



# ELECTRICITY GENERATION FROM LANDFILL GAS

Project funding options

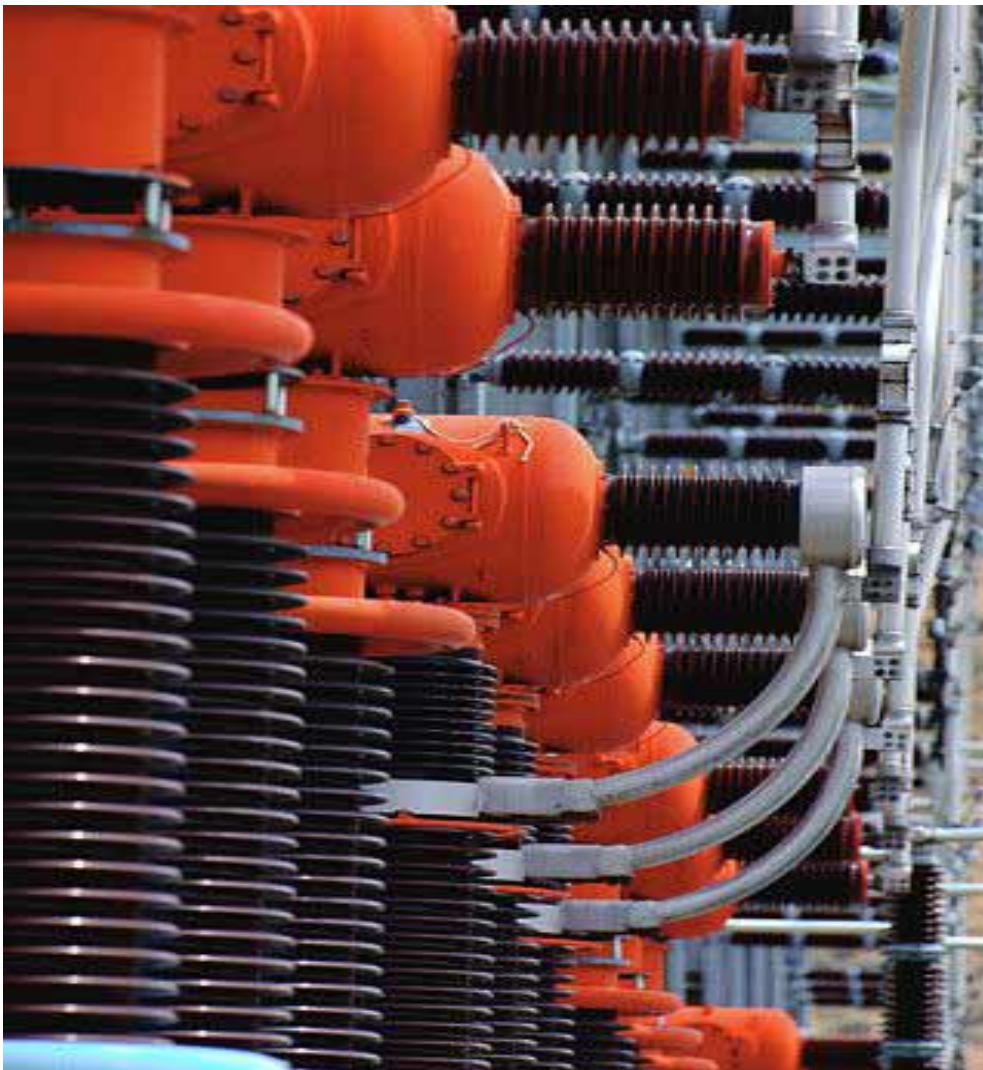
Feasibility studies

Pumping trials

Complete project design

Manufacture, install and commission

Operation and maintenance



## PROJECT ROUTE

DESK STUDY TO EVALUATE  
POTENTIAL FOR  
ELECTRICITY GENERATION

FIELD DATA COLLECTION TO  
DETERMINE FACTORS THAT  
WILL IMPACT UPON  
VIABILITY

PUMPING TRIALS TO  
DETERMINE EQUILIBRIUM  
PRODUCTION RATE OF  
LANDFILL GAS

DECIDE UPON CAPACITY FOR  
POWER STATION

SYSTEM DESIGN INCLUDING  
GAS EXTRACTION SYSTEM,  
GAS TREATMENT (IF  
REQUIRED), ENGINE LOCA-  
TIONS AND ELECTRICAL CON-  
NECTION

ESTABLISH THAT FINANCE IS  
IN PLACE AND ADEQUATE  
FOR THE FULL PROJECT  
IMPLEMENTATION

PROCURE COMPONENT  
PARTS OF THE PROJECT

CONSTRUCTION AND  
COMMISSIONING

OPERATION AND  
MAINTENANCE

## PRE-REQUISITES

The utilisation of landfill gas for electricity generation is an established commercial activity. The days of risk assessment and uncertainty have long since passed. The technology involved may be applied with certainty.

In the late 1980s it was not unknown for a banker to require that a full gas extraction system be installed and operated for one or two years before it could be accepted that there was adequate gas for a commercially viable project.

Today the technology and understanding has advanced to the point where a desk study followed by a pumping trial, carried out by a suitably qualified, experienced and competent company, is adequate. It is now recognised that one or two years of full extraction is a significant waste of a valuable asset.

In landfill gas engineering, experience is of paramount importance. Every site is different and every site has its own pitfalls.

## DESK STUDIES

A good desk study will establish very clearly the scale of the opportunity involved.

It is necessary, as a minimum, to know approximately the quantities of waste in place and the tipping history of the site. The type of waste and its approximate composition is also important.

Other factors, such as the extent and quality of the capping employed, as

well as the hydrogeological regime in a site may make a significant difference to the overall project viability.

If, for example, the site is flooded, it may be necessary to allow for a full leachate extraction and treatment system prior to being able to access the landfill gas. The extent and cost of such an option must be assessed before the project progresses to a pumping trial.

A desk study would feed relevant information into a mathematical model. The mathematical model, showing the future profile of gas production is a key tool in determining the capacity of a given landfill site

With a good desk study it is possible to establish to some degree of accuracy the potential for landfill gas utilisation. Further project establishment activities would then be aimed at confirming this position, rather than discovering new information.

## FIELD DATA COLLECTION

Much can be learned from an on-the-ground study of a landfill. Aspects such as the best route to power lines and the fall of the land are important in deciding not only feasibility but also the optimum use of technology.

It is also important to have some understanding of the options for locating the power plant itself. These may be as much operational as geographic.

An experienced designer and generator will immediately pick up those aspects that will need to be addressed in formulating a plan of action.





## PUMPING TRIALS

A pumping trial is an advisable adjunct to a desk study. This will ensure that no unexpected conditions are encountered farther into the project. There is nothing worse for a developer than to discover that the gas profile envisaged by the desk study was actually incorrect.

It has been noted, for example, that in certain localities around the world



waste is burned in-situ in the landfill, both during and after tipping. Where this has occurred on a large-scale over a significant period of time the result may be that the actual organic content of the waste is at variance with that derived from the tipping history.

A pumping trial establishes the current equilibrium gas production rate at specific locations around a landfill site. From this information it is possible to confirm the accuracy of the production profile determined by a mathematical model.

## CAPACITY DETERMINATION

This is an important decision gate for any project. There is a temptation to consider that as landfill gas is "free" it is not important. However, it is clear that any investment should be made to work to the maximum that is available, without taking undue risks.

A power generation facility may be sized to take the full duty out of a gas production curve or it may be set up to play safe and avoid risk.

As the graph at the foot of this column shows, a curve may be fitted with up to 3.5 MW maximum at the appropriate time, or in the "play-safe" mode, this may be reduced to 2 or 3 MW.

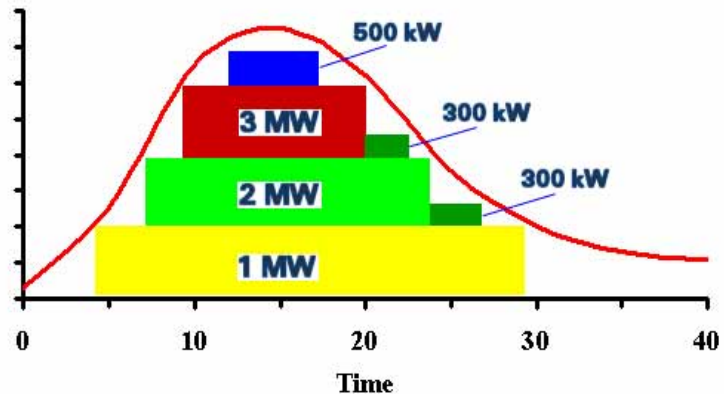
Being able to produce the maximum commercial return from a given situation requires a thorough understanding of the parameters involved and the realistic options that are available.

## SYSTEM DESIGN

As an understanding of the market and the needs of its customers have developed, so the main engine suppliers have progressively improved the quality of the fit between their product and market demand.

There are, therefore, no hard and fast rules about how a new system should be designed. Advantage should be taken of every commercial opportunity available.

Being at the forefront of this technological development has allowed Organics to offer the most appropriate solutions based upon the latest developments.



## KEY FEATURES

PROVEN EXPERIENCE IN POWER GENERATION FROM LANDFILL GAS OVER MORE THAN 15 YEARS

EQUIPMENT PROVIDING MORE THAN 95% AVAILABILITY FOR COMPLETE FACILITIES AND 99% FOR GAS PUMPING AND PROCESSING EQUIPMENT

TURNKEY DESIGN, MANUFACTURE AND INSTALLATION SERVICES AVAILABLE OR COMPONENT SUPPLY ONLY

FINANCE AVAILABLE THROUGH AFFILIATED COMPANIES

OPERATION AND MAINTENANCE SERVICES PROVIDED

A ONE STOP SOLUTION FOR A COMPLETE SERVICE RELATING TO THE EXPLOITATION OF LANDFILL GAS AS A COMMERCIAL RESOURCE

**GAS EXTRACTION**

Gas extraction from landfill sites is a critical element of a good landfill gas utilisation system. If well designed, it will allow tight control of the equilibrium gas production, ensuring stable operation for the duration of the project.

The specialised flow-control valve commonly employed by Organics will permit wellhead calibration by means of gas quality and flow rate; flow rate being adjustable to approximately 1 Nm<sup>3</sup>/hr. By use of this system operators have been able to finely balance systems to allow higher productivity on the back-end of the gas production curve.

Water is another difficult element in a gas collection system, both from ground water ingress through well-liners as well as condensate formation during active gas extraction. Care must be taken, down to a very detailed level, to ensure that water build-up does not effect system performance.

**FINANCE**

Given the success of companies operating landfill gas utilisation systems around the world, the question of finance is not as much of an issue as it used to be. The issue now is one of choice; to

select the source of finance most suited to the needs of any one particular situation.

**PROCUREMENT**

As a final lead-in to the actual implementation of the project, the procurement cycles will begin. There are several elements of the project which must be timed to arrive when required.

A common delay, and surprisingly a mostly unexpected one, is the establishment of an electricity export connection. As with many other aspects of this type of project, each situation has its unique sensitivities. It is necessary to maintain a critical awareness of the key elements to ensure that they are adequately covered.

**MANUFACTURE, INSTALLATION AND COMMISSIONING**

The staff at Organics has worked on over three hundred landfill sites during the course of the last fifteen years. This includes locations in the United Kingdom, the United States, Greece, Portugal, Turkey, Mexico, Thailand, Hong Kong, Singapore, New Zealand, Australia, and Ireland - to name but a few.

On all of these landfill sites the equipment that has been installed has been designed and manufactured by

the staff of Organics. This provides a thorough grounding for the team to be able to select the best equipment configurations, to design with an awareness of the issues involved and to monitor fabrication quality to ensure that quality failures do not obstruct project performance.

**OPERATION AND MAINTENANCE**

The final, and by no means least important, element in attaining a viable outcome is to maintain and operate installed systems in an optimum manner. As with all commercial activities there is a point at which every additional element of revenue goes straight to the bottom line.

Operating at 90% availability may be commercially viable but if the plant can be run with 99% uptime the additional 9% makes a significant impact upon the overall profit margin of the operation.

All the elements of such projects come round eventually to the same end point - excellence in application of knowhow leading to unassailable commercial success. This is the speciality of Organics



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