



Clean Air Gas Engines

Clean & Affordable Power



CAGE has developed a range of world leading ultra low emission gas engines and generators that can use any gas fuel with large cost savings over diesel power.

Pollution & High Energy Costs

**Diesel generators
produce pollutants
that harm human health**



Solution for construction



Viabile alternative to diesel for off-grid applications



Reduces local harmful emissions & Carbon saving over diesel



Reduces fuel costs



Enables transition from diesel to net zero fuels



Affordable small and medium size generators



Engines, Generators, Hybrids



- World leading gas engines using sophisticated combustion control
- A range of emission focussed and net zero gas generators
- Gas, Solar, Battery hybrid systems with optimised efficiency



Focus on Emissions Reduction

Our priority is to design engines with the lowest possible emissions, by optimising gas combustion

Comparison with Stage V:

- **95%** CO reduction
- **96%** NOx reduction
- **33%** PM reduction
- **95%** PN reduction



LPG generator at HS2's London, Euston Station

New Net Zero and Clean Air Technologies



CAGE IP Intelligent System Control: Optimises Generator Efficiency & Reduces Emissions



Biogas



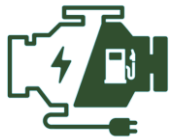
No compromise operation
On Low CH4 Content

LPG/
BioLPG

CNG/
Biomethane

rDME*

H2



Optimised combustion
for high efficiency
& low emissions



Fuel flexibility



Responds instantly
to load demand



CHP/Heat Recovery



Sophisticated telemetry

* rDME (renewable Dimethyl Ether) is a new 'net zero' fuel made from recycled waste

Multi-fuel Generator



15 kVA @3,000 RPM / 10 kVA @1,500 RPM

- Runs efficiently on different fuels (LPG, H2, DME, NG)
- Smooth transition to net zero power
- LPG can save circa 30% fuel cost compared to diesel



Larger output gensets to be developed in 2025

Hybrid Systems: Generator + Battery + Solar + Wind

Containerised system for a microgrid project in Africa:

- Biogas generator + solar panels + windmill + batteries
- LPG generator + battery pack running CAGE facility



Engine Development

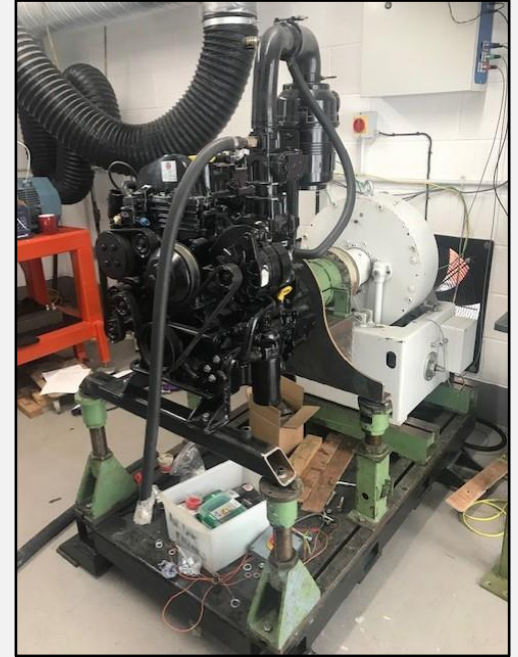
- Full in-house engine test and development
- Team of senior engineers from automotive and aerospace
- can use other clean gas fuels if hydrogen is not available.



Engine cell control room



Emission testing



200kW dynamometer
with CAGE biogas engine

How we can help



Waste-to-Power

Market

Application



Livestock Farm

Biogas to power +
CHP



Workplace
Canteen

Food waste to CHP



Landfill Sites,
Waste Recycling

Landfill gas to power

Multiple gases

Market

Application



Construction
Sites

Prime & backup
power & welfare



Aquaculture

Backup power for
operations/welfare



Microgrid

Power for remote
sites

Project 1: CAGE hydrogen generators



HIMET (Hydrogen in an Integrated Maritime Energy Transition)

2021-2022, Orkney Islands - Kirkwall cruise terminal

Trial with solar and battery storage on hybrid welfare unit at Kirkwall cruise terminal on the Orkney Islands in collaboration with the European Marine Energy Centre (EMEC)

- Clean fuel alternative with zero carbon emissions
- Cruise terminal building connected to a hydrogen tank
- Green hydrogen produced offshore by wind farms and wave farms
- Generator is 20% the cost of equivalent hydrogen fuel cell

Link: <https://www.emec.org.uk/projects/hydrogen-projects/himet/>



Project 2: Gas-Solar Hybrid Welfare unit

CAGE Clean Air Gas Engine for HS2 at Euston station

CAGE developed a 6kW and 30 kW LPG engines and generators

- The 6kW was trialed by HS2, incorporated in gas-solar-battery hybrid power system for 5 off grid site welfare buildings
- The 30kW was used as a stand-alone generator

- Reduced carbon & harmful emissions by up to 95%
- Reduce noise
- Major fuel cost savings

Video: <https://www.youtube.com/watch?v=zI8V0F2xzal>



HS2

Advanté

 **CALOR**



Project 3: Flexible Hybrid Gas Engine

Red Diesel Replacement (RDR) 2022-2025

Deploying seven generators running on different fuels on HS2 construction sites

Multi-gas engine technology

- Run on conventional gas fuels or hydrogen, or a mixture of gas fuels
- Run on renewable & recycled carbon dimethyl ether (rDME)
- No fundamental change to the engine

Smooth transition to net zero power

- Net zero compliant technology
- Operates on conventional clean fuels
- Operates on hydrogen when supply chain is developed



Project 4: Biogas in Africa

CAGE Biogas in emerging economies

Provides efficient, reliable, clean power for off grid farms and communities, using biogas produced from farm waste



- World first plug and play small biogas generator
- 30% more efficient than the next best biogas engine tested by Sistema
- 5 trial units deployed in Kenya, cumulating over 4000 hours of operation
- Further 22 machines being deployed to India, Kenya & Mexico



Clean, Affordable & Resilient Power



CAGE
TECHNOLOGIES

Clean Air Gas Engines