

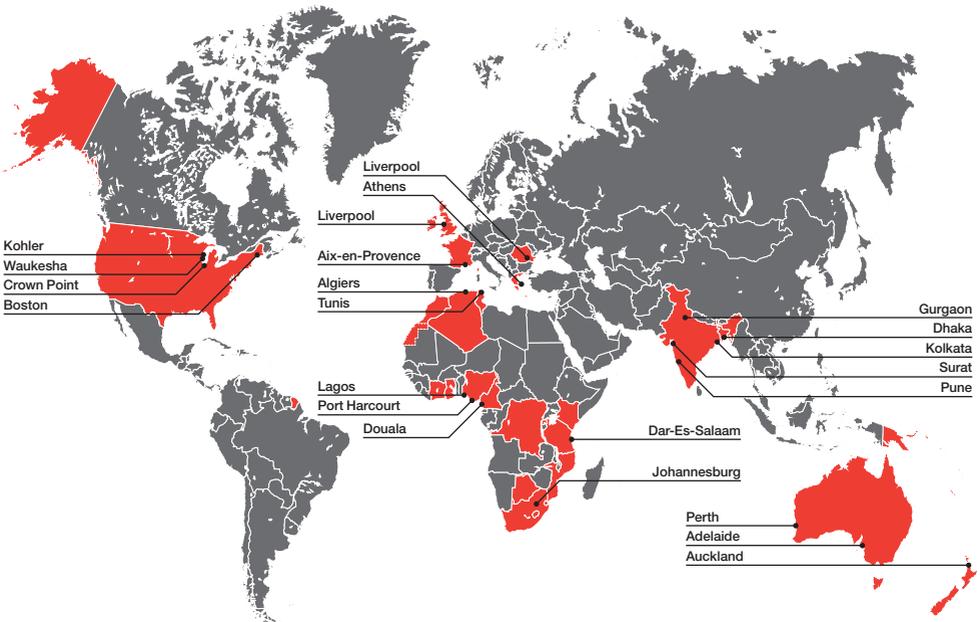
# Clarke Energy®

Engineer - Install - Maintain



**JENBACHER**  
INNIO

# Global Reach, Local Focus



## Global

Operating in 27 countries with 8GW of power generation solutions deployed globally.



## Supporting net-zero

Our projects support the transition to a net-zero carbon economy.



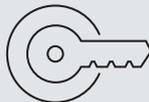
## Resilience

Installations supporting local and grid-level resilience.



## Lower costs and carbon

Reduced operational costs and carbon emissions through fuel efficient power.



## Turnkey EPC

Single point of contact with, turnkey design, engineering, procurement & construction (EPC) services



## Maintenance

Full maintenance, operation and overhaul services maximising equipment run hours

# Clarke Energy INNIO Relationship

## INNIO

### Design – Manufacture

- Product quality focused
- Engine design
- Engine development
- Engine manufacture
- Parts production

## ClarkeEnergy®

Engineer - Install - Maintain

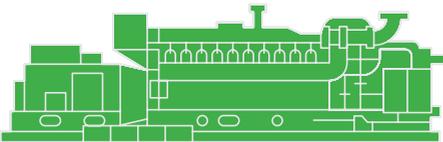
### Engineer – Install – Maintain

- Installation design
- Project management
- Installation works
- Commissioning
- Maintenance

## Flexible Delivery Model

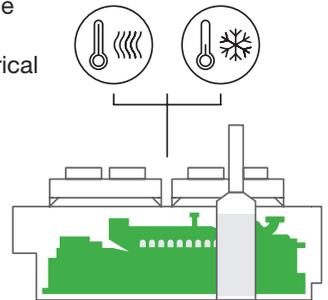
### Gas Genset

Configured to produce electrical power only.



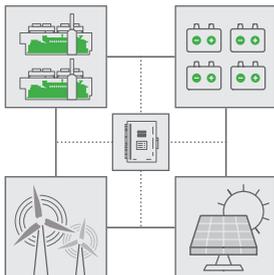
### Power Module

A Jenbacher gas engine module configured to recover electrical and heat.



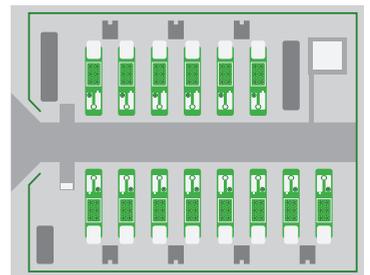
### Hybrid energy solutions

Clarke Energy can accept greater scope incorporating different power generation and storage technologies as turnkey microgrid.

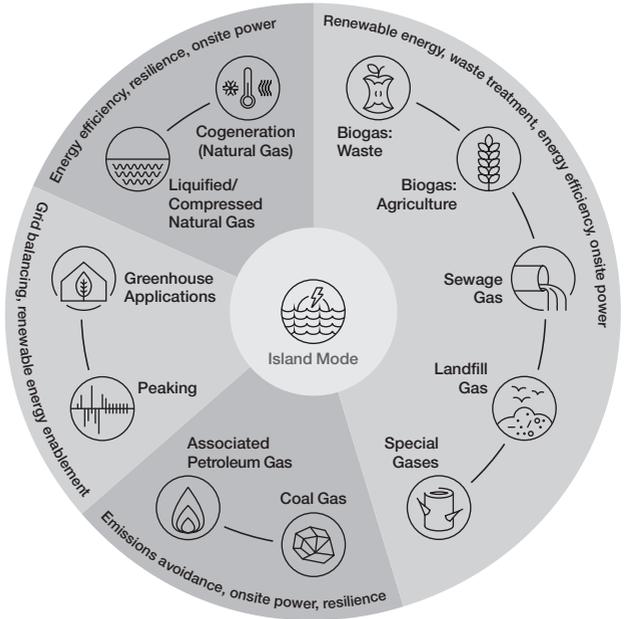


### Turnkey power plant

Clarke Energy can supply a turnkey installation of a multi-engine power plant.



# INNIO Jenbacher 0.3MW – 10MW



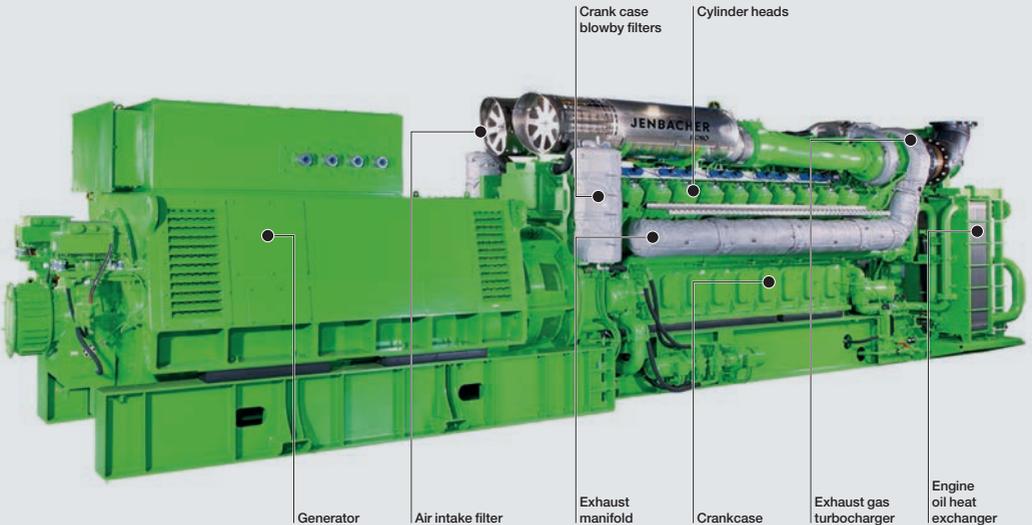
## Reciprocating gas engines with *fuel flexibility*

50+ years  
of innovation

Wide range of  
applications and  
gas types

Robust performance  
in challenging  
conditions

Short payback and  
long term ROI



# Engine Versions

Engine		J208	J312	J316	J320	J412	J416
Electrical output (kW <sub>e</sub> )		330	635	851	1,067	901	1,202
Electrical efficiency (%)		39.4	42.2	41.9	42.0	42.3	42.5
Thermal efficiency (%)		42.1	46.2	46.8	46.8	47.3	47.3
Platform options		L8	V12/16/V20			V12/16/20	
Minor/Major overhauls ('000 Hours)		30/60	30/60, 40/80			30/60, 40/80	
Application	Natural Gas	✓	✓	✓	✓	✓	✓
	Biogas	✓	✓	✓	✓	✓	✓
CHP (70/90°C)		✓	✓	✓	✓	✓	✓
Steam (8bar-12bar)		✓	✓	✓	✓	✓	✓
Trigeneration (6/12°C)		✓	✓	✓	✓	✓	✓

Engine		J420	J612	J616	J620	J624
Electrical output (kW <sub>e</sub> )		1,561	2,007	2,676	3,360	4,481
Electrical efficiency (%)		43.0	44.3	44.6	44.6	45.5
Thermal efficiency (%)		47.6	45.5	45.3	45.5	43.3
Platform options		V12/16/20	V12/16/20/24			
Minor/Major overhauls ('000 Hours)		30/60, 40/80	30/60			
Application	Natural Gas	✓	✓	✓	✓	✓
	Biogas	✓	✓	✓	✓	✓
CHP (70/90°C)		✓	✓	✓	✓	✓
Steam (8bar-12bar)		✓	✓	✓	✓	✓
Trigeneration (6/12°C)		✓	✓	✓	✓	✓

# Rehiko 15kVA – 4200kVA

## *High-efficiency diesel gensets for a wide range of applications*

- Revolutionary & Reliable Engine
- Smooth Running
- Tested & Approved
- Ultimate Performance

High-efficiency diesel gensets can be utilised for continuous power, or alternatively as backup power alongside Jenbacher gas engines.

Cooling System:  
Up to 50°C  
Ambient Cooling

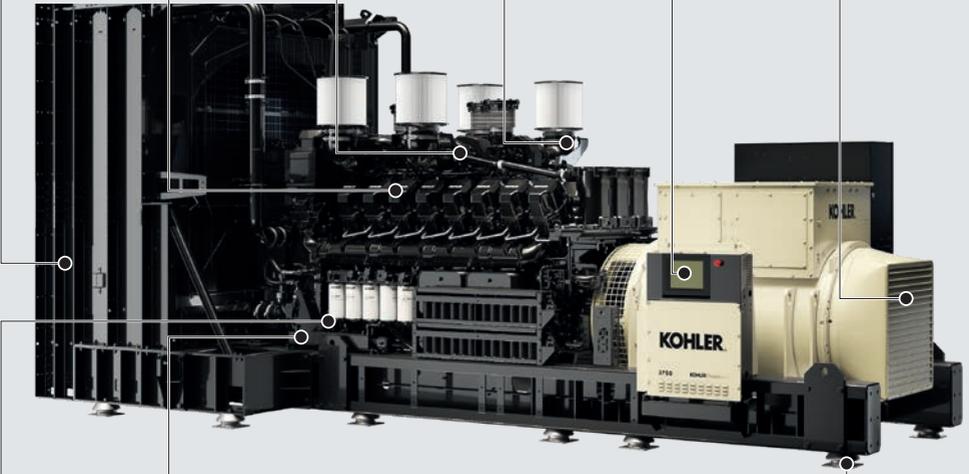
Concentrated  
Power, Low  
Consumptions,  
Modular  
Components

Right Sized Turbo  
Chargers, Low  
Combustion Air

Closed  
Crankcase  
Ventilation,  
Up to 95%  
Efficiency

Integrated  
Controls

Alternator,  
Fast Recovery  
& Response  
Time, High  
Motor Starting  
Capabilities,  
Digital Voltage  
Regulator



High Fuel Lift

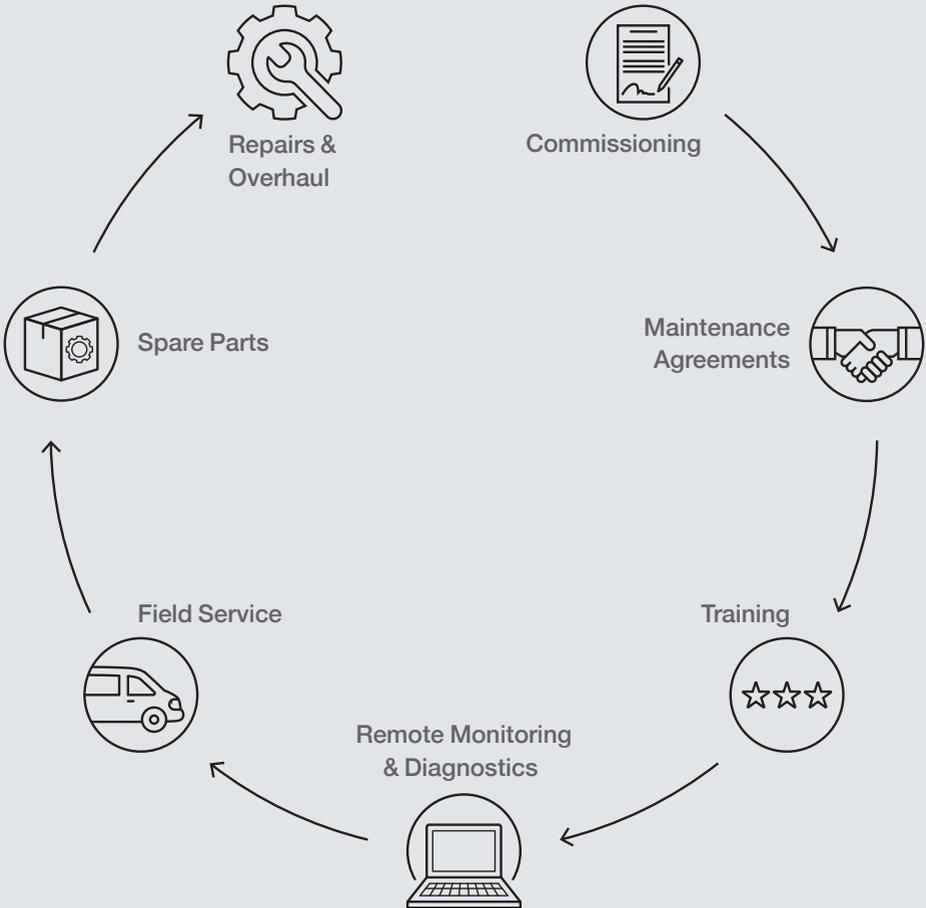
High Isolation Mounts  
Up to 95% Efficiency

High kW Density,  
Smaller Footprint

# Service Lifecycle

Clarke Energy's ethos is ensuring the highest levels of equipment availability such that it translates to a *maximised return on investment* on our customer assets.

We achieve this by organising localised service teams in each country that we operate. We maintain a high inventory of genuine original equipment manufacturer (OEM) approved parts. Our teams are trained to the highest standards. In addition, we offer training programmes for our customers. Explore the service lifecycle of an engine from the options below.



# Clarke Energy's sustainable solutions



## Energy resilience

Clarke Energy delivers resilient localised power generation that can help keep the lights on in the event of a grid failure or extreme weather event.



## Renewable electricity enablement

Clarke Energy can deploy flexible generation and energy storage technologies to balance demand and supply of power and deliver a wholly renewable power network.



## Energy efficiency

Clarke Energy deploys CHP technology to deliver short term tangible carbon savings through the minimisation of primary fuel consumption.



## Renewable energy

Clarke Energy delivers systems to generate renewable electricity, heating, and cooling from range of renewable fuels such as biogas, biomethane and hydrogen or can integrate intermittent solar or wind-based generation.



## Sustainable waste management

Clarke Energy provides solutions to waste management by helping to utilise renewable gases such as biogas, landfill gas and sewage gas or deploy upgraders to produce biomethane.



## Carbon utilisation

Clarke Energy can deploy systems to capture, clean and recover carbon dioxide for storage or use as a product in manufacturing and agriculture.

# BESS

A Battery Energy Storage System (BESS), is the industry's generic reference name for a collection of equipment that comprise a system to store energy in batteries

A typical system is comprised of batteries (including battery management), an inverter, switchgear, transformer, and protection devices

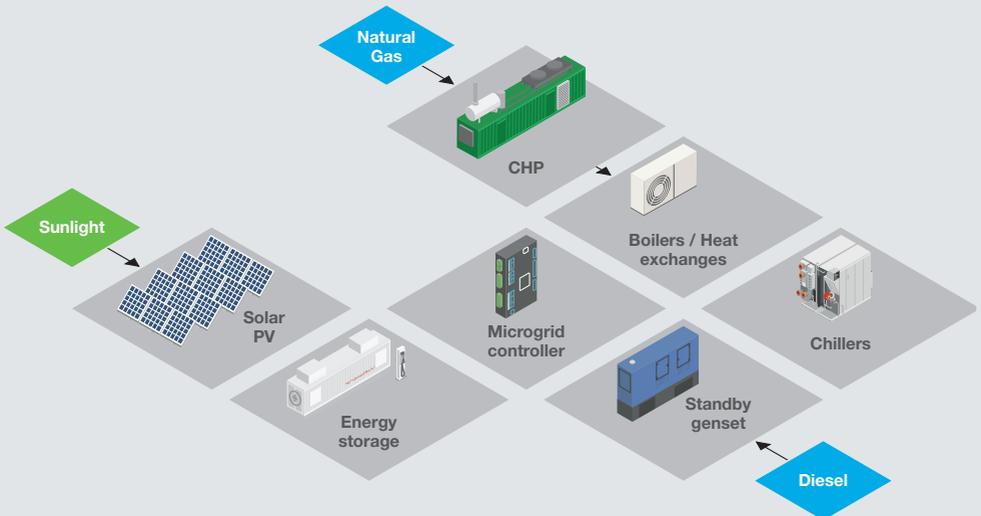
Often renewable energy sources are combined with a BESS to store the renewable energy during peak production time and then dispatch the energy when it is most needed.



# Microgrid controller

Microgrids typically consist of a number of different power generation technologies and draw upon the benefits of renewable energies, storage technologies and gas and diesel engines. The combination and synchronization of different power generation technology types can be referred to as 'hybrid power generation'.

Clarke Energy can provide a flexible gas engine in support of a microgrid, or design and develop a full solution incorporating an advanced control and optimisation system.



# Case study



## Mamuda Industries, Kano, Nigeria

- 9 x Jenbacher 620 engines
- 3 x Jenbacher 612 engines



# 36MW

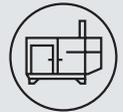
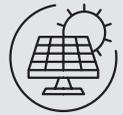
electricity

# Case study



## Danone, Boksburg, South Africa

- 2 x Jenbacher 616 combined heat and power engines
- Jenbacher microgrid controller
- Integration with onsite solar and backup diesel gensets



# 5MW

electricity

# 90%

CO<sub>2</sub> reduction

# Case study



## Lodhia Industries, Tanzania

- 5 x Jenbacher 320 gas engines
- 5MW electrical output total



# 5MW

electricity

Switch on the  
*reliable power*