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MAXIMIZING THE VALUE OF ON-SITE POWER GENERATION WITH EPA TIER 4 FINAL STATIONARY ENGINES

Introduction

Whether for standby power, baseload power generation or built-in redundancy for critical assets, many organizations install stationary engines at their facilities so they may generate their own power. Because these stationary engines are relatively commonplace, they collectively have an impact on air quality and public health, so the Environmental Protection Agency (EPA) has been regulating them for decades. As it relates to stationary diesel engines, progressively stricter EPA standards were released and finalized between 1996 and 2014.

These EPA standards mandated diesel engines to reduce their exhaust emissions to various tier levels. The final of these regulations — Tier 4 Final standards — is discussed in further detail.

Tier 4 Final Standards

A newly installed stationary diesel engine must be certified to Tier 4 Final standards if it is used in a nonemergency application.

The EPA's standards vary depending on the size of an engine. For the largest nonroad engines, those with a rated power of 750 horsepower or more, particulate matter emissions must not exceed 0.075 grams per horsepower-hour. Nitrogen oxides emissions for engines of 75 horsepower or more must not exceed standards ranging from 0.3 to 2.6 grams per horsepower-hour, depending on the exact size and type. These standards are similar in stringency to the standards adopted for diesel-powered trucks and buses manufactured in 2007 or later.

Legacy diesel engines constructed before Tier 4 Final emissions standards went into effect do not have to meet Tier 4 Final standards. However, they must meet applicable standards for the years they were produced, in addition to local regulations that may apply and, potentially, National Emission Standards for Hazardous Air Pollutants (NESHAP) requirements. An engine manufactured in 2011 or later must be Tier 4 EPA-certified by the manufacturer and cannot be retrofitted for nonemergency operations.

Why Consider a Tier 4 Final Engine as Part of Your On-Site Solution

When it comes time to picking a generation source for your facility, all of this regulation has made Tier 4 Final engines better than many other options for on-site power generation. Two important reasons are these:

1) Tier 4 Final Engines Enable the Broadest Applications. New Tier 4 Final diesel engines are cleaner than ever before and more fuel efficient so they can be used all the time, in nonemergency applications, including baseload generation and resiliency applications. This puts them on par with other common on-site prime movers, such as natural gas turbines. In addition, because Tier 4 Final engines have fast ramp-up time, they are effective for participation in economic value-generating applications such as peak load management, ISO/RTO emergency response programs and others.

2) Built-in Redundancy. Because Tier 4 Final diesel engines and generators can run in parallel, the redundant nature of multiple power blocks helps the reliability of the system. Unlike large, single-engine options, there is always a backup. If the engines have met capacity and one fails, there is still limited output available from the generator for load shedding and keeping critical systems online.

Implications For Your On-Site Solution Selection

Now we discuss what industrial and commercial engineering and procurement managers should consider when selecting a stationary diesel engine that is certified to Tier 4 Final standards.

Getting the answers to these questions, and choosing the right system, will ultimately provide a solid return on the Tier 4 Final stationary diesel engine investment.

Tier 4 Final Factory Certification Is a Must Have

A factory-certified, Tier 4 Final generator set already has an emissions control system that is designed specifically for that engine. It is factory tested and guaranteed to operate as promised while providing excellent emissions control.

Uncertified system risks are also far greater than those of a factory-certified generator set. If the packager did not properly set up the correct controller program before the equipment arrived on-site, for example, commissioning and EPA testing could be delayed for months.

Additionally, even if certified, Tier 4 Final generation sets that are comprised of a hodgepodge of components from multiple manufacturers and various suppliers is not advisable. A company might first buy an engine, for example, then add a catalytic converter, then a third-party controller that is expected to monitor the engine RPM, the air/fuel ratios and all other functions. It is easy to see there are many opportunities for incompatibility and breakdowns.

It is also important to point out here that the EPA has ruled in multiple cases and sent out several guidance documents strictly forbidding the practice of retrofitting post-2011 Tier 2 engines with aftermarket controls and operating in nonemergency circumstances. They have made it clear that “Tier 4 Equivalent” or “Tier 4 Compliant” are terms that were never recognized by the EPA and denote actions that are clearly in violation in EPA rules and statutes.

By investing in a factory-certified generator set, the supplier and/or manufacturer guarantees it will work as expected. Each component is designed into the system to work seamlessly together. Some call it a “turnkey system” for a reliable source of clean power.

System Scalability and Reliability Are Critical Considerations

Planning for growth is not always easy. However, there are actions that can be taken today when choosing a Tier 4 Final generation set that will help accommodate anticipated growth and operational changes, as well as reduce capital spending on multiple safety factors from day one.

The right Tier 4 Final generation set supplier offers scalable packages that include engines, cable trays, switchgear and all other required system components. Furthermore, a scalable system that is designed for expansion can reduce future costs and installation complexities. If, for example, the plan calls for only three engines today, look for a supplier that can easily, quickly and economically accommodate more engines and capacity when the time comes.

Facilities requiring N+1 redundancy will find a modular approach to backup systems to be an economical and redundant solution that lowers capital requirements and reduces excess unused capacity. Additionally, facilities can reach N+1 redundancy faster with a modular approach to backup systems, as well as save money on reduced capital expenses and lowered capacity.

Monitoring and Run-Time Experience Makes All the Difference

When considering suppliers for a Tier 4 Final stationary diesel engine, look for technology that will eliminate worry and complexity by providing information on fuel tracking, system diagnostics and historical trending, as well as remote system control and a proactive storm-warning response.

The supplier’s system technology should include engines that send critical system information to a central location, staffed 24/7 by people trained to respond immediately to utility outages, generator alarms, load control dispatch, emergency events and severe weather threats.

Ask about the supplier's experience tracking these events. How many have they monitored? How long have they been doing it? Does the supplier's monitoring experience include power system standby operations in hospitals, data centers, utility substations, universities, and retail and manufacturing facilities? What is their geographic reach providing reliable electrical service? Do they offer Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and National Fire Protection Association (NFPA) Standard 110 reporting compliance?

Getting the answers to these questions, and choosing the right system, will ultimately provide a solid return on the Tier 4 Final stationary diesel engine investment.

Conclusion

Choosing the correct Certified Tier 4 Final generator set not only meets EPA standards and avoids costly penalties, it is essential for growth and profitability. A scalable Tier 4 Final generator set keeps capital requirements low while providing room for future growth. It ensures a reliable and easily maintainable system. Expert local and remote system monitoring takes the worry out of ensuring a reliable power supply. In most cases, a factory-certified generator set removes the requirement for initial and ongoing emissions testing, placing the burden of compliance on the engine manufacturer. All these benefits are readily available from a proven solutions expert partner.

About the Author

PowerSecure is a turnkey microgrid solutions provider, offering energy solutions in distributed generation, energy storage and renewables, and energy efficiency.

PowerSecure works with potential customers to first define the problem and then build a business case that provides an all-inclusive solution. In contrast to a single-engine supplier that wants to sell a diesel engine through its distributor network, a Tier 4 Final generation set solutions expert has products and employees already on staff. A true solutions expert provides a much more diverse and robust energy solution than a traditional equipment supplier.

The company manages the entire lifecycle of the generator set while handling construction, installation, commissioning, start-up, ongoing maintenance and monitoring. PowerSecure can also integrate multiple and different power sources into a microgrid, including a generator as well as solar, battery storage and fuel cells.

PowerSecure's products include its PowerBlock Generation System, which features EPA factory-certified Volvo Tier 4 Final engines, power ratings from 625 kW to 3,750 kW in a single enclosure, and the ability to integrate multiple PowerBlocks together at a single facility. This modular design provides the flexibility to add additional power over time. It is a fully integrated system for standby power generation that incorporates proprietary switchgear, controls and monitoring software.

PowerSecure customizes each generation system to the needs of each site based on required load and customer goals such as demand response, peak shaving and utility rebates or buyback programs. The ability to customize generation systems maximizes the economic value for users. Tier 4 Final generation systems have no federal run-time limitations and no post-installation emission test requirements. They also simplify permitting processes.

Because the system has built-in redundancies with multiple 16-liter Volvo engines, if one engine fails, there will be some remaining capacity. This multi-engine system provides efficient, cost effective and scalable generating capacity that can grow as power demand increases. N+1 redundancy can be achieved by adding an engine.

By meeting the EPA's most stringent standards, a 90% reduction in particulate matter and nitrogen oxides emissions can be achieved without compromising ramp-up time. Tier 4 Final certification broadens the PowerBlock system applications to include participation in a variety of economic programs (such as peak load management, ISO/RTO emergency response programs and others) on top of traditional backup power.