

Power Generation – The Impact of Stage V

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The power generation industry globally is worth billions, but its environmental credentials have come under an increasingly bright spotlight. The **diesel** power generation industry, the focus of this briefing, is relied upon by many individuals, companies and governments to support electricity demand. That demand is only going to increase as national power sources begin to flounder under increased load.

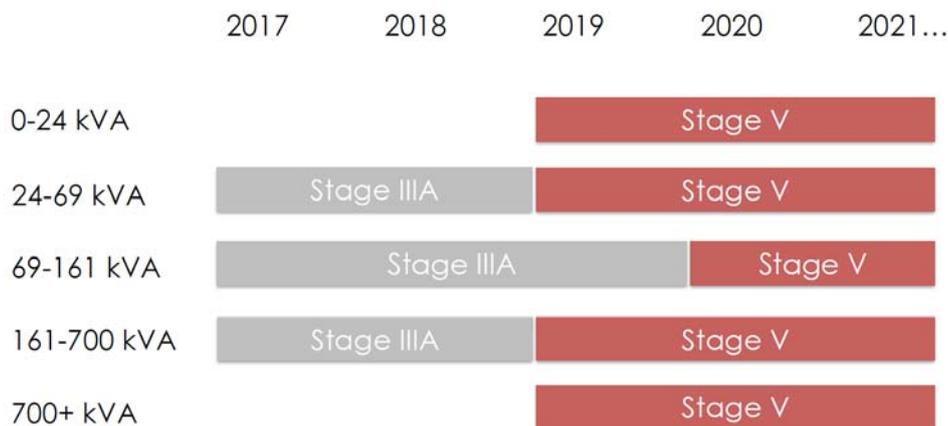
Globally the diesel-powered generator set market is worth over \$15 billion annually, with Europe ranking as the second largest market representing around 25% of the total. This briefing examines the impact of Stage V on diesel power generation, and what this means for OEMs, suppliers and consumers. Some of the key questions we look at include:

- What new technology is being adopted?
- The cost implication of additional technology?
- Which sub-sectors within diesel power generation are most effected? – Rental, Emergency & Standby, Prime Power etc...

We are also using this opportunity to announce a partnership between Knibb Gormezano & Partners (KGP Auto) and Power Gen Statistics (PGS) – This new partnership will bring together two industry experts to help customers throughout the diesel power generation industry understand the challenges posed by stricter emissions legislation, changing technology demands, increased globalisation and the introduction of alternative fuels.

As with the NRMM sector, which is one of KGP's core markets, legislation reducing emissions of diesel generators is based on a number of power bands, as summarised below:

Figure 1: Stage V Timings by Electrical Output Bands



Source – Power Gen Statistics

Stage V is a challenge for all companies operating in the NRMM sector. The need for a diesel particulate filter (DPF) and in-service monitoring (ISM) hold many challenges for OEMs and suppliers alike – however, the technological and economic impact on variable speed engines isn't as vigorous as previous rounds of legislation. However, the opposite is true for constant speed engines, which make up most of the market volume. The impact of Stage V legislation on the engine-driven power generation industry will therefore be substantial.

Currently **mobile constant speed** engines must be compliant with at least Stage IIIA/Tier 3 in Europe and North America respectively. The wording of the legislation is somewhat vague – the official language used to define what is not covered in the legislation is:

“machinery that is intended to be permanently installed in one location for its first use and is not intended to be moved, by road or otherwise, except during shipment from the place of manufacture to the place of first installation”. Where permanently installed means: “bolted, or otherwise effectively fixed so that it cannot be removed without the use of tools or equipment, to a foundation or an alternative constraint intended to cause the engine to operate in one single location in a building, structure, facility or installation”

Therefore most global production will require Stage V compliance, if sold in Europe. KGP and PGS estimate that there were around 7,500 mobile gensets sold in Europe in 2017. The impact of Stage V compliance will dampen growth with 2023 expected to see a modest rise to 7,600 units.

Mobile, constant speed engines sold into Europe currently, must be compliant with Stage IIIA – Stage IIIA requires no aftertreatment, most engines will have just switched to common rail fuel injection and electronic engine control to meet Stage IIIA legislation.

For Stage V, constant speed engines that are placed into mobile applications are likely to require a combination of SCR, DPF, DOC and/or EGR technology depending on specific power ratings. The table below outlines possible technology paths genset OEMs are likely to use for Stage V type-approval.

Figure 2: Stage V Aftertreatment Requirements

Power Band	Stage IIIA		Stage V	
	FI & EC	AT	FI & EC	AT
<19kVA	Direct, Mech	None	Direct, Mech/Elec	None
19-36kVA	Direct, Mech/Elec	None	CR, Elec	EGR, DOC, DPF
37-56kVA	CR, Elec	None	CR, Elec	EGR, DOC, DPF
56-130kVA	CR, Elec	None	CR, Elec	EGR*, DOC, DPF, SCR
130-225kAV	CR, Elec	None	CR, Elec	EGR*, DOC, DPF, SCR
225-560kVA	CR, Elec	None	CR, Elec	EGR*, DOC, DPF, SCR
>560kVA	CR, Elec	None	CR, Elec	EGR*, DOC, DPF, SCR

Source – KGP

FI – Fuel Injection Type

EC – Engine Control

AT – Aftertreatment

CR – Common Rail Fuel Injection

Elec – Electronic Engine Control

Direct – Direct Fuel Injection

Mech – Mechanical Engine Control

DPF – Diesel Particulate Filter

SCR – Selective Catalytic Converter

DOC – Diesel Oxidation Catalyst

EGR – Exhaust Gas Recirculation

*Optional

The end user price implications of this additional engine and exhaust technology for mobile gensets is significant. PGS estimates that in some power categories, the cost of sales could increase as much as 100%.

Figure 3: Stage V Cost Increase

Power Category	Stage V Cost Increase
<19kW	80-100%
19-36kW	40-60%
37-56kW	40-60%
56-130kW	40-60%
130-225kW	40-60%
225-560kW	40-60%
>560kW	80-100%

Source: KGP, PGS

In the very price competitive segment this cost increase cannot be absorbed by the OEMs, so the price must filter through to the customers. However, this does present an opportunity to key suppliers, such as aftertreatment system suppliers, advanced engine control suppliers, valvetrain and fuel injection specialists.

Business Model Changes

As the price of the base engine is set to increase, KGP believes that some business models will have to adapt for stakeholders to stay afloat.

The cost of an engine represents around 70% of the total generator set cost, with the base price of an engine increasing substantially many key players in the market will see some parts of their business under threat. This is because the additional costs cannot be absorbed in the production process, the cost must be moved on to the customer – which could result in a downturn in demand, especially in the short to medium term. Generator assemblers, who don't have in-house engine production, such as Generac (Pramac) will experience a downturn in business for their high volume, low price assembled gensets. Engine OEMs will feel this impact less than those companies without in-house production, JCB, Caterpillar/Perkins, Kohler, etc... although they will still be negatively impacted by the price increase.

OEMs and rental companies will also have to adapt, sales are expected to rise in the run-up to Stage V introduction and decline significantly in the years immediately after Stage V introduction. Type approval and stock management will have to be closely monitored by these companies during their Stage V transition strategy.

Regulation for Stationary Gensets

Under Stage V legislation, stationary gensets – used primarily for prime power, peak shaving, load shedding and emergency & standby applications – are not regulated. However, there are some pieces of legislation that companies within the industry should be aware of for future strategy:

- Medium Combustion Plant Directive – legislates emissions for stationary gensets or groups of stationary gensets between 1MW and 50M – could see this initiative expanded to include large stationary gensets?
- London Low Emission Zone and London Ultra Low Emission Zone – whilst not as stringent as up to date emission legislation for new machinery, soon Stage IIIB will be mandatory in

most of London, meaning many stationary gensets may have to be retrofitted with a DPF and possibly and SCR system.

KGP and PGS – An Expert Partnership

We are proud to announce a new chapter in the development of KGPs product portfolio. In partnership with Power Gen Statistics, we are now going to include generator engines within our **NRMM Service - Engine & Aftertreatment**, and we will support this addition by writing a detailed report on the key challenges and opportunities facing companies who operate in the power generation sector.

Power Gen Statistics

PGS Consulting was founded by Romain Mocaer and Waleed Mountassar who met at Cummins Power Generation in Ramsgate, UK. After working several years in the Marketing & Strategy department, they found that there was a lack of market studies with real industry knowledge and expertise.

They created www.powergen-statistics.com in 2010 to provide the most reliable and specific market information to manufacturers of generating sets, alternators, engines and control panels globally. They have developed two databases (MarketGen and TradeStats) to timely monitor the power generation market and PowerGen Statistics has become the leading source of information for the power generation industry.

Since 2010, PGS Consulting has followed its core line of business: to be knowledgeable and focused on the power generation industry.

Knibb Gormezano & Partners

Founded by Brian Knibb and Joe Gormezano in 1988. Alex Woodrow, the current Managing Director, joined a few years later. Since then the team has grown to include James Dorling, Paris Kiernan, Michelle Gallway, and an extensive network of industry experts and consultants.

Operating in close co-operation with Off-Highway Research and LMC Automotive, KGP has developed their flagship products:

- **The Non-Road Mobile Machinery Service**
- **The Commercial Vehicle Service**

Each service centres on diligent, ethical research into key technologies, insightful analysis into volume vs value characteristics and specific understanding of global trends and key drivers.

These products consist of **production, sales and parc** data for the following topics:

- Engine and Aftertreatment
- Driveline
- Hybridisation, Electrification and Alternative Fuels
- Electronics & Sensors
- Fluids
- Materials

KGP works for a wide range of industry customers and stakeholder including:

- Vehicle & Equipment OEMs
- Engine OEMs
- Aftertreatment Companies
- Tier One Suppliers
- Other Suppliers

- Engineering Companies
- Consultants
- Investment and Finance

Disclaimer

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