POWERING THE FUTURE.

Cat® Product and Technology Solutions for Tier 4 Interim Regulations

CAT®

CAT® IS LEADING THE WAY

Building on a legacy of diesel engine expertise and armed with the industry's largest established dealer network, Caterpillar is leading the industry in meeting the latest emission standards set by the U. S. Environmental Protection Agency (EPA).

The technology used to meet the new Tier 4 Interim emission standards is an evolution of existing technologies Caterpillar has used successfully for decades. And, Caterpillar continues to invest in the research and development of cleaner engines and emissions-reduction technologies to meet the new emission standards, while providing ever-increasing value to our customers.

At Caterpillar, we set the standard for meeting your technological needs for the future by continuously developing new designs, testing criteria, improving performance characteristics, and enhancing our service and support offerings.

TIER 4 INTERIM REGULATIONS

Beginning January 1, 2011, the EPA will extend the first of its two-phase Tier 4 emissions control regulations to cover mobile engines greater than 130 bkW and non-emergency stationary engines less than 10 liters per cylinder and greater than 130 bkW. These regulations call for dramatic reductions in carbon monoxide (CO), hydrocarbons (HC), particulate matter (PM) and oxides of nitrogen (NO_x) emissions. In the past, technological improvements to the engine allowed engine manufacturers to conform with emission standards. Tier 4 emission standards are so stringent that in many cases aftertreatment components are needed. In some power classes, the new emission standards are more stringent for generator sets than for other types of non-road equipment.

The new emission standards:

- Affect the majority of non-road mobile equipment powered by diesel engines greater than 130 bkW, including mobile generator sets
- Apply to non-emergency stationary generator sets
- Vary based on the power category of the engine
- Require the use of ultra low sulfur diesel fuel (ULSD)
- Require both the engine and aftertreatment be certified as a complete system

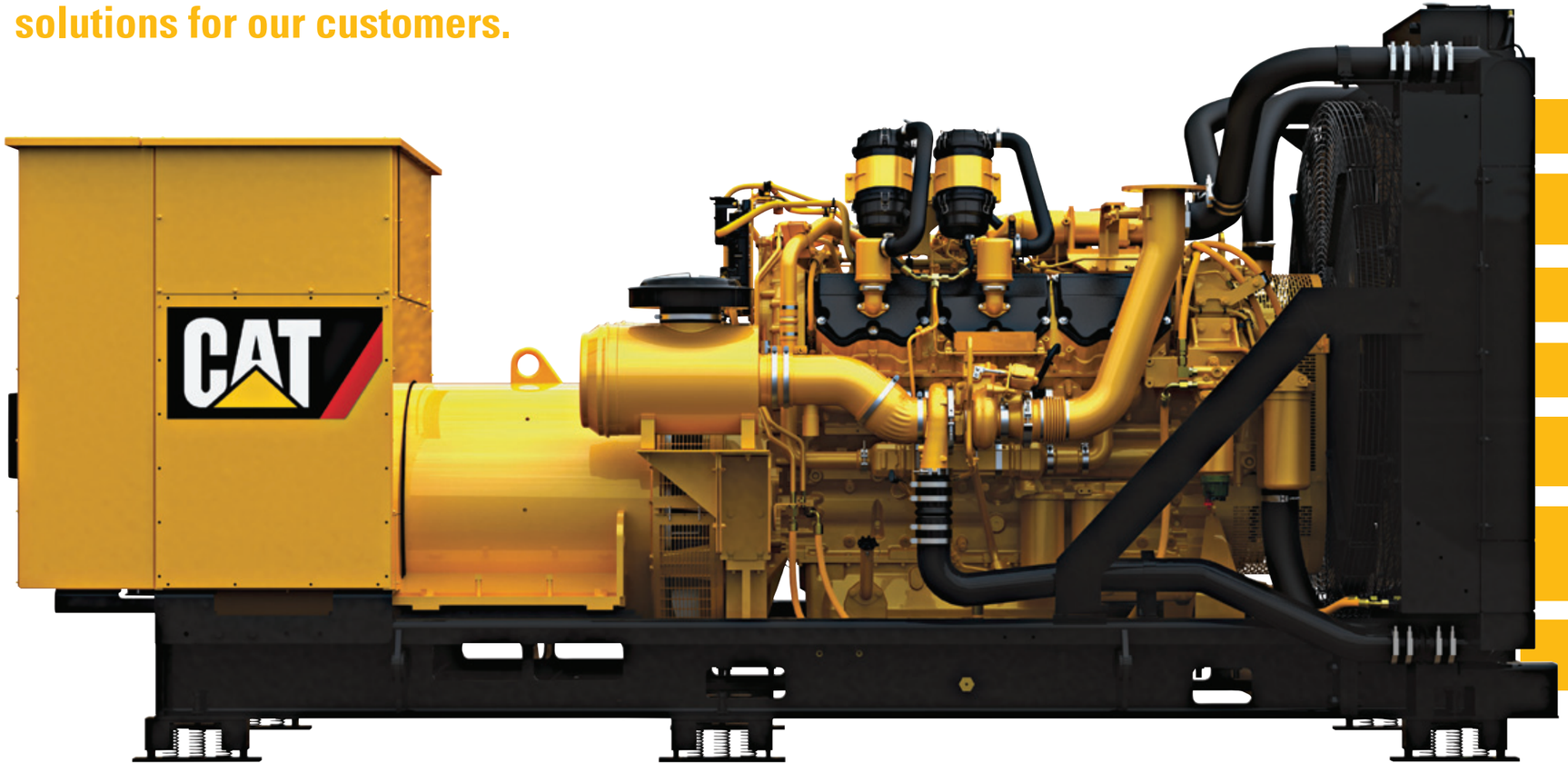
CHANGE FOR THE BETTER

Engineering teams across all Cat® product lines have leveraged their expertise to conform with federal and local regulations, helping our customers rise to the business demands of today and tomorrow. Cat Tier 4 Interim generator sets continue the Caterpillar tradition of excellence in design, performance, reliability and durability, while providing the most cost-effective solutions for our customers.

Caterpillar has developed robust, state-of-the-art engine-integrated technology packages that can be used in combination to meet the EPA Tier 4 emission standards across a wide range of products and applications. And, they are vertically integrated in more than 300 different Cat machine products, which allows for optimizing each engine based on the specific application it will power. So, no matter what your business needs are, Caterpillar is ready to provide the breadth and depth of product offerings that you require to meet the Tier 4 emission standards.

CAT TIER 4 INTERIM GENERATOR SETS

Meeting Tier 4 emission standards not only requires further development of the current generation of Tier 2 and Tier 3 engines, but also the use of exhaust aftertreatment technologies. Working closely with genset owners and operators, Cat engineers have studied the specific demands of each power class and determined which technologies deliver the greatest customer value – resulting in the development of specific products to best meet the unique needs of each generator size.



CAT TIER 4 INTERIM GENERATOR SETS ARE AVAILABLE TO MEET POWER REQUIREMENTS FROM 11 TO 3000 ekW, AND OFFER:

- Optimal performance, reliability and improved fuel efficiency
- Technical solutions, which minimize impact on installation, operation and maintenance
- The next generation of Cat EMCP generator controls
- EPA Tier 4 Interim certification
- Reductions of up to 90 percent of PM and NO_x emissions, depending on power class
- A complete, integrated solution (engine, generator set, Uninterruptible Power Supply, Switchgear and Automatic Transfer Switch) that boosts overall power
- Full support by Cat Dealers and technicians trained in emissions technology installation and service

A TOTAL SYSTEMS SOLUTION

Caterpillar has the unique advantage of being the only manufacturer to offer our customers a total power system, including the engine, generator set, Uninterruptible Power Supply, Switchgear and Automatic Transfer Switch. All components are designed to work together, fully integrated and from a single manufacturer – making the system a seamless, efficient and cost-effective solution for our customers.

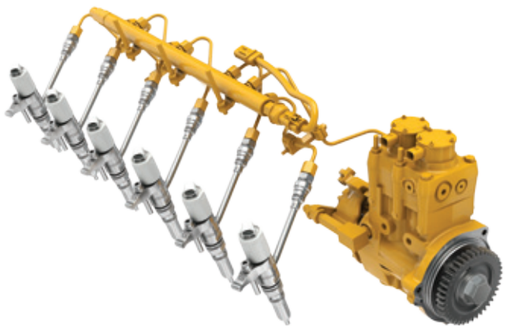
The complete Cat system integration greatly increases the reliability of the power system by using high-quality, durable products and proven technology. Optimized engine performance plus tailored aftertreatment provides the most cost-effective solution. With our total systems solution, you get the productivity, efficiency, reliability and service that you count on from Caterpillar.

CAT ENGINE AND AFTERTREATMENT TECHNOLOGIES

Depending on the power class, we offer a variety of leading-edge technologies to meet the different requirements of the Tier 4 Interim emission standards. Utilizing "in-cylinder," "on-engine" and exhaust aftertreatment technologies, we are able to provide our customers with ideal solutions for a broad range of applications.

MORE POWERFUL, RELIABLE ENGINE ELECTRONICS

- The electronics used in Cat® Tier 4 Interim engines are more powerful and robust than ever.
- Increased feature and connection commonality improve the customer experience and increase quality and reliability.
- Sealed-over-foam wiring harness adds to reliability – even in the most demanding applications.



NEXT GENERATION FUEL SYSTEM

As a key component of Cat Tier 4 Interim technology, injection timing precisely controls the fuel injection process through a series of carefully timed microbursts. This injection timing provides more control of combustion for the most efficient fuel burn. To maximize customer value, Cat engineers specified fuel systems based on the power and performance demands for each engine.

- High Pressure Common Rail Fuel Systems with full electronic injection improve precision and control that boosts performance and reduces soot for the C4.4 ACERT™ Technology and C7.1 ACERT and C175 ACERT electric power engines.
- Advanced MEUI-A and MEUI-C injectors handle increased injection pressures and more precise fuel rates. These durable injectors enhance responsiveness while controlling soot in the C13 ACERT, C15 ACERT, C27 ACERT and 3500 Series electric power engines.

INNOVATIVE AIR MANAGEMENT

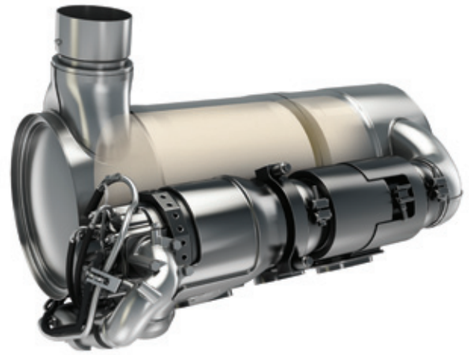
- Cat Tier 4 Interim air management is accomplished through simplified turbocharging solutions. A range of turbocharging solutions, including smart wastegate and series units, optimizes performance for each model of generator set.

CAT NO_x REDUCTION SYSTEM (NRS)

- Utilized on engines < 900 bkW, the Cat NRS is a compact "on-engine" system is designed to reduce NO_x by up to 50% while minimizing overall installation size.
- The Cat NRS captures and cools a small quantity of exhaust gas and sends it back into the combustion chamber where it drives down combustion temperatures and reduces NO_x emissions.
- The result of more than a decade of Caterpillar engineering research into this technology, the Cat NRS is designed to be the most reliable system of its type.

CAT CLEAN EMISSIONS MODULE (CEM) – PARTICULATE REDUCTION

- Designed to withstand the most severe applications and conditions, the CEM is a modular aftertreatment concept that allows a common core design to be utilized in a wide variety of Cat equipment. Cat generator set customers thus benefit from a cost-optimized, tailored solution that is fully mounted and integrated into the generator set.
- Depending on the engine model, the CEM may include a diesel oxidation catalyst (DOC) and a diesel particulate filter (DPF) in a stainless steel canister, the regeneration system, mounting and support structure, air cleaner, muffler, sensors and other related components.

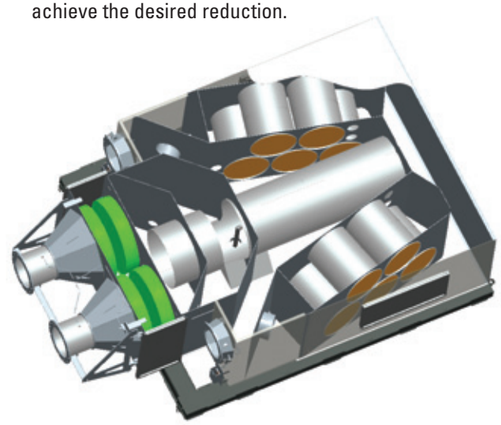


CAT REGENERATION SYSTEM (CRS)

- This active, high-temperature regeneration system is incorporated in the CEM design for engines rated 130-560 bkW.
- As soot builds up in the DPF, a combination of models and sensors indicate when regeneration is needed. The electronic control unit (ECU) then searches for the optimum time to initiate the CRS event, such as periods of steady load or speed–providing a flexible and transparent solution in all operating conditions.
- The CRS safely elevates exhaust gas temperatures to promote oxidation and burn off soot in the DPF. It allows fast and accurate control of regeneration independent of engine exhaust temperatures.

CAT CLEAN EMISSIONS MODULE – SELECTIVE CATALYTIC REDUCTION (SCR)

- In generator set applications, engines greater than 900 bkW must conform with stringent NO_x emission limits, which necessitate the use of an SCR system. This larger CEM consists of integrated PM and NO_x aftertreatment.
- Using a DOC for PM and HC control, as well as an SCR system with air-assist diesel exhaust fluid (DEF) injection, the CEM also features an Ammonia Oxidation Catalyst (AMOX), integrated sound attenuation and an insulated exterior to reduce heat radiation in engine room installations.
- A dosing control module is connected to the SCR module to provide closed-loop control of the NO_x reduction process by monitoring NO_x sensors before and after the SCR catalysts and controlling the injection of appropriate amounts of DEF to achieve the desired reduction.



- Dual-bank round ceramic SCR design for low pressure drop at reduced cost and weight
- Access to key service items
- Dual-wall insulation for thermal protection
- Wraparound flow path gives long mixing tube – time for DEF to decompose
- Thin wall stainless with mild steel external support structure to minimize cost and weight
- Integrated Sound Attenuation Chambers maximize space with minimal cost and backpressure impact

ELECTRIC POWER TIER 4 INTERIM PRODUCT AND TECHNOLOGY SUMMARY

C1.5 – C2.2
13, 20, 25, & 30 ekW

Effective Year of Regulation
2008

Power/Rating
> 19 bkW < 56 bkW

Fuel System
Mechanical Fuel Pump

Air System
NA / Turbo / ATAAC

No_x Reduction Technology
In Cylinder

PM Reduction Technology
In Cylinder

Regeneration Technology
Not Required

Generator Set Controls
EMCP 3.1

C7.1 ACERT
200 ekW

Effective Year of Regulation
2011

Power/Rating
> 130 bkW < 560 bkW

Fuel System
Common Rail

Air System
Series Turbo plus ATAAC

No_x Reduction Technology
Cat No_x Reduction System

PM Reduction Technology
Diesel Particulate Filter

Regeneration Technology
High Temp Cat Regeneration System

Generator Set Controls
EMCP 4.2

C13 ACERT
350 ekW

Effective Year of Regulation
2011

Power/Rating
> 130 bkW < 560 bkW

Fuel System
Electronic Unit Injection (EUI)

Air System
Asymmetric Turbo plus ATAAC

No_x Reduction Technology
Cat No_x Reduction System

PM Reduction Technology
Diesel Particulate Filter

Regeneration Technology
High Temp Cat Regeneration System

Generator Set Controls
EMCP 4.2

C15 & C27 ACERT
500 & 800 ekW

Effective Year of Regulation
2011

Power/Rating
> 560 bkW < 900 bkW

Fuel System
Electronic Unit Injection (EUI)

Air System
Asymmetric Turbo plus ATAAC

No_x Reduction Technology
Cat No_x Reduction System

PM Reduction Technology
No Aftertreatment Required

Regeneration Technology
Not Required

Generator Set Controls
EMCP 4.2

3516CHD
2000, 2200 & 2500 ekW

Effective Year of Regulation
2011

Power/Rating
> 900 bkW

Fuel System
Electronic Unit Injection (EUI)

Air System
Turbo plus ATAAC

No_x Reduction Technology
Selective Catalytic Reduction

PM Reduction Technology
Diesel Oxidation Catalyst

Regeneration Technology
Not Required

Generator Set Controls
EMCP 4.2

C175-16 ACERT
3000 ekW

Effective Year of Regulation
2011

Power/Rating
> 900 bkW

Fuel System
Common Rail

Air System
Turbo plus ATAAC

No_x Reduction Technology
Selective Catalytic Reduction

PM Reduction Technology
Diesel Oxidation Catalyst

Regeneration Technology
Not Required

Generator Set Controls
EMCP 4.2

POWERFUL OPTIONS

The Tier 4 Interim emission standards affect mobile engines greater than 130 bkW and non-emergency stationary engines less than 10 liters per cylinder and greater than 130 bkW. Cat generator sets in this power range incorporate combinations of Cat Tier 4 engine and aftertreatment technologies to provide the ultimate in productivity and efficiency for our customers. Armed with the most advanced technologies in the industry, Caterpillar is ready to meet your high expectations for performance and reliability in all Cat engines.

60 Hz ekW			
Standby	Prime	Stationary	Rental
200	180	D200	XQ200
350	320	n/a	XQ350

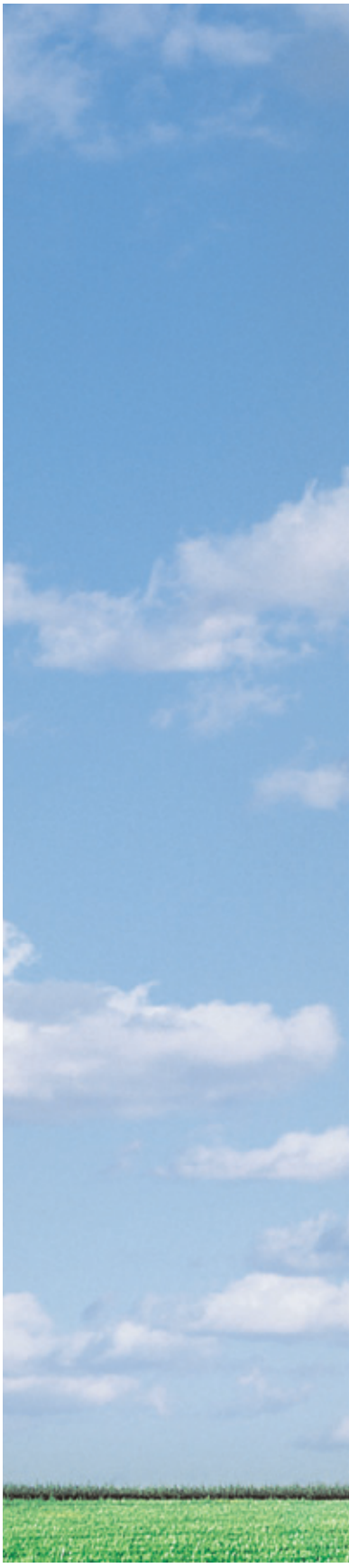
- Cat NO_x Reduction System and Clean Emissions Module (DOC+DPF+CRS)
- Maximizes uptime through automatic DPF regeneration
- Minimum impact on operation and maintenance
- Minimum impact on installation design

60 Hz ekW			
Standby	Prime	Stationary	Rental
500	455	C15	XQ500
800	725	C27	XQ800

- Cat NO_x Reduction System
- Proven ACERT Technology and additional air management
- Compact, cost-effective design

60 Hz ekW				
Standby	Prime	Continuous	Stationary	Rental
2000	1825	1650	3516C-HD	n/a
2200	2000	1825	n/a	XQ2200
2500	2250	2050	3516C-HD	n/a
3000	2750	2500	C175-16	n/a

- Clean Emissions Module (DOC+SCR)
- Layout, specification and control system optimized for Cat generator sets – designed specifically for Cat engines (catalyst size, exhaust flow, noise characteristics)
- No regeneration requirement
- Reliable, compact, lightweight
- Flexible configuration



WE'RE WITH YOU ALL THE WAY

The worldwide Cat Dealer network is committed to supporting your generator sets and your operations anytime and anywhere in the world. Our field technicians have been expertly trained to support Tier 4 Interim engines and aftertreatment systems. You will further benefit from the design commonality built into these engines, enabling common service tooling and parts stock coverage. With world-class service and support, you get the ultimate in engine performance and ongoing value for the life of your engine.

Cat Dealers also offer Customer Support Agreements and fleet and business management expertise that can help you reduce overall operating costs and maximize efficiency, allowing you to manage your business even more effectively. Our commitment extends to every level of your business, from the most advanced technology to the highest-quality service. With Caterpillar, you have the power to take your business successfully into the future.

For more information, contact your local Cat Dealer or visit http://www.cat.com/power-generation/generator-sets/emissions

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