



Clean energy and climate change mitigation globally

Capture the energy



Welcome to Green Gas International

Green Gas is an international clean energy company that specialises in converting methane emissions from coal mines, landfills and biomass into clean energy.

Whilst improving our customer productivity and safety, we provide new and clean sources of electricity and heat, and eliminate a potent greenhouse gas and waste.

We offer a fully funded, integrated and commercially attractive solution for gas management and utilisation for coal mine and landfill owners.

We cover gas collection, gas drainage, project management, operations and maintenance.

With over 40 projects operating in Europe and a consolidated 50 year track record in the industry, we help our customers and communities to reduce their carbon footprint, in a commercially viable way.

Vision

Green Gas aims to be the preferred partner of coal mine, landfill and biomass owners. We add value to our partners by improving their core business and providing focus as well as technical and operating expertise to the business of monetising their waste.

A global challenge

Methane (CH₄) – a potent greenhouse gas

- Methane is a potent greenhouse gas – over 21 times more effective in trapping heat in the atmosphere than carbon dioxide (CO₂)
- Methane remains present in the atmosphere for approximately 9 to 15 years
- Research indicates that methane is now more abundant in the Earth's atmosphere than at any time during the past 400,000 years
- Methane is highly flammable and may form explosive mixtures when in contact with air.

Coal mines and landfills emit methane

- Coal mines and landfills are amongst the largest sources of usable methane gas emissions
- Together they represent some 2 per cent of global greenhouse gas emissions and approximately 21 per cent of methane emissions from human-related sources
- Coal mine methane released during coal mining activity will disrupt coal production and cause serious safety and health hazards if not managed properly
- In landfills and open dumps, methane is produced as a natural by-product from waste decomposed under anaerobic conditions, causing harm to the environment and local communities.

When properly extracted, coal mine methane and landfill gas can be used to produce electricity and heat, thus eliminating a greenhouse gas and generating revenues.



CMM energy plant 'Blumenthal 7'
Recklinghausen, Germany



Coal mine methane

Our solution

Working with our partners, we have built a reputation for solving coal mine methane (CMM) problems. By integrating the technical solutions needed at every stage of gas release from coal seams with the efficient utilisation of the resulting gas flows, we help gas owners to maximise revenues from the sale of power, heat and carbon credits.

To facilitate the subsurface stage of this process, we employ international best practice for gas capture at high purity from underground sources, taking into account the local geological setting and mining methods.

The resulting commercial quality gas streams will be a combination of gas which has been:

- Drained directly from the seams before mining
- Drained from gas horizons affected by the mining process
- Collected from voids left behind after mining.

By 'capturing' gas in this way, we are able to facilitate a significant improvement in mine productivity and safety. This is because we remove gas from the mine at a safe concentration that would otherwise flow into the working areas of the mine.

We utilise the captured gas in a combination of class-leading high-temperature flares and combined heat and power (CHP) plants, designed and operated to maximise the value from the gas resource.

By adopting this integrated approach, we closely match the specification of the utilisation equipment to the optimised and accurately-predicted gas flows, enabling the equipment to be operated continuously at maximum efficiency.

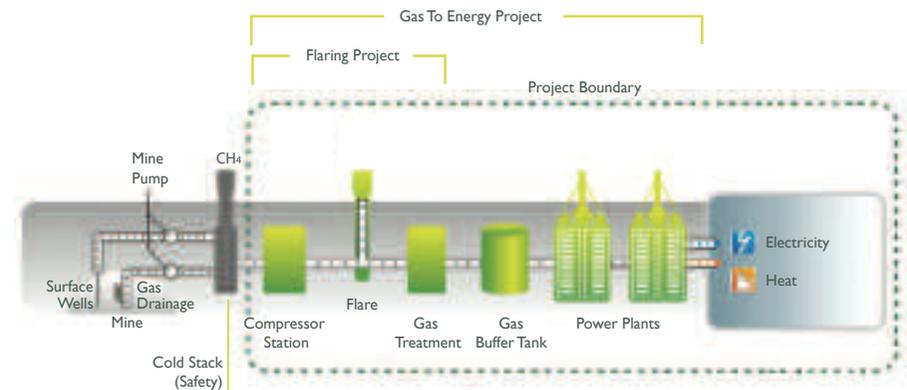


CMM energy plant 'Blumenthal 3/4'
Recklinghausen, Germany

Partners benefit from:

- Improved coal mine safety and productivity
- Reduced greenhouse gas emissions
- Fossil fuel energy sources replaced with green energy
- Additional revenue from the sale of heat and power.

CMM utilisation



MINE GAS EXTRACTION

Mine gas is drained from the mine:

- For mine safety
- To allow increase in coal production
- To allow gas utilisation
- To reduce methane in the ventilation air.

MINE GAS COMPRESSION

The gas is independently compressed to secure maximum operating hours of the utilisation part of the project.

FLARING

Surplus gas is flared and methane converted into CO₂ thus reducing greenhouse gas (GHG) emissions.

MINE GAS TREATMENT

Mine gas is cleaned and dried in the gas treatment plant.

GAS BUFFER TANK

The gas is collected in a buffer tank to secure maximum operating hours of the power plant.

POWER PLANTS

By turning the gas into electricity and heat in combustion engines methane emissions are avoided and demand for other fuels is reduced. Thus GHG emissions are reduced.

Technology and expertise

Green Gas DPB (www.dpb.cz)

Green Gas DPB is a wholly-owned subsidiary of Green Gas. It offers a surface and underground drilling capability as well as mine gas production and distribution.

The company distributes around 100 million m³ of CMM (100% methane concentration equivalent) from both abandoned and operating coal mines, for sale as a fuel and for the production of heat and electricity.

Green Gas DPB conducts routine drilling for gas drainage, geothermal water, geological exploration and large diameter ventilation boreholes, supported by extensive laboratory facilities.

Hofstetter Umwelttechnik AG (www.hofstetter-uwv.ch)

Based in Switzerland, Hofstetter Umwelttechnik AG (Hofstetter) specialises in gas collection systems and flares. With over 30 years experience and over 1,500 plants installed worldwide, Hofstetter uses the latest incineration technology to ensure the safe and quiet flaring of gas.

Operating success

Czech Republic

Within the Czech Republic, Green Gas DPB has a coal mine gas portfolio of projects that provide some 30 MWel of annual generating capacity. This generates enough power for 50,000 households, while reducing annual carbon emissions by 1.2 million tonnes. 22 MW of this total planned generating capacity was already operational in 2008.

Germany

Green Gas is particularly active in the Ruhr area of Germany. With numerous projects, including the Kurl 3, Weme Schacht 3, and Minister Stein projects, each having a prospective annual CO₂ emission reduction equivalent to 95,000 tonnes. The largest is the Ewald Fortsetzung project, which has a prospective annual CO₂ emission reduction equivalent to 246,000 tonnes. CO₂ emissions are reduced by capturing methane and converting it into electricity and heat by combustion of coal mine methane in gas engines.

CMM energy plant 'Haus Aden'
Bergkamen, Germany



Landfill gas

Our solution

Green Gas is an international developer of projects utilising landfill gas. We offer bespoke integrated solutions covering the entire value chain, from gas collection to the sale of heat and power.

With over 30 years experience in the landfill gas industry we have installed more than 200 energy generation projects along with 1,500 flaring projects worldwide. This represents an electrical capacity of over 120 MW.

Our specialised solution includes the optimisation of landfill practices with respect to leachate water and gas collection systems, maximising revenues by optimal utilisation schemes.

We add value based on:

- Reducing the technical risk of a project
- Integrating Kyoto Protocol requirements
- Financing or co-investing in projects.

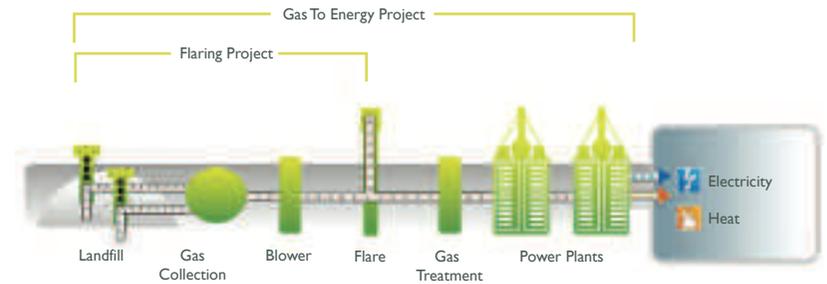
Our technical solution includes:

- Gas prognosis and analysis
- Optimisation of landfill practices to maximise gas collection
- Secured degasification of landfills
- Improving the gas quality
- Optimising utilisation alternatives through:
 - *Modular unit design*
 - *Utilisation of lean calorific value landfill gas*
 - *Grid connections*
 - *Control systems*
- Engineering, procurement and construction management (EPCM)
- Operational and maintenance management.

Partners benefit from:

- Reduced greenhouse gas emissions
- Improved safety at or near landfill
- A reduction in unpleasant odours
- Fossil fuel energy sources replaced with green energy
- Additional revenue from the sale of heat and power

LFG utilisation



GAS COLLECTION

Gas is collected through gas wells on the landfill and transported through pipelines to the blower.

FLARING

Methane is converted into CO₂ thus reducing greenhouse gas (GHG) emissions

GAS TREATMENT

The gas is treated by gas cleaning systems to secure the gas quality before utilisation

POWER PLANT

The gas is transformed into electricity and/or heat by combustion engines

ELECTRICITY/HEAT

The electrical energy produced is fed into the grid. If applicable, thermal energy can be sold to customers

Project Examples

Jan Karel, Czech Republic

Installation of two CHP units on the premises of an active carboniferous mine. Gas is delivered from a central gas system supplying mine gas. The electricity generated is delivered into the local distribution network, with heat delivered to the boiler-room of the mine. 2 x 1.6 MW electrical output, annual energy production of approx 24,700 MWh.



CMM Jan Karel
Czech Republic

Blumenthal, Germany

In 2007, Green Gas installed 4 MW generating CHP plant in the city of Recklinghausen, operated from closed mines with CH₄ content below 25%. The plant generates approximately 25,000 MWh per year, with a prospective annual emission reduction in tons CO₂ equivalent to 129,000.



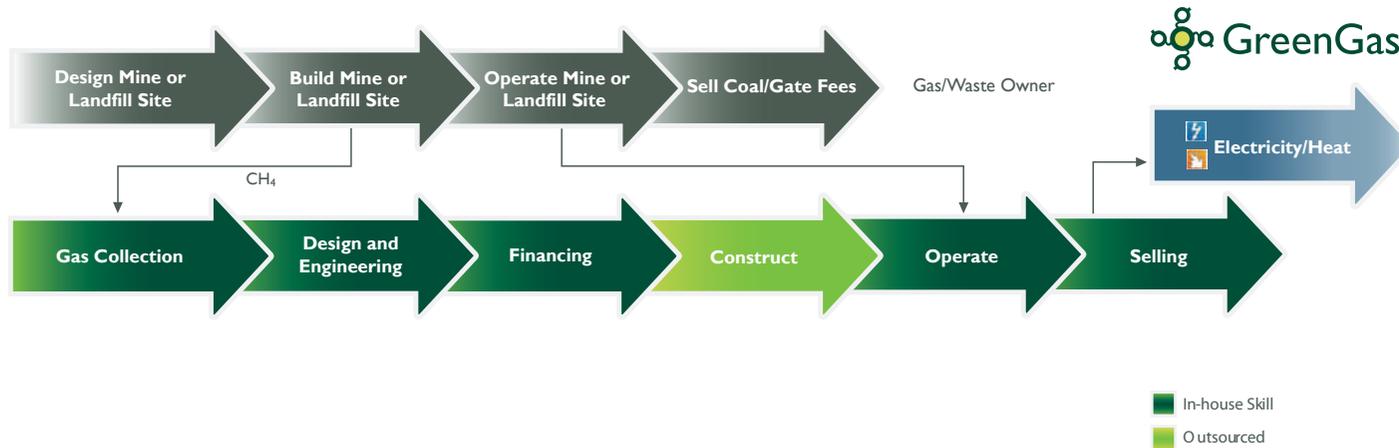
CMM Blumenthal
Germany

CMM flaring project
Krasnodon Ukraine

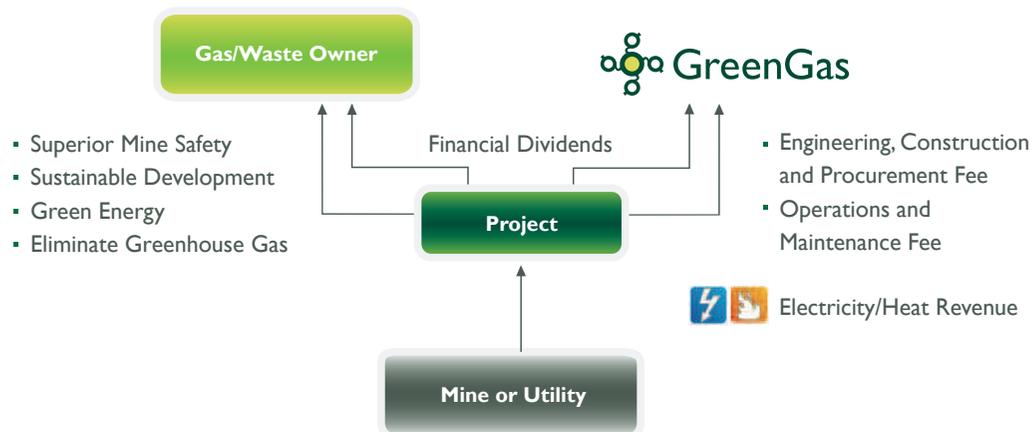


Added value

We cover the whole value chain:



We provide substantial benefits through partnership:



Committed to our communities

Using methane for energy is a 'win-win' opportunity for sustainable development. Our projects involve communities, local governments and industry. We work hand-in-hand with community and corporate entities to fulfil their commitments to cleaner air, renewable energy, economic development and improved public welfare and safety.

Employing local people and using local services during construction projects and in ongoing site activity is an important objective to benefit communities close to our operations.

We provide innovative ways to deal with methane emissions, enabling our customers to improve their operating environment, to benefit from better waste management, and demonstrate responsible citizenship.



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