

Landfill Gas Capture, Flaring and Generation: CAPEX and OPEX overview

FACTSHEET

Councils across Australia have been implementing landfill gas capture systems as part of their efforts to reduce greenhouse gas emissions.

These systems capture methane from decomposing waste and either flare it, use it for electricity generation, or sometimes process and store it for later use. This fact sheet provides an indicative cost breakdown for both flaring-only systems and systems that include power generation, based on an analysis of aggregated, anonymised data from relevant Emissions Reduction Fund (ERF) projects implemented from 2011 to 2018, adjusted for inflation and expressed in terms of 2024 \$AUD values.

Flaring-only systems

Capital Expenditure (CAPEX)

A landfill gas capture system with flaring-only focuses on combusting methane to reduce emissions without generating electricity. Based on available data adjusted for landfills serving around 150,000 people, the costs have been conservatively estimated as follows:

Total CAPEX: \$1,250,000

- **Landfill gas capture system: \$675,000**
 - **Wellheads: \$75,000**
(21 wellheads covering 60m x 60m per well)
 - **Gas capture piping: \$450,000**
(500m of piping)
 - **Additional equipment and materials: \$150,000**
(pumps etc)
- **Flare system: \$400,000**
(capacity to handle 600 m³/hr landfill gas)
- **Electrical controls: \$75,000**
- **Engineering: \$100,000**
(design, project management, and installation)

The costs exclude landfill activities (e.g., land purchase, landfill equipment and buildings, fencing, approvals, site or cell development, operations, capping, rehabilitation and aftercare).

Operational Expenditure (OPEX)

Flaring-only systems have ongoing costs for operation, expansion and maintenance. The annual OPEX for a landfill of this size is approximately:

Total OPEX per annum: \$205,000

- **O&M for landfill gas capture system: \$105,000**
- **Expansion of gas collection network: \$45,000**
- **O&M for flare system: \$20,000**
- **Insurance: \$25,000**
- **General Administration: \$10,000**

These costs include the routine maintenance of wellheads and flare systems, insurance, and administrative overheads.

Flaring with power generation systems

Capital Expenditure (CAPEX)

For landfills that incorporate or add power generation, the gas captured is used to generate electricity in addition to flaring any excess. Based on available information, the costs for a landfill serving 150,000 people are approximately:

Total CAPEX: \$4,550,000

- **Gas capture and flaring CAPEX (as above but with downsized flaring system): \$1,050,000**
- **Power generation system: \$2,500,000**
(capacity to generate 1 MW+)
- **Additional engineering: \$100,000**
(design, project management, and installation)

The power generation system includes gas engines, biogas scrubbing system, gas/exhaust, pipework, associated electrical works (instrumentation and control, high voltage switchgear, switchboard, control systems, transformers, circuit breakers, etc.), and general mechanical/civil/earth works.

Operational Expenditure (OPEX)

Power generation systems incur higher operational costs due to the maintenance of power generation engines. Power generation engines also require major overhauls after every 16,000 MWh of operation, approximately every 3 to 5 years. Overhaul costs include labour, parts, and equipment and should be factored into long-term planning. For a 1 MW+ power generation system, this could amount to \$300,000 to \$400,000. The estimated annual OPEX for this setup is:

Total additional OPEX per annum: \$230,000

- **O&M for power generation engines: \$145,000**
- **Engine overhaul costs (annualised): \$75,000**
- **General Administration: \$10,000**

These costs include the routine maintenance of wellheads and flare systems, insurance, and administrative overheads.