2010

Stage 1 (2010) –  
flaring at Hofstetter  
Umwelttechnik AG  
*HOFGAS® – Ready 800*

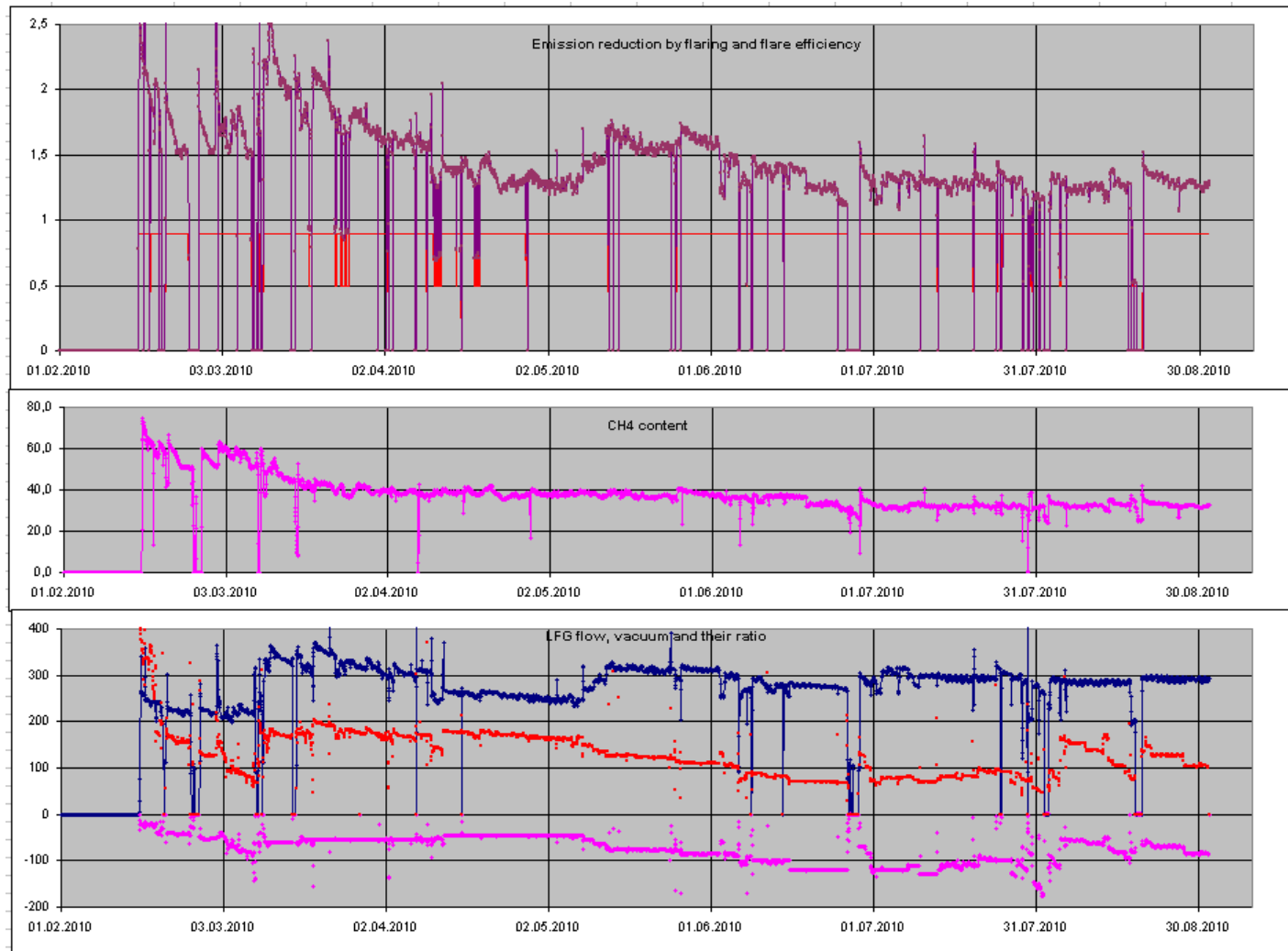


Stage 2 (2011) –  
CHP Jenbacher engine 0,625 MW

Stage  $\frac{3}{4}$  (2011-1012) -  
Landfill #2



# LFG project in Mariupol Monitoring





# Problems and prospects of LFG technology development in Ukraine

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- Local project structure and decision making – bottleneck
- Key point - financial conditions and level of interest of the owner/operator of the landfill site
- Low waste management tariffs. Co-financing from owners (municipalities) and operators can hardly be expected
- Bad technical conditions and a lack of reliable technical data at some landfills restrict practicability of potential JI projects
- Ukraine is not big. Ukrainian landfills are relatively small

# Problems and prospects of LFG technology development in Ukraine

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- Currently LFG projects at old landfills can hardly be implemented without Kyoto Protocol
- The main GHG emission reduction potential is connected to the towns with population more than 200,000 – 33 towns
- The usual method of LFG utilization can be power generation by IC-engines
- For smaller town with population less than 100 thousands inhabitants LFG can be captured and flared without utilization. For JI project it can be recommended to joint 3-5 landfills in the certain region under one project umbrella
- Condition would improve:
  - price for natural gas goes up
  - support of the government by green tariffs for electricity
  - implementation of the strategy of new regional landfill erection and old landfill closure

# Thank you for your attention

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