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Our energy working for you.™

Cummins Inc.	**www.cummins.com**
Cummins Power Generation	**www.cumminspower.com**
Cummins G-Drive	**www.cumminsgdrive.com**

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No-one's putting more energy into creating a cleaner world

Cummins Inc. is a world leader in the design and manufacture of power generation equipment. For countless industrial and commercial operations across the globe, we're providing more than reliable, efficient and easy-to-use power systems; we're proving we're committed to meet, and exceed, regulatory air quality standards worldwide.

In fact, since 2004, as strict schedules of increasingly stringent European and international regulations have come into force, our integrated technological innovations have always lived up to them. More importantly, we're in a position to guarantee they will continue to do so through 2017 and beyond.

As a recognised leader in developing innovative low-emission technologies and the first engine manufacturer to offer a complete range of EU Stage IIIA compliant products, our fresh approach to power generation is as important in today's world as it will be in tomorrow's.



The environment comes first

To protect public health and conserve our planet's natural resources, legislation from the U.S. Environmental Protection Agency (EPA) and regulatory agencies in the European Union (EU) has, for the past decade, required that pollutants produced by diesel engines - such as nitrogen oxides (NOx), hydrocarbons (HC) and particulate matter (PM) - be reduced.

Throughout this time, Cummins Inc. has been at the forefront of the move to meet these new standards, becoming:

- the first manufacturer to introduce EPA Tier-2 and Tier-3 products to the market - ahead of the regulatory deadline;
- the first manufacturer to introduce EU Stage IIIA compliant generator-drive diesel engines to Europe;
- the leader in innovative emissions solutions that focus predominantly on in-cylinder design improvements to eliminate most of the NOx, HC and PM before they are formed.

As a result, our diesel engines are not only very clean, but also retain all of their performance advantages without exhaust aftertreatment strategies that add cost and complicate maintenance for end users.

This is truly - Our Energy Working For You.

Award-winning diesel technology

In recognition of our continued advancements and market leadership in emissions technology, and on top of our award in 2006, Frost & Sullivan have named Cummins Power Generation the recipient of the 2008 North American Diesel Engine Technology Leadership of the Year Award.



Right now, emissions regulations vary from country to country. But it is acknowledged that working towards harmonised global standards will not only simplify the choice of cost-efficient power systems for manufacturers and customers, but also minimise the impact on air quality.

To assure end-users of the best solution for their application, regardless of country or continent, it's long been a fundamental part of our strategy to design engines that meet or exceed the world's most stringent requirements - those of the EU and U.S.

Allowable emissions set by the EU and U.S.
Categories of allowable emissions are set out as Tiers 1-4 in the U.S. and Stages I-IIIA in the EU. Each increasing Tier or Stage specifies lesser amounts of NOx, HC, CO and PM based on the number of grams per kilowatt-hour of the compounds present in diesel exhaust.

To meet the 2011 target - for NOx and PM levels to have dropped 98% below unregulated levels - requires a phase-on-phase emissions reduction of around 40%.

Whilst in the U.S. both nonroad (portable diesel generator sets and other industrial engines) and stationary applications (generator sets used primarily for peak shaving, load shedding and standby power) are regulated, the EU (with the exception of Germany's TA Luft and France's Directive 2910) regulates only nonroad applications.

Taking into account the broad power range of nonroad diesel engines (and the fact that in the EU, only those producing 18 kWm to 560 kWm are regulated), emissions standards for this class are phased in by power categories, for example:

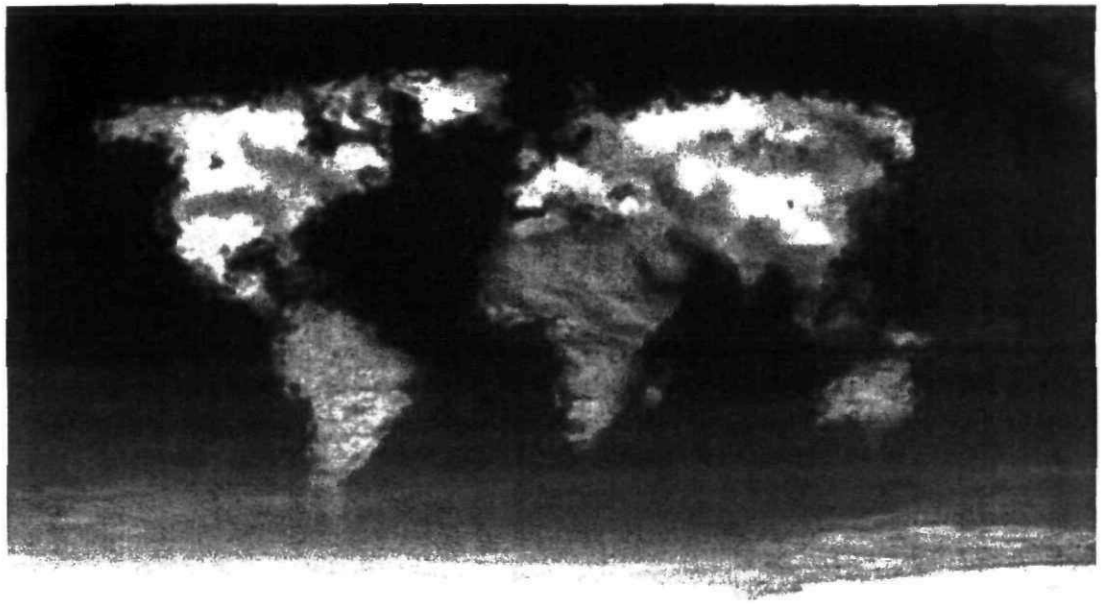
100-174 hp (75-130 kWm)
174-750 hp (130-560 kWm)

TA Luft and Directive 2910
Under existing legislation, limits for stationary applications within Europe apply to applications above the following:

1 MW (thermal) in Germany
2 MW (thermal) in France

Standby applications (in use <500 hours/year in France and <300 hours/year in Germany) also benefit from less stringent requirements as Germany's TA Luft mainly controls NOx and PM, while France's Directive 2910 controls emissions of NOx, CO, SO2, non methane organic compounds (NMOC) and PM.

For continuous or prime power applications, TA Luft also regulates NOx and CO emissions according to application size, whilst Directive 2910 limits NOx to 1500 mg/m3. (Variations of these two rules also apply in Austria, Switzerland, Belgium and Luxembourg).



By ensuring all our engines already meet, and very often exceed, the world's toughest emissions regulations, we're helping accelerate the move towards global standards and a cleaner world.

Developing natural compliance

Existing legislation in the rest of the world

China
Legislation exists for all nonroad engines up to 560 kWm. Within this classification, mobile generator sets powered by 37 kWm - 560 kWm engines have, since 2007, had to comply with China Tier I, and from 2009, diesel generator sets powered by engines 18 kWm - 560 kWm will have to comply with China Tier II.

India
Regulations are currently divided into two categories - engines below 800 kWm and engines above this figure. Engines smaller than 19 kWm must comply with U.S. Tier 1. The next level of regulations, based on EU Stage II, is likely to come into effect in 2011.

Japan
Japan does not regulate emissions from very small or very large engines. Current permissible levels (with some exceptions) are similar to EU Stage I and the U.S. EPA Tier 1.

Singapore
Off-highway diesel engines (including portable generators) must meet either EU Stage I or U.S. Tier 1.

Central and South America
As yet, Mexico, Argentina and Brazil have no controls on nonroad power generation engines, although local authorities may institute emissions regulations if warranted by air quality. Chile is adopting its own version of the TA Luft standard.

Timetables for compliance

With the timeframe for the introduction of new global air quality standards in place, our innovative technology is already producing cleaner, quieter, more efficient diesel engines to ensure you have the power to comply.

U.S. EPA nonroad emissions regulations schedule

Emergency standby generators need only comply with Tier 3 and are exempt from Tier 4 Interim and Tier 4 Final regulations that require aftertreatment.

kW	(HP)	2009	2010	2011	2012	2013	2014	2015	2016	2017
0 - 7	(0 - 10)	(7.5) / 6.6 / 0.40								
8 - 18	(11 - 24)									
19 - 36	(25 - 48)	(7.5) / 5.5 / 0.30				(4.7) / 5.0 / 0.03				
37 - 55	(49 - 74)	Opt T4i 0.30 PM: 37-55 kW								
56 - 74	(75 - 99)				3.4 / 0.19 / 5.0 / 0.02			0.40 / 0.19 / 5.0 / 0.02		
75 - 129	(100 - 173)									
130 - 224	(174 - 301)			2.0 / 0.19 / 3.5 / 0.02			0.40 / 0.19 / 3.5 / 0.02			
225 - 449	(302 - 602)									
450 - 560	(603 - 751)									
>560[a]	(>751)[a]			3.5 / 0.40 / 3.5 / 0.10				3.5 / 0.19 / 3.5 / 0.04		
				0.67 / 0.40 / 3.5 / 0.10[b]				0.67 / 0.19 / 3.5 / 0.03[b]		

Tier 2 ■ Tier 3 ■ Tier 4 Interim Tier 4 Final

a. Applies to portable power gen engines >900kW (>1207hp).
b. Applies to portable power gen engines >560kW (>751hp).

EU nonroad emissions regulations schedule

Portable nonroad generator sets (i.e. rental) are required to meet Stage II and Stage IIIA where indicated by red bars. The EU does not regulate stationary prime or emergency standby installations.

Europe

kW	(HP)	2009	2010	2011	2012	2013	2014	2015	2016	2017
18 - 36	(24 - 48)	8.0 / 1.5 / 5.5 / 0.3								
37 - 55	(49 - 74)	7.0 / 1.3 / 5.0 / 0.4								
56 - 74	(75 - 99)									
75 - 129	(100 - 173)	6.6 / 1.0 / 5.0 / 0.3								
130 - 560	(174 - 751)	6.0 / 1.0 / 3.5 / 0.2								

Stage II ■ Stage IIIA ■

U.S. EPA stationary emissions regulations schedule

Non-emergency engine requirements shown in black; emergency engine requirements shown in red. All 2009+ requirements are the same as prevailing nonroad requirements except > 3000 hp T1 for 2009-2010, and when emergency engine requirements become unique by not forcing aftertreatment.

Engine Manufacturer Certification

kW	(HP)	2009	2010	2011	2012	2013	2014	2015	2016
0 - 18	(0 - 24)	T4 / T4							
19 - 36	(25 - 48)	T4i / T4i				T4i / T4i		T4i / T4i	
37 - 55	(49 - 74)				T4[in] / T3			T4 / T3	
56 - 74	(75 - 99)				T4i / T3			T4 / T3	
75 - 129	(100 - 173)				T4i / T3			T4 / T3	
130 - 560	(174 - 751)			T4i / T3			T4 / T3		
561 - 900	(752 - 1207)	T2 /		T4i / T2				Power gen: T4 (NOx&PM A/T) / T2 Other: T4 (PM A/T) / T2	
901 - 2237	(1208 - 3000)	T2 /		Power gen: T4i (NOx A/T) / T2					
>2237	>3000	T1 / T1 (nonroad is T2)		Other: T4i (non - A/T) / T2					

Tier 1 [E] Tier 2 ■ Tier 3 ■ Tier 4 Interim Tier 4 Final

Compliance with optional 'Option 1' 0.30g/kW-hr PM limit in 2008 allows 1-year delay of T4 until 2013.
Option 1 engines in 2008 are T4i engines not T3 engines

Key

NOx / HC / CO / PM (g/kW-hr)
(NOx + HC) / CO / PM (g/kW-hr)
(Conversion: (g/kW-hr) x 0.7457 = g/bhp-hr)
Separate NOx and HC standards separated by a slash.
Combined NOx and HC standards denoted in parenthesis '( )'.

Notes

1. Generally, effect dates of standards are for engines built on or after 1 January of the respective year, except where noted.
2. All standards are based upon ISO 8178 C1 8-mode test for variable-speed engines and D2 5-mode test for constant-speed engines. Transient test required beginning with 2011 phase-in.
3. Smoke requirements: U.S. - On-highway federal test procedure. Europe - None, but some OEMs require R24.03 certification.
4. Nonroad generator sets in Europe are required to meet Stage IIIA standards beginning 1 January 2011 or 2012, based on power band.

Leading the way ahead

Combustion chemistry

NOx - Gases composed of nitrogen and oxygen that react together during combustion. The EPA estimates that diesel engines emit 25% of all NOx in the U.S.

HC - React with NOx in sunlight to form ground-level ozone, involved in the formation of smog and acid rain.

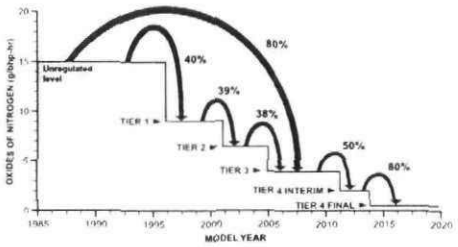
CO - Produced by the incomplete combustion of fossil fuels and present at very low levels in diesels.

PM - A non-gaseous material consisting of soot, carbon and other combustion by-products. The EPA estimates that diesel engines emit 15% of all PM in the U.S.

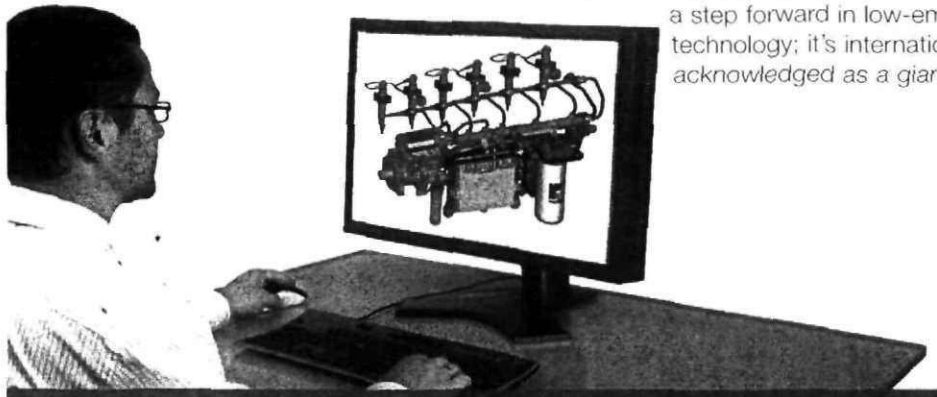
By relying on analysis-led design rather than prototype testing, the Cummins Quantum system brings together a series of integrated technologies using proven base-engine platforms.

As well as meeting stringent regulations up to U.S. Tier 3/EU Stage IIIA, predominantly without the use of exhaust aftertreatments or other power-consuming strategies, the system reduces primary pollutants by 60% compared to Tier 1 levels, without sacrificing engine performance or reliability.

Percent reduction of NOx + HC (typical 250 kWe/60Hz and 275 kVA/50 Hz generator set).
Since U.S. EPA emissions regulations for nonroad diesel engines came into effect in 1996, Cummins Power Generation has, through in-cylinder design improvements and precise control of the combustion process, developed technologies that reduce the primary pollutants in diesel generator set exhausts by approximately 80%.

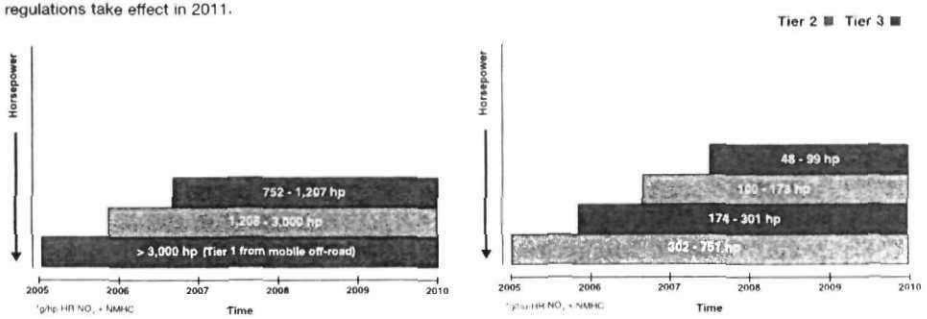


With the power to cut pollutants not engine performance, our intelligent Quantum system represents more than a step forward in low-emission technology; it's internationally *acknowledged as a giant leap.*



Tier 2 regulation phase-in (752 hp to >3000 hp)
Large generator engines of >3000 hp must comply with Tier 2 if used in nonroad or non-emergency stationary applications. Stationary emergency generator sets powered by engines of >3000 hp will remain at Tier 1 until Tier 4 regulations take effect in 2011.

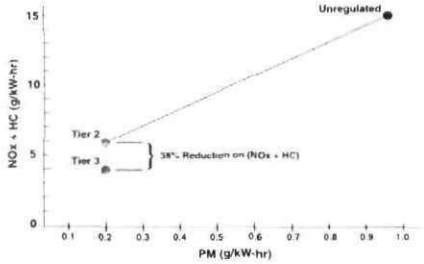
Tier 3 regulation phase-in (48 hp to 751 hp)
Small to medium generator engines have also been phased in to Tier 3 regulations based on horsepower because different size engines require different control strategies.

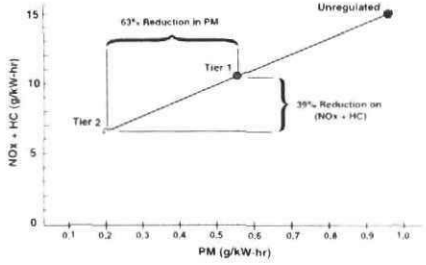


Charting the move to clean air
Under the current legislative timetable, by 2010 the move from U.S. Tier 1 regulations to Tiers 2 and 3 will have reduced diesel engine NOx emissions by 1.2 million tons; HC emissions by 163,000 tons; and PM emissions by 140,000 tons.

(NOx + HC) reduction medium-hp engines
(NOx + HC) emissions from medium-horsepower engines are reduced 39% from Tier 2 to Tier 3 levels.

(NOx + HC) + PM reduction high-hp engines
(NOx + HC) + PM emissions from high-horsepower engines are reduced 39% from Tier 1 to Tier 2 levels; PM emissions are reduced 63%.





Integrating innovative developments

Designed to minimise emissions and maximise performance

By controlling NOx and PM during combustion while producing the highest possible power output, the Cummins Quantum system delivers real benefits to the end-user and the environment, ensuring:

- Compliance with EPA Tier 2 and Tier 3 regulations
- Lowest-cost installation
- Generator set footprints that are virtually identical with those of Tier 1
- High fuel efficiency with only a minor increase in heat rejection

Optimising combustion efficiencies

The key components of the Quantum system
With advanced in-cylinder combustion control and optimised fuel delivery, the Quantum system has the technology to meet global emissions standards through to 2017.

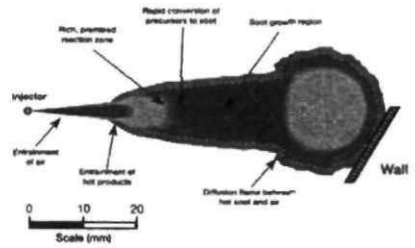
Advanced electronic engine controls
With new electronic sensors and microprocessor-based engine controls to compensate for load, temperature, fuel energy content, barometric pressure and even engine wear, fuel efficiency and power output are improved while production of both NOx and PM are decreased.

The advantages of advanced in-cylinder combustion control > 751 hp

- Uses proven engine platforms with no displacement or base-engine changes
- Avoids complicated engineering such as exhaust gas recirculation (EGR) or major changes to turbocharging or cooling
- Tolerates high-sulphur fuel

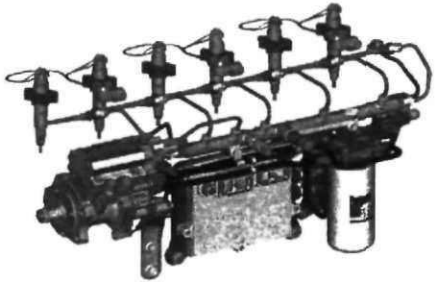
Meticulous research and development has enabled our engineers to design one of the world's most advanced combustion systems; one that delivers both increased fuel efficiency and reduced emissions.

Improved combustion chamber geometry
Using computer simulation of the combustion event, Cummins' engineers have altered the combustion chamber geometry to improve the compression ratio and fuel and air mixing. As a result, the production of emissions is significantly reduced, as is mechanical stress through the lowering of piston temperatures and cylinder pressures.



- Fuel-rich, premixed flame
- Initial soot formation
- Thermal NO production zone
- Soot oxidation zone

Optimised fuel injection systems
Enhanced injection timing, injection pressure and nozzle design ensure greater control of both NOx and PM. In addition, the high-pressure common rail fuel system (used on engine platforms QSB5, QSB7 and QSL9) reduces engine noise and stress on engine parts for greater durability, whilst the modular common rail system (for QSK19, QSK38, QSK50 and QSK60) does much the same for the higher-horsepower engines.



Enhanced 'FCD' cast iron pistons
With a new ferrous cast ductile (FCD) single-piece, cast iron piston in all our high-horsepower engines to permit expansion and contraction during thermal cycles, we've increased power cylinder durability by up to 15%. Our tier-compliant designs also include piston-cooling nozzles for a higher oil flow rate, a nitrided cylinder liner for reduced oil consumption and wear, and a simplified valve train to minimise loading on crankshafts and gear train.



High-pressure common rail
Higher injection pressures from new fuel injection systems improve fuel atomization, assist combustion chamber penetration (for better cold starting and response to transient loads), and enhance engine performance, effectively:

- Reducing noise and smoke
- Improving idle stability
- Improving low-end torque
- Producing cleaner combustion

Taking greater control





Proven emissions-compliant engine platforms

*To be certified emissions compliant late 2009

Designed to meet U.S. Tier 2/Tier 3 and EU Stage II/Stage IIIA regulations, our products offer everything from prime power to standby systems for offices, data centres, telecoms, hospitals and a wide variety of other applications.

X1.3*



- EPA T4i
- 10 Kwe 60 Hz standby power
- 11 kVA 50 Hz standby power
- 1.3L displacement

X1.7*



- EPA T4i/EU SIIIA
- 15 Kwe 60 Hz standby power
- 16.5 kVA 50 Hz standby power
- 1.7L displacement

X2.5*



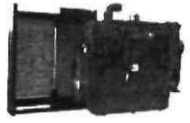
- EPA T4i/EU SIIIA
- 25 Kwe 60 Hz standby power
- 27.5 kVA 50 Hz standby power
- 2.5L displacement

X3.3*



- EPA T4i/EU SIIIA
- 35 Kwe 60 Hz standby power
- 38 kVA 50 Hz standby power
- 3.3L displacement

QSX15



- EPA Tier 2/EU Stage II
- 500 kWe 60 Hz standby power
- 400-550 kVA 50 Hz standby power
- High-pressure fuel system
- 15L displacement

QSK19



- EPA Tier 2
- 550-600 kWe 60 Hz standby power
- 600-715 kVA 50 Hz standby power
- Modular common rail fuel system
- Dual speed
- 19L displacement

QSK23



- EPA Tier 2 at 1500/1800 rpm
- 650-800 kWe 60 Hz standby power
- 825-900 kVA 50 Hz standby power
- High-pressure injection fuel system
- Dual speed
- 23L displacement

QST30



- Tier 2
- 750-1000 kWe 60 Hz standby power
- 825-1100kVA 50 Hz standby power
- 30L displacement

B3.3



- EPA T3/EU SIIIA
- 60 Kwe 60 Hz standby power
- 70 kVA 50 Hz standby power
- 3.3L displacement

QSB5



- EPA Tier 3/EU Stage IIIA
- 60-125 kWe 60 Hz standby power
- 70-150 kVA 50 Hz standby power
- High-pressure common rail fuel system
- Dual speed
- 4.5L displacement

QSB7



- EPA Tier 3/ EU Stage IIIA
- 100-200 kWe 60 Hz standby power
- 110-220 kVA 50 Hz standby power
- High-pressure common rail fuel system
- Dual speed
- 6.7L displacement

QSL9



- EPA Tier 3/EU Stage IIIA
- 200-275 kWe 60 Hz standby power
- 220-300 kVA 50 Hz standby power
- Full-authority electronic engine
- High-pressure common rail fuel system
- Dual speed
- 8.9L displacement

QSK38



- Tier 2
- 900-1250 kWe 60 Hz standby power
- 1000-1400 kVA 50 Hz standby power
- Modular common rail fuel system
- 38L displacement

QSK50



- Tier 2
- 1100-1600 kWe 60 Hz standby power
- 1250-1700 kVA 50 Hz standby power
- Modular common rail fuel system
- 50L displacement

QSK60



- Tier 2
- 1750-2000 kWe 60 Hz standby power
- 1875-2250 kVA 50 Hz standby power
- Modular common rail fuel system
- 60L displacement

QSK78



- Tier 1
- 2500-2750 kWe 60 Hz standby power
- 2750-3000 kVA 50 Hz standby power
- High pressure injection fuel system
- 78L displacement

Matching every application

With the broadest product line in the world, and a range of power ratings to match, Cummins' engines already power more types of equipment in more markets than those made by any other manufacturer.

G-drive engines
Purpose-designed for high load factors, high usage in a variety of applications and reliability, our G-drive engines are used extensively by original equipment manufacturers. Capabilities include:

- Mid-range (1.3 - 9L) medium-horsepower engines (16 to 476 hp), providing the broadest Tier 3 range which further reduce Tier 2 NOx levels by 38%
- Heavy duty (11 - 15L) 415 to 755 hp engines powering commercial operations
- High-horsepower (19 - 78L) 675 to 3700 hp at both 1500 and 1800 rpm, designed to meet Tier 2/Stage II emissions requirements for electronics and diagnostics, base engine and turbocharging, power cylinder and fuel systems

Strategic emissions leadership for Tier 4 and beyond

By developing advanced regenerative filters and selective catalyst reduction (SCR) systems, we're already in a position to help you gear up for the 15-ppm ultra low-sulphur fuel, PM filter and high-efficiency NOx aftertreatment requirements of the Tier 4 nonroad generator set emissions standards.

In fact, by designing, installing and servicing these aftertreatment strategies, we'll be able to provide you with compatible, high-performance systems that assure maximum reliability and durability not just for 2011, but way beyond.

Get our energy working for you
With trusted local relationships, innovative solutions and dedicated customer service, Cummins Inc. is committed to understanding and meeting customers' needs worldwide. It's this promise that enables us to deliver power wherever, whenever and however it is needed.

For more information on global emissions standards, visit:

www.cumminspower.com
www.cumminsgdrive.com
www.epa.gov
www.dieselnet.com/standards/eu/offroad.html
www.cleanairworld.org

Or, contact your Cummins distributor.





Cummins is the only manufacturer to offer dual-speed diesel G-Drive engines from 4.5L - 9L. These not only boast the most advanced technology, but also represent compliance with the most stringent EPA Tier 3 and EU Stage IIIA norms at both speeds (50 & 60 Hz). The ability of our engines to meet these strict emissions norms ensures our products represent a cost effective and versatile power solution for rental and mobile applications.