

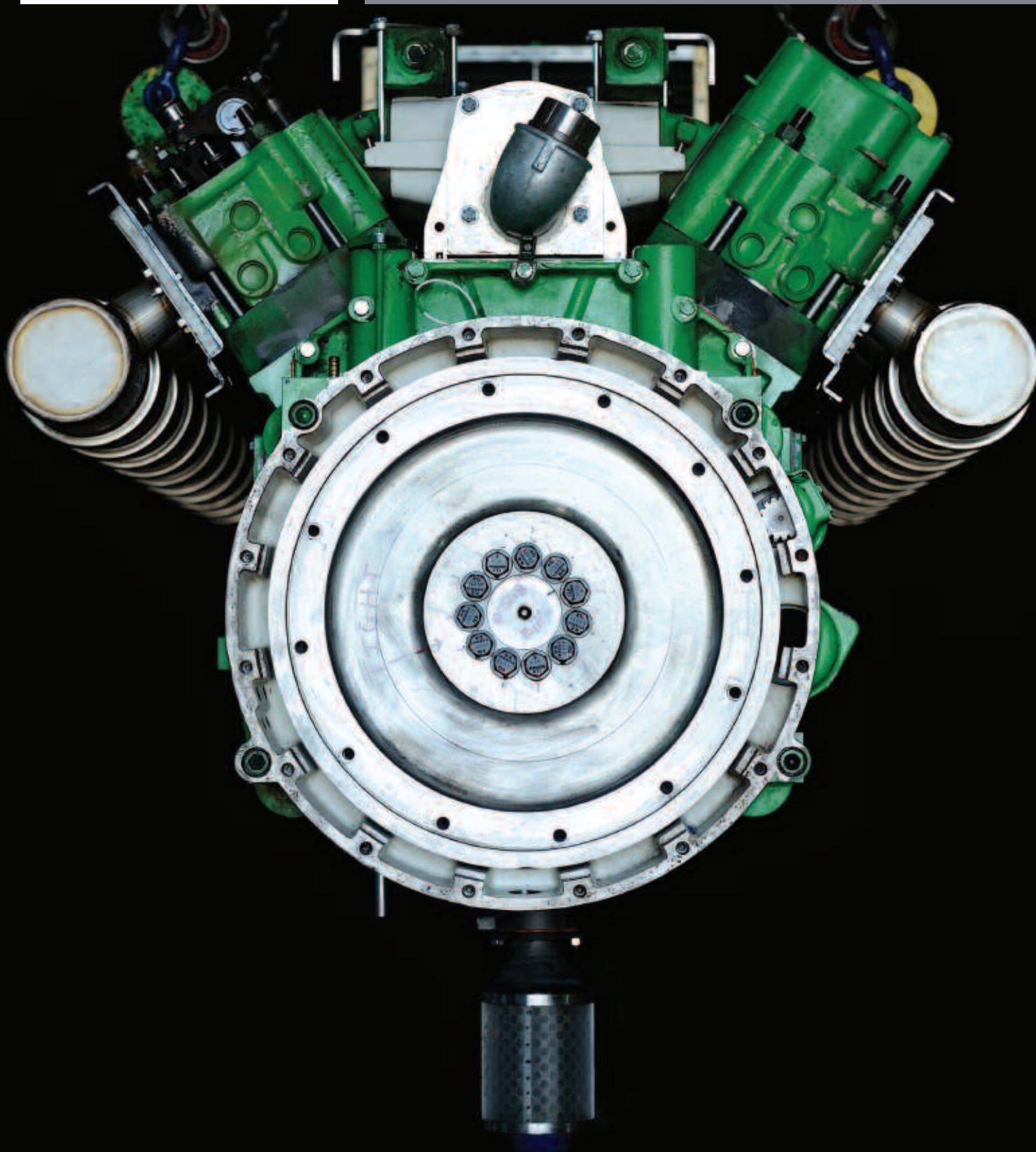
# Clarke Energy<sup>®</sup>

Engineer - Install - Maintain



Distributor & Service Provider  
Reciprocating engines

# Services





# Introduction

Clarke Energy is the authorised distributor and service partner for GE's gas engine business in a growing number of countries across the world. In addition to providing high-efficiency, reliable gas engines we combine this with the expertise and resources to deliver unbeatable product support.

Whether your requirement is for the supply of a single gas engine generator or a complete turnkey power generation facility, we can meet that need. Our ability to add value by offering an end-to-end service, from initial proposal to reliable long-term maintenance, has led to us becoming a multi-national company with operations in many countries across the globe. Our company prides itself on integrity, delivering only the highest quality products whilst providing a reliable accountable localised service.

Clarke Energy provides flexible solutions for your gas generation projects. Our services range from the supply of a gas engine generator, through to the complete turnkey installation of a gas powered generation facility. Clarke Energy has a dedicated, top-quality team of sales, engineering, project management, commissioning and maintenance staff to meet your needs. We also offer long-term maintenance contracts backed up by a strong balance sheet, giving peace of mind with respect to the long-term performance of your GE gas fuelled generation equipment.



# Commissioning

Clarke Energy is able to commission GE's Jenbacher gas engines in all the countries in which we operate. Commissioning is conducted by local Clarke Energy service engineers. This means that the engineers commissioning the generator will be from the same team of engineers that look after the engine into the future. This arrangement gives consistency for the customer and helps facilitate the highest levels of service through familiarity with the site and project.

As an additional benefit, for engines that Clarke Energy has sold, installed and commissioned we are able to offer maintenance agreements that include availability guarantees.

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## Benefits

- Single point of contact
- Accountability
- Service engineers with site familiarity
- Possibility of availability guarantees with maintenance contract (if Clarke Energy has sold, installed & commissioned the generator)
- Support with grid synchronisation tests

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## Grid Synchronisation Support

Our service engineers are also able to support with grid synchronisation tests such as the G59 in the UK and G10 test in the Republic of Ireland. Please discuss your requirements with your local Clarke Energy office.

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# Maintenance Agreements

Clarke Energy is able to provide the highest levels of customer service and peace-of-mind along with comprehensive long-term maintenance agreements. A maintenance agreement creates a relationship with us for the life of your equipment. Approximately 40% of the GE Jenbacher gas engines we supply are serviced through a maintenance agreement with the majority supported through long term exclusive part supply agreement. In creating each agreement, we work directly with you, defining the best and most suitable solution for your service needs. A maintenance agreement typically consists of the different components of our service product portfolio and compliments the lifecycle of your gas engine.



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## Benefits

A maintenance agreement will provide you with various advantages:

- More predictable operating costs and risk mitigation over the life of your equipment.
- Optimum customer care through our dedicated personnel, backed by the global Jenbacher service network and remote services.
- Jenbacher original spare parts.
- Integrated outage management: The outage schedule will be aligned with your workload, while integrating planning will optimise availability of parts, material and service technicians.
- Guaranteed availability, subject to engines being sold and installed by Clarke Energy.
- Flexible scope of agreements, customised to your specific needs.

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## Scope of Service Agreement Maintenance Agreement

Maintenance agreements provide high value while reducing risk for your plant. These agreements shall allow you to focus on your core business. Clarke Energy's Jenbacher maintenance agreement usually contains:

- Scheduled (preventive) maintenance according to the maintenance needs of your engine, including all necessary spare parts. Clarke Energy only supplies original Jenbacher spares and not third party imitations
- Required unscheduled repairs and corrective maintenance for the duration of the contract, including all necessary spare parts
- Minor and major overhauls
- Remote services to ensure timely and accurate technical support (please contact your local Clarke Energy office to understand what is available in your country).
- Availability guarantees (subject to engine being sold, installed and commissioned by Clarke Energy)
- Consumables needed for scheduled maintenance (e.g. spark plugs or filters)
- Supply of oil / lubricants

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## Part Supply Agreement

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Material Stream Agreements (MSA) are ideal if your staff can conduct the maintenance work themselves. These agreements provide delivery of original Jenbacher gas engines spare parts for preventive maintenance, based on the operating hours of your engine. With an MSA you benefit from:

- Favourable prices and price security for Jenbacher original parts for the duration of the contract
- The Clarke Energy team takes care of planning and preferential dispatching for your spare parts needs
- Latest available technology parts, delivered at the time needed
- Exchange engines at pre-defined rates



# Training

The availability and reliability of power generating equipment is central to your plant's efficient operation. To ensure optimum operation and maintenance, you need a dedicated team of trained staff. Clarke Energy offers specialised customer-orientated training programmes for beginners and experienced service technicians alike. Customers, service providers and other stakeholders can participate in our comprehensive training program in one of the GE training centres, or directly on-site at a customer's plant.

The main focus of our training programmes – developed by GE's Global Training Centre for gas engines – is in-depth product knowledge, applications knowledge sharing and safety training. Our courses apply everything learned in both theoretical and practical sessions at the engine site to make sure your staff are well prepared to meet the challenges of everyday operation.



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## Benefits

- Easier and more efficient operation of your equipment
- Greater safety for you as an operator
- Technical expertise for the operation and maintenance
- Knowledge-sharing of the GE gas engine technology
- Practical training modules, working directly on the engines
- Customised training modules to meet your individual requirements and specific engine configurations
- Multiple languages including English, German, Italian and Spanish (interpreters for other languages available on request)

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## Comprehensive Training

As the authorised distributor of the original equipment manufacturer, along with GE, we have the best understanding of your gas engine. We share this knowledge with you, our customers, to support your business and successfully run your power plant. Drawing on the many years of experience, our specialised trainers translate this deep product knowledge into an extensive training programme – one that is customisable based upon your specific gas engine's application.

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## Modular Design

According to your needs, Clarke Energy, in collaboration with GE, offers specialised learning modules for operators and service engineers. Course content is adapted to your requirements to make certain that all participants receive the most relevant information. Training sessions consist of a theoretical section in the classroom and a practical unit working directly on a training engine or simulator.

Our modular training programme begins with an operator course that provides the basis for the remainder of the training programme. The practically-orientated extension modules include:

- Training on the Job – Maintenance
- Training on the Job – Extended DIA.NE® Access (for advanced learners)

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## Individual Units

Courses are held in small groups with a maximum of eight participants and take place at one of the Jenbacher training centres or onsite at the customer's premises. On request, we can put together individual training units for topics of your choosing. In addition, we can organise refresher courses or customise information modules on current technological innovations. Training sessions are typically given in English, German, Italian or Spanish, but may also be offered in other languages or with interpreters on request. After successfully finishing a training module, each participant receives a completion certificate.

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## High-tech Equipment

To ensure an optimal learning environment, training facilities are equipped with the latest technology and infrastructure:

- Classrooms with the latest presentation equipment
- Simulators for all engine control systems such as SAM, EMS 2000, EMS3000, DIA.NE® and DIA.NE® XT 3
- Training test bench with full functional and operational training engines ranging from genset to container solution for practical demonstrations of maintenance work
- Special tools for carrying out maintenance work
- Simulators for gas mixing and ignition systems





# Remote Monitoring & Diagnostics

In order to optimise the performance of a generation facility, GE's gas engines can be remotely linked to centralised monitoring stations.

Designated service engineers can be automatically notified about unscheduled generator stops such as engine trips via automated phone call, text message or e-mail.

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## Benefits

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- Ability to monitor engine performance from different location
- Optimised engine availability
- Reduced site manpower requirements
- Diagnosis of problems

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## Engine Monitoring

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It is possible to monitor a variety of different engine performance parameters including:

- Whether an engine is running
- Availability (hours ran)
- Electrical output (kW, kWh)
- Gas quality when linked to gas detectors (CH<sub>4</sub>, O<sub>2</sub>, H<sub>2</sub>S)
- It is also possible to provide trends in historical engine performance data.

Please speak to your local Clarke Energy office to determine what services are available in your area.



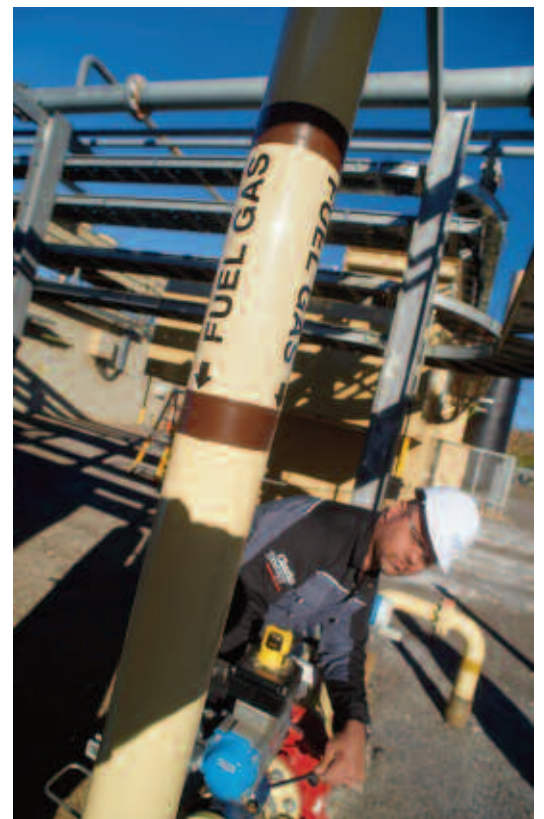


# Field Service

Clarke Energy has a comprehensive network of field service engineers in the different countries in which we operate. Field service engineers are typically located in the surrounding region, looking after a small number of gas-powered generators. This facilitates rapid response to your generator in the event of any unscheduled maintenance requirements. With our contractual maintenance agreements we are able to offer optimised response times and availability guarantees for your generator.

Alternatively, for large or remote sites under a full operation and maintenance contract engineers can be assigned dedicated to a single installation.

If you would like to find out more about what services are available in your local area, please contact your nearest Clarke Energy office.





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# GE Gas Engine Spare Parts

Clarke Energy is the authorised supplier of genuine GE Gas Engine spare parts in a wide range of countries. Outside of the engine manufacturing facility in Jenbach, Austria, we have one of the largest inventory of Jenbacher spare parts in the world.

Spare parts availability is critical if engine downtime is to be kept to a minimum. Clarke Energy recognises this fact and globally we hold over £15 million worth of approved Jenbacher spare parts. These spare parts can be dispatched at short notice where required in the countries in which we operate.

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## Benefits

- We supply only genuine GE Jenbacher spare parts meaning optimal performance levels achieved
- Quality control and accountability
- Rapid dispatch when needed meaning minimal levels of down-time
- Competitive global pricing

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## Efficient Team

Our GE Jenbacher spare parts team has a reputation for friendly and excellent service and is familiar with spare parts across the GE Jenbacher range. This ensures that any problems with parts identification or supersessions are dealt with quickly and efficiently, thus ensuring that the correct item is supplied to the customer first time, every time.

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## Storage

All spare parts are carefully stored on self-contained racking units in our quality controlled, purpose built warehouse, operating to ISO9001 standards. Our warehouse stocks are managed by the latest in computer software which replenishes parts when a minimum stock level is reached, ensuring a rapid turnaround on 90% of purchase orders.

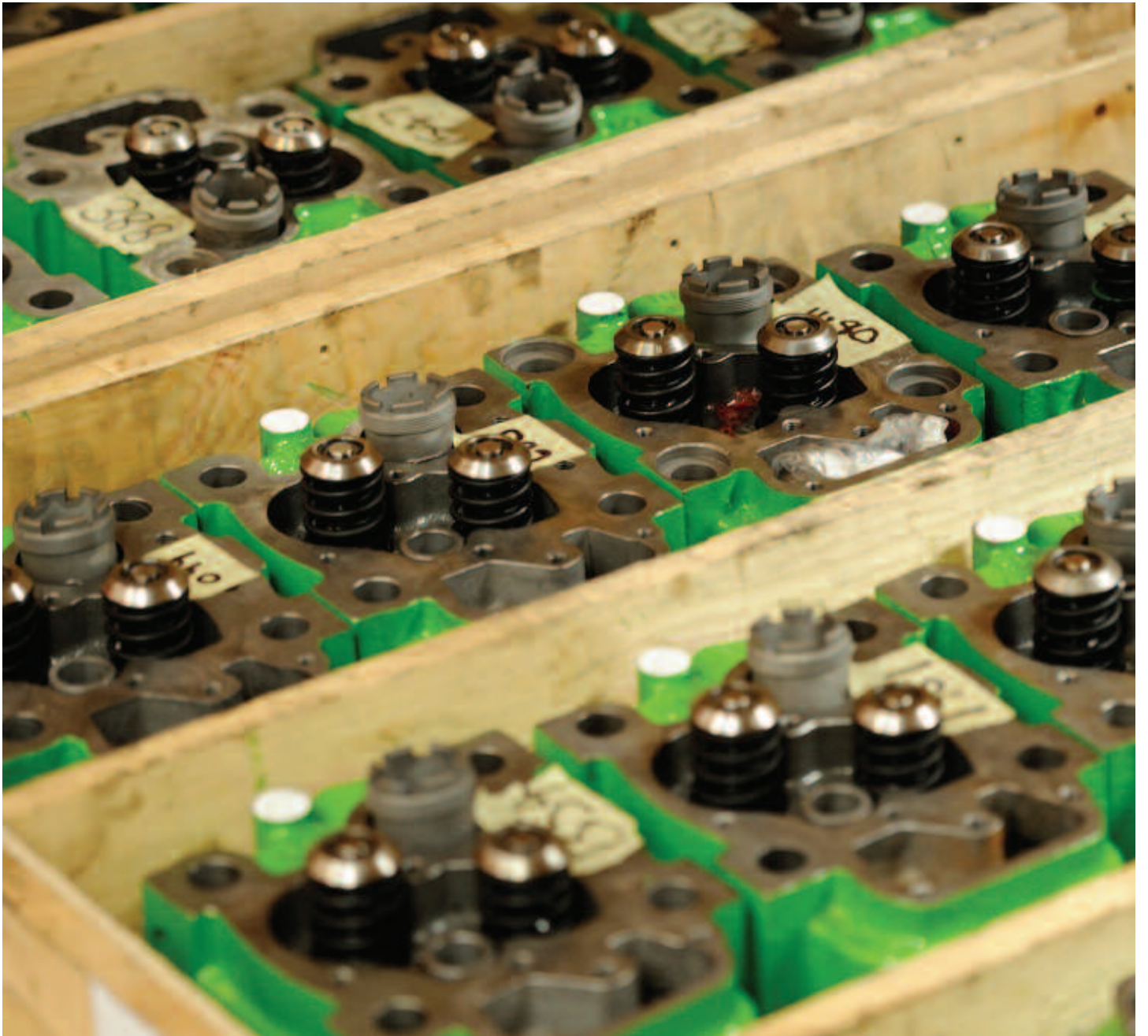
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## Re-conditioned Parts

In addition to new genuine parts, Clarke Energy can also offer a wide range of re-conditioned and service exchange items. Our stocks include J620, J420 and J320 short-motors and alternators, all series cylinder heads, connecting rods, water pumps, turbochargers, intercoolers, starter motors and oil pumps.

In 2011 Clarke Energy also opened a facility dedicated to the reconditioning of used GE Jenbacher cylinder heads. This facility 'recycles' old cylinder heads, giving them a new lease of life and provides a quality control service to our customers.





# Overhauls, Repair and Upgrades

Gas engine maintenance typically falls into two key categories; scheduled and unscheduled.

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## Scheduled Maintenance

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In order to ensure a generator has the highest levels of availability, scheduled maintenance should be completed at specific points in the operational life of the gas engine. The operational life is measured in number of actual operational hours (hours run). Each engine has a specific maintenance schedule that is related to the quality of engine's fuel gas. For example, natural gas is cleaner and less challenging than landfill or biogas.

Attendance for replacement of consumables such as oil and filters typically occurs every 1,000 – 2,000 operational hours.

Scheduled intermediate services occur at 10,000 hour intervals.

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## Overhauls

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The GE Jenbacher gas engine has a full overhaul at 60,000 hours of operation. At this time ideally the engine will be taken away from the site to be stripped down and fully serviced with specialised machinery. This either occurs at the authorised rebuild centre in Liverpool, UK or Jenbach, Austria, depending upon the geographical location of the unit. If we are provided sufficient notice, we are able to provide a reconditioned swing-engine that can be brought in at the relevant time. This provides the lowest down-time for your generation plant.





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## Unscheduled Maintenance

The GE Jenbacher gas engine product is renowned for its reliability, however from time to time there will be a need for unscheduled maintenance. This could be due to trips, problems with the fuel gas quality or problems with components. The best solution to counter any unscheduled maintenance is to ensure your gas meets the GE technical instruction for fuel gas quality and support this with a full maintenance agreement with Clarke Energy.

It is also possible to set up remote monitoring of your GE Energy gas generation facility. Remote monitoring enables you to monitor performance of your generator and to be notified via text message or e-mail about trips or unplanned shut-downs.

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## Upgrades

When your engine is overhauled it may be possible to upgrade all components to the latest versions. This may provide additional benefits to the customer from increased generating efficiency. Please speak to your local Clarke Energy office to determine whether there are any upgrades available for your generation equipment.



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**“The maintenance to our engines is a fundamentally important part of our business. It’s a concept where we get peace of mind knowing that our engines and equipment is being looked after by Clarke Energy, with their team of professionally approved engineers supported by the manufacturer.”**

Shaun Cherry, Fernbrook Bio

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