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LANDFILL GAS TO ENERGY PROJECTS IN POLAND

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Overview

- **Description of Instytut Nafty i Gazu (Oil & Gas Institute)**
- **Landfills in Poland**
- **LFG to Energy Projects in Poland**
- **Challenges**
- **Summary**

Instytut Nafty i Gazu

Oil & Gas Institute

The Institute's research scope comprises all stages of natural gas fuel chain, prospecting for and mining oil, environmental protection and **renewable energy** in particular:

- assessment of exploration prospects in various regions of the country;
- assessment of geological, mineable and industrial deposits of oil and natural gas;
- drilling technology;
- management and mining of natural gas and oil deposits;
- evaluation of plastic materials used in gas industry;
- technical evaluation of gas pipe fittings and gas metering systems;
- evaluation and quality control of hydrocarbon fuels;
- new technologies of gas use;
- **environmental protection issues in the oil and gas industry;**
- **technical assistance in landfill gas capture and utilization (Renewable Energy Technology Department)**

Instytut Nafty i Gazu

Oil & Gas Institute

Renewable Energy Technology Department

- Designs landfill gas capture and utilization systems
- Performs landfill gas modeling and gas pump tests for verification of gas production
- Performs cost assessments of landfill site construction projects and degasification of municipal landfills (pre-feasibility studies)
- Provides technical assistance for operational LFGE projects
- Participates in international landfill gas and biogas project

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Landfills in Poland

Landfills conditions:

- Landfills in Poland are well managed.
- According to Polish Law every landfill is required to have leachate and LFG collection systems. Ground water contamination monitoring and landfill gas emissions are also required.

Landfill sizes:

- Many landfills but small and medium size. Larger landfills exist only in major urban areas (main cities or capitals of voivodeships).

LFG to Energy Projects in Poland

- Electricity generation from LFG is dominant technology in Poland (more than 90% of LFGE projects)
- There are only a few CHP installations (heat is sold to end users)
- The most commonly used LFG electricity generation technology is internal combustion engines
- Most installations are located at large municipal landfills

LFG to Electricity Projects in Poland

Number of projects and its capacity

Voivodeship	Project quantity	Capacity [MW_e]
dolnośląskie	5	4.345
kujawsko-pomorskie	7	2.987
lubelskie	2	0.660
lubuskie	1	0.500
łódzkie	4	3.336
małopolskie	5	2.938
mazowieckie	18	9.970
podkarpackie	3	1.764
podlaskie	1	0.700
pomorskie	4	2.654
śląskie	14	9.733
świętokrzyskie	1	0.360
warmińsko-mazurskie	2	1.142
wielkopolskie	6	4.590
zachodniopomorskie	8	2.394
Total	81	48.073
Source: Energy Regulatory Office, updated: 31.03.2011		

LFG to Electricity Projects in Poland

LFG Electricity Projects in 2002 – 2011

LFG Projects Capacity:

Year 2002* – 15 MW
Year 2003* – 15 MW
Year 2004* – 17 MW
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October 2011# – **48 MW**

* source: Obwieszczenie Ministra Gospodarki w sprawie ogłoszenia raportu zawierającego analizę realizacji celów ilościowych i osiągniętych wyników w zakresie wytwarzania energii elektrycznej w odnawialnych źródłach energii (M.P.06.31.343)

source: http://www.ure.gov.pl/uremapoze/mapa.html

LFG to Electricity Projects in Poland

Possible reasons for increase in LFG energy installations

- Subsidies for construction of a installation (UE resources)
- Energy Certification - availability of “Green Certificates”. Additional revenue source.
- Increased investor interest in landfill gas

LFG to Electricity Projects in Poland

Revenue sources

- Conventional electricity market price is established by The Energy Regulatory Office – 195 PLN/MWh*
- „Green certificates” – 280 PLN/MWh* (additional amount to conventional electricity price)

*** October 2011**

LFG to Electricity Projects in Poland

Barycz Landfill, Krakow

Project description:

- Capacity: 1,340 MWe (average output 1,0 MWe)
  (249 kWe + 249 kWe + 373 kWe + 469 kWe)

- Pump station output: max 1000 m^3/h of LFG

- Average LFG composition:

CH_4 60% [v/v]
CO_2 37% [v/v]
O_2 0,0% [v/v]
N_2 2,85% [v/v]
rest 0,15% [v/v] pollutants like (H_2S, CO etc.)

LFG to Electricity Projects in Poland

Barycz Landfill

LFG to Electricity Projects in Poland

Barycz Landfill

Challenges

- Increasing of waste heat utilizing. Waste heat is rarely utilized because of lack of onsite or adjacent thermal demand.
- Captured LFG should be sent through a cleaning (treatment) system before use. When raw gas is used, it causes problems in energy installations (engines).
- In Poland, landfills are relatively small. LFG captured from these landfills is low (50 m^3/h).

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Summary

- Landfill gas in Poland is utilized for energy at larger landfills (electricity generation)
- Small and medium sized landfills typically flare gas without utilization
- Regulatory limit of amount of organic matter in landfills will cause reduction of gas generation
- Landfill gas needs to be minimally treated before use in internal combustion engines
- Improved landfill management will allow landfills with low gas production to still utilize gas for energy projects