

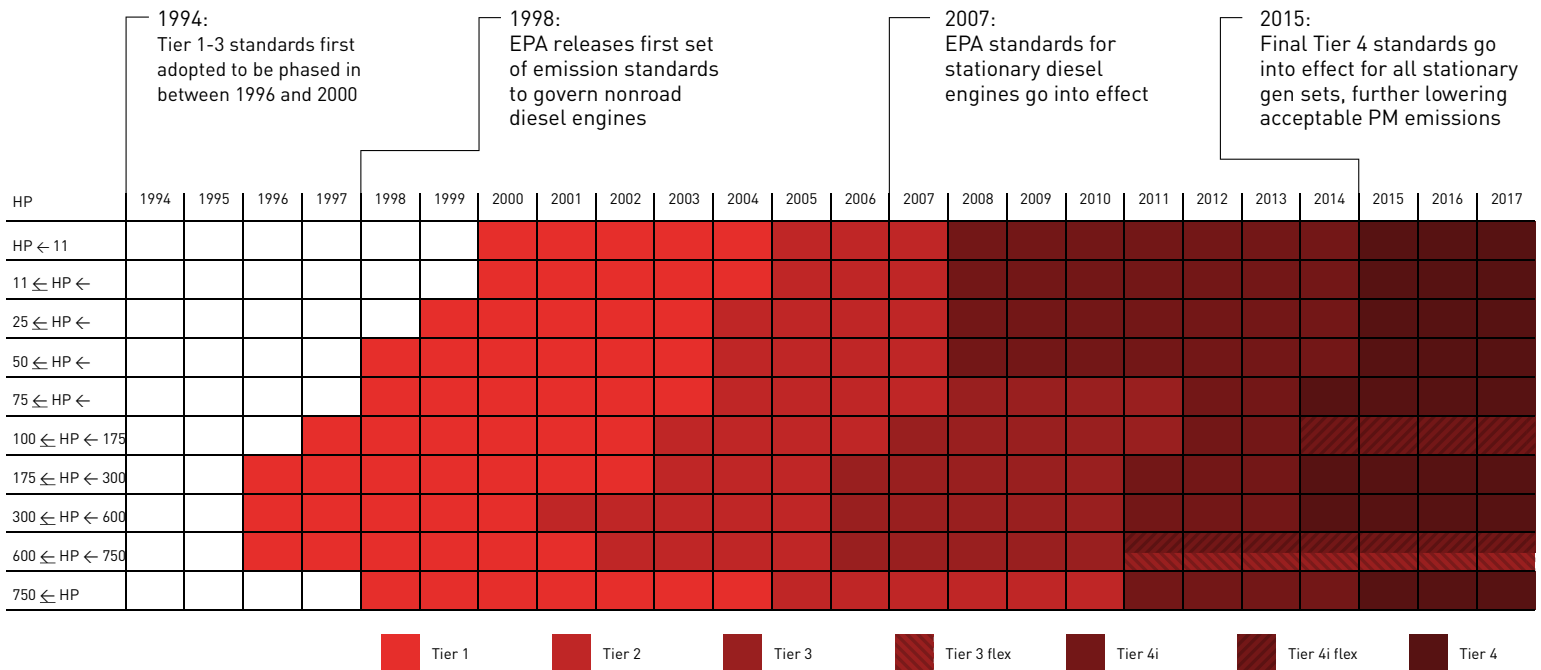


THE GUIDE TO FINAL TIER 4 REGULATIONS



The implementation of final Tier 4 solutions prior to the deadline at the end of the 2015 calendar year can be a complex issue. Because of the staggered timeline for final implementation, the science behind the targeted emissions reduction, the number of diesel engine applications, and the different strategies for meeting emission caps, there's ample opportunity for confusion to arise.

Many owners of diesel engines—both for on-road applications and off—are unsure of whether or not the rules apply to them. Some aren't sure of whether or not they'll be subject to penalties for continuing to use their existing equipment. Some just plain aren't sure how to proceed. Hopefully, this guide will serve to clear up some of the most perplexing aspects of the new standards.



The what and the why

The first EPA standards for diesel emissions were put into place in 1996. It wasn't until two years later, however, that non-road applications were brought under the authority of these regulations. Prior to 1998, these standards applied only to highway-use applications like trucks and buses. But, after 1998, [rules governing stationary internal combustion engines](#) were put in place because they are "common combustion sources that collectively can have a significant effect on air quality and public health."

Initial standards were phased in over a period of four years. Since then, the criteria for the power and application of the engines that are required to meet these standards have broadened significantly. In 2004, the EPA introduced stricter (Tier 4) engine standards, which were phased in starting in 2008 and are to be implemented by the end of 2015. The term "final Tier 4" refers to this ultimate deadline for the implementation of the EPA's most recent standards.

Two of the byproducts of diesel engines that have been targeted specifically by the EPA's tiered emission reduction program are nitrogen oxides (NOx) and particulate matter (PM).

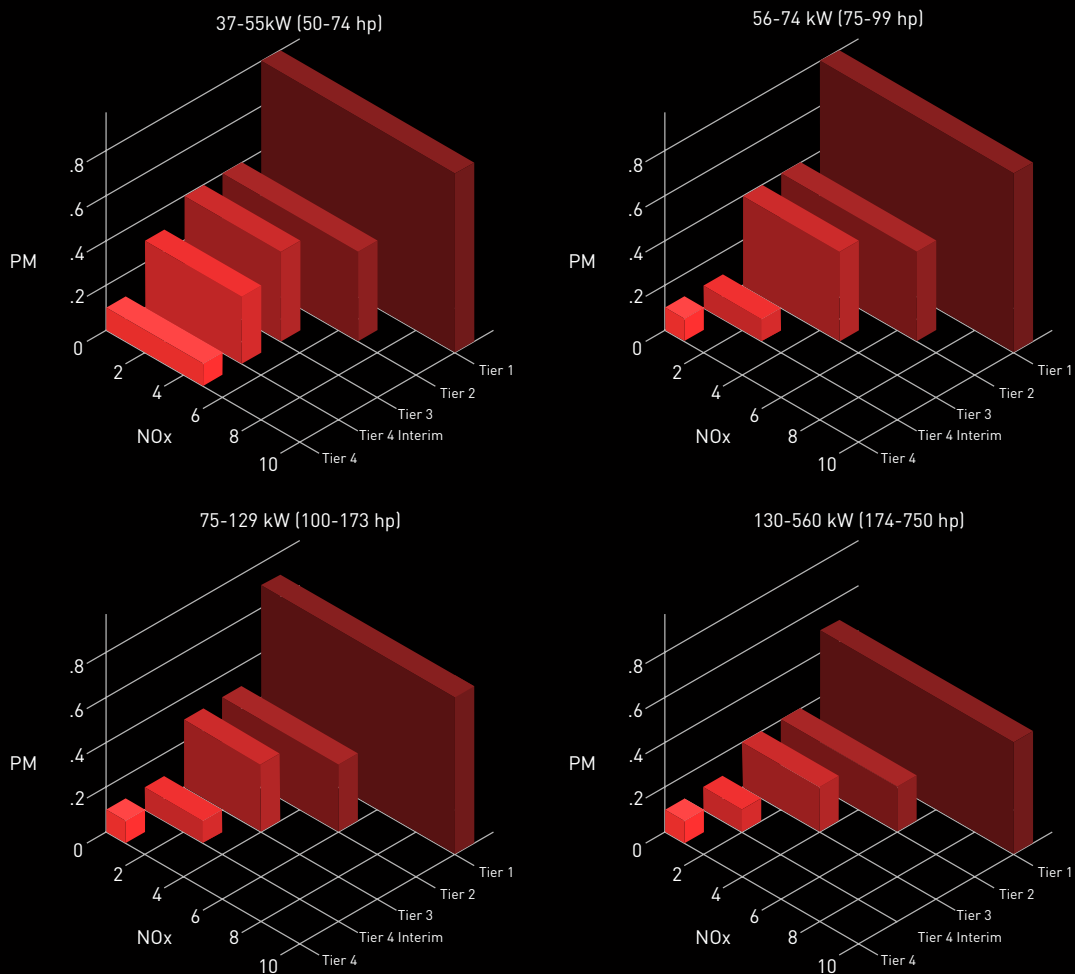
Nitrogen Oxides

Nitrous acid, nitric acid and nitrogen dioxide are all examples of NOx and are of particular concern for the EPA. Of these, nitrogen dioxide is especially concerning because of its tendency to form as a byproduct of combustion engines, once exposed to nitrogen and oxygen. NOx can be responsible for acid rain, is instrumental in the formation of ground-level ozone and contributes to respiratory issues like asthma in children and adults.

Particulate matter

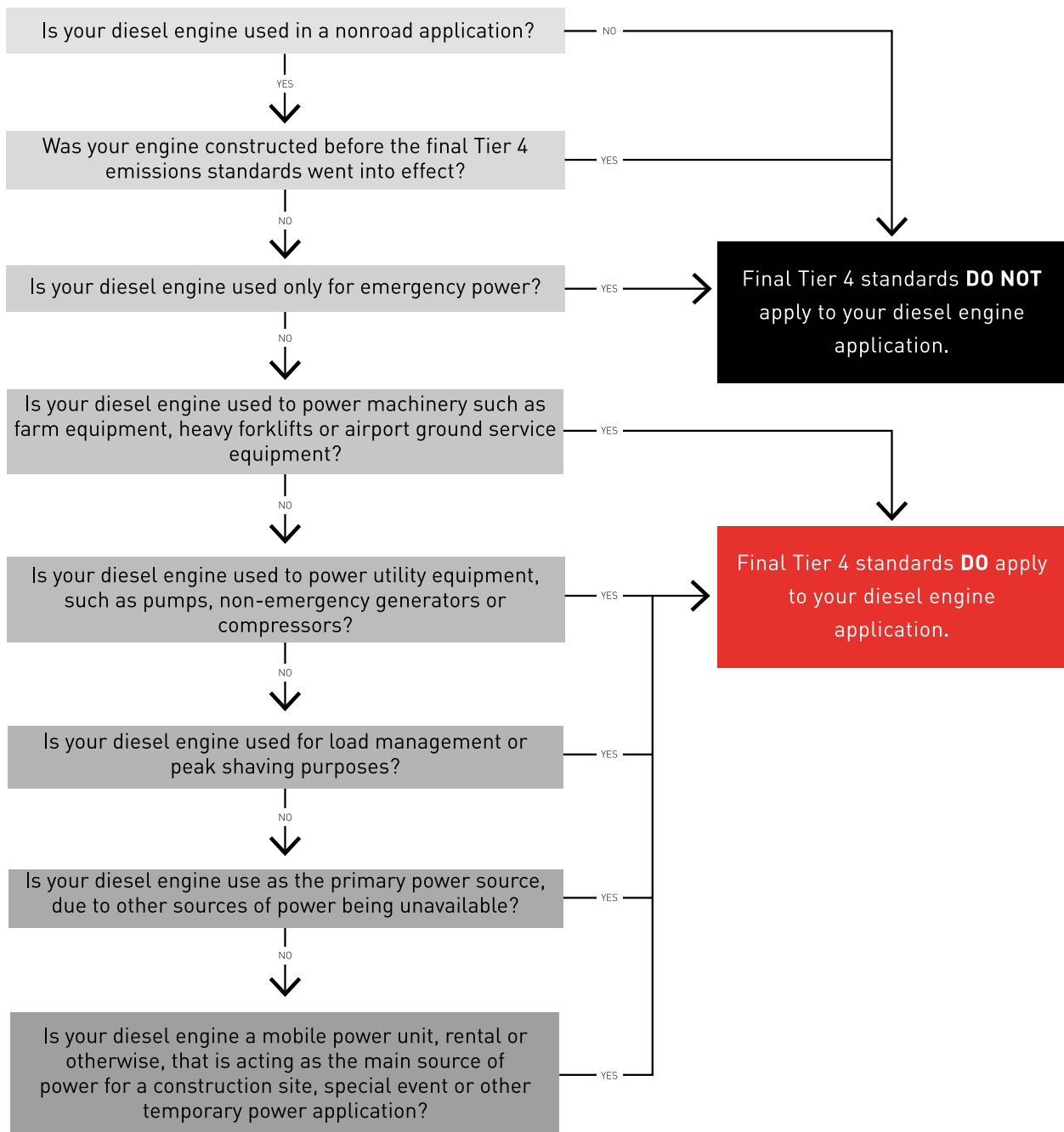
According to the EPA, **PM** is “a complex mixture of extremely small particles and liquid droplets.” PM can be emitted either as a pollutant in itself, or by what are known as “secondary sources,” which emit gasses that have a tendency to become PM in the atmosphere. So, what’s the problem? The body filters out most large PM, but smaller (called “fine PM”) particles have a tendency to become lodged in the throat and lungs, where they have been found to cause health problems.

The EPA’s progressive tier system has had tremendous success in scaling back the harmful emissions from diesel engines. After a [health assessment](#) conducted in 2002 concluded that long-term inhalation of diesel exhaust fumes posed a substantial lung cancer hazard to humans, final Tier 4 emission standards were designed to cut exhaust emissions from diesel engines by 90 percent (see figure below).



Which applications are affected?

It can be difficult to determine if your application is governed by the final Tier 4 standards. We've created a flow chart that will hopefully simplify the process of determining whether or not your equipment needs to comply with the final Tier rule, but here we'll dive a little more deeply into some common exceptions and other points of confusion when it comes to deciding if an application is affected.



The first step in deciding whether your application falls under the rule concerns on and off-road applications. While diesel engines for trucks, buses and other vehicles meant for highway travel have emission standards they must meet, the relevant rule is not final Tier 4. To be clear, that's not to say that nothing with four wheels and a diesel engine is affected. Farm tractors, excavators and other types of construction earthmovers are affected by final Tier 4 standards, since they are technically considered non-road applications. But those vehicles designed specifically for on-road use aren't covered here.

Two more categories of exempt machinery to be aware of are legacy equipment and emergency applications:

Legacy equipment

Legacy equipment refers to diesel engines that satisfied all of the emissions requirements for the year they were produced. This equipment is not required to be retrofitted to fit the upcoming final Tier 4 standards. Only newly purchased stationary diesel internal combustion engines fall under the mandate of the new EPA standard.

Emergency applications

Standby generators (those that are only meant for use in the case of a failure of the primary source of power) are also not regulated by final Tier 4 standards. The EPA determined that the limited running time from these generators contribute only a negligible amount to the pollutants it was seeking to control. This does not, however, mean that generators intended for use load management or peak shaving are exempt from the rule. Those applications are considered to be for regular and planned usage and are therefore affected. It should also be noted that mobile power generators, when they are acting as the sole source of power, are also subject to final Tier 4 standards.

Determining whether your application is affected by the upcoming deadline can be complex. It never hurts to reach out to a trusted engine or generator provider to double-check the status of your application.

Common final Tier 4 implementation problems

Customers and manufacturers alike have had to make some adjustments in order to meet these new standards. Diesel engine manufacturers have had to investigate and select the strategy that limits NOx and PM without sacrificing performance from the engines that bear their names.

For customers looking to upgrade to final Tier 4, the concern generally takes a single form: How do I fit my new final Tier 4 equipment into my current operations as smoothly as possible?

Here are some of the most frequently encountered stumbling blocks for buyers aiming for a smooth transition:

Finding the right solution

Many of the same customers have often been ordering engine equipment from us for years. And it was easy. The buyer goes to a trusted manufacturer, lays out horsepower requirements and a description of the application, and that was pretty much it. The manufacturer would then provide a menu of options ready to be dropped into a machine and put to work. But that's all changed. Now, an engine manufacturer may quote one price, without mentioning that components crucial to meeting the final Tier 4 emission standards are not included in that price, or at least not assembled already. Ordering based on horsepower requirements alone has gotten more difficult, and placing orders based on low bid alone can have repercussions.

Base constraints

Bigger engines are putting strains on the available space in many applications. Some owners have long been mounting an engine in six feet of space, only to be told that their new equipment will require six and a half. It's true in most cases that the parts added to reduce emissions lead to engines that take up more space than before. Here, it can be tremendously helpful to go through a manufacturer that has engineering staff on hand. By now, these engineers will likely have a good deal of experience freeing up the space necessary to accommodate larger equipment.

Regeneration

Regeneration is perhaps the most significant drawback to come out of the final Tier 4 emission standards, because it means downtime for users. To burn off excess particulate matter in order to meet the new emission requirements, the diesel particulate filters on some final Tier engines will periodically need to function above normal operating temperatures for some time. Regeneration is not the only possible strategy for meeting Tier 4 standards, but it's one that those shopping for power solutions should be aware of. If downtime simply isn't an option for your operation, it's best to explore other strategies.

These are some of the most frequently encountered holdups when upgrading to final Tier 4 status. All of them should be navigable with the right manufacturer expertise and service. All are good points to raise when shopping for final Tier 4 equipment solutions.

LET'S TALK

Some engine manufacturers may draw their customer's attention to these issues, and some may simply be looking to close the sale and move on.

For our engineers, the puzzle is finding a solution that works for your business. They work with you to address common final Tier 4 engine problems including finding the right product, making it work with your existing processes and making sure you're aware of any changes resulting from new machinery.

[Get in touch](#) with CK Power today to discuss how the transition to final Tier 4 will affect your business, and how we can make the transition as smooth as possible.

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