Air Resources Board

Mary D. Nichols, Chairman
9480 Telstar Avenue, Suite 4
El Monte, California 91731 www.arb.ca.gov

Linda S. Adams
Acting Secretary for Environmental Protection

Edmund G. Brown Jr.
Governor

January 18, 2011

Reference No.: 10-661-723

Ms. Ellen Garvey
Cleaire Advanced Emission Controls
14775 Wicks Boulevard
San Leandro, California 94577

Dear Ms. Garvey:

Using the *Verification Procedure, Warranty and In-Use Compliance Requirements for In-Use Strategies to Control Emissions from Diesel Engines* ("Procedure," Title 13, California Code of Regulations (CCR), Sections 2700-2710), Air Resources Board (ARB) staff reviewed your application for conditional verification of the Lonestar™ system for use with off-road diesel engines. Based on an evaluation of the data provided, and pursuant to the terms and conditions specified below, ARB hereby finds that Lonestar™ reduces emissions of diesel particulate matter (PM) consistent with a Level 3 Plus device (greater than or equal to an 85 percent reduction and meets the 2009 nitrogen dioxide emissions limit) and emissions of oxides of nitrogen (NOx) by 40 percent (Title 13, CCR, Sections 2702 (f) and 2708). ARB also finds that Lonestar™ satisfactorily completed 33 percent of the durability demonstration period. Accordingly, ARB determines that the system merits conditional verification and, subject to the terms and conditions specified below, classifies Cleaire's Lonestar™ as a Level 3 Plus system for rubber-tired off-road vehicles and portable equipment using engines from the engine families listed in Attachment 1.

The aforementioned conditional verification is subject to the following terms and conditions:

- Lonestar™ is conditionally verified for a period not to exceed 3 years from the date of December 23, 2008. For the Lonestar™ to be considered for full verification, Cleaire must complete all remaining requirements no later than December 23, 2011, as specified in the letter 08-661-460.
- Conditional verification is equivalent to verification for the purposes of satisfying the requirements of in-use emission control regulations.
- Only one system may be installed per engine. For an engine with a dual exhaust system from the original equipment manufacturer (OEM), including two exhaust manifolds, two mufflers, etcetera, no more than one system may be installed per exhaust manifold.

- The engine must not be in an auxiliary power unit for on-road trucks, transport refrigeration unit, gantry crane, stationary application, marine vessel, or locomotive.
- The engine must be originally manufactured from model year 1996 through 2009 and have an engine family name listed in Attachment 1.
- The engine must have a maximum power output rating of at least 150 horsepower and at most 350 horsepower.
- The engine must have a displacement of at least 5.9 liters and at most 11 liters.
- The engine must be in its original certified configuration, except that if an OEM oxidation catalyst is present, it may be removed if the Lonestar™ system is installed. Should the Lonestar™ system be removed, the OEM oxidation catalyst must be re-installed, returning the engine to its original certified configuration.
- The engine must have a PM certification level of at most 0.12 grams per brake-horsepower hour (g/bhp-hr), and greater than 0.01 g/bhp-hr.
- The engine must not employ exhaust gas recirculation.
- The application must have a duty cycle with an exhaust temperature greater than 260 degrees Celsius for at least 70 percent of the time.
- The system must be installed with a backpressure monitor that notifies the operator when the backpressure limit is reached. The notification must occur and be clearly visible to the operator while the vehicle or equipment is in use.
- The engine may or may not have a pre-existing OEM oxidation catalyst.
- The engine must not have a pre-existing OEM diesel particulate filter (DPF).
- The engine must be certified for off-road applications.
- The engine must have a four-stroke combustion cycle.
- The engine must be turbocharged.
- The engine may be mechanically or electronically controlled.
- The engine must be well maintained and not consume lubricating oil at a rate greater than that specified by the engine manufacturer.
- Lube oil, or other oil, must not be mixed with the fuel.
- The engine must be operated on fuel that has a sulfur content of no more than 15 parts per million (ppm) by weight.
- Lonestar™ must not be operated with a fuel additive, as defined in Section 2701 of Title 13, CCR, unless explicitly verified for use with the fuel additive.
- Lonestar™ must not be used with any other systems or engine modifications without ARB and manufacturer approval.
- The system may be re-designated in its entirety to other vehicles or equipment within a common ownership fleet if authorized by Cleaire. A system re-designation must be performed in accordance with Section 2706, Title 13, CCR and the policy document found here: http://www.arb.ca.gov/diesel/verdev/swap/swap.htm
- The other terms and conditions specified below.

It is also ordered and resolved that installation of the Lonestar™ system, manufactured by Cleaire Advanced Emissions Controls of 14775 Wicks Boulevard, San Leandro, California 94577, has been found not to reduce the effectiveness of the applicable vehicle pollution control system, and therefore Lonestar™ is exempt from the prohibitions in Sections 38390 and 38391 of the Vehicle Code for installation on off-road vehicles using engines listed in Attachment 1.

This exemption is only valid provided the engines meet the aforementioned conditions.

ARB reserves the right in the future to review this conditional verification letter and the exemption provided herein to assure that the exempted and conditionally verified add-on or modified part continues to meet the standards and procedures of Title 13, Section 2474, et seq and Sections 2700 through 2710, of the CCR.

The Lonestar™ system consists of the following major system components, listed in order from exhaust inlet to outlet as they are arranged within the exhaust system of the vehicle: one fuel injector, one static mixer, one inlet cone, two lean NOx catalyst modules, one catalyzed wall-flow DPF, and one outlet cone. The Lonestar™ system also includes a backpressure monitor and warning system. The major components of the Lonestar™ system are identified in Attachment 2. Schematics of the approved product and engine labels are shown in Attachment 3.

The Lonestar™ system is comprised of two lean NOx catalyst modules and a single catalyzed wall-flow DPF designed to filter the exhaust from a single engine. Lonestar™ systems with multiple DPFs, including designs with two or more filter components canned together or multiple individually-canned filter components in parallel or in series (or any combination thereof), are not valid under this Executive Order. Channeling exhaust from a single engine through multiple Lonestar™ systems, deployed in parallel or in series or any combination thereof, is also not valid under this Executive Order unless the engine has a dual exhaust system as described above.

This conditional verification letter is valid provided that installation instructions for the Lonestar™ system do not recommend tuning the vehicle to specifications different from those of the vehicle manufacturer.

Cleaire must ensure that the installation of Lonestar™ conforms to all applicable industrial safety requirements.

No changes are permitted to the device. ARB must be notified, in writing, of any changes to any part of Lonestar™. Any changes to the device must be evaluated and approved by ARB. Failure to do so invalidates this conditional verification.

Changes made to the design or operating conditions of Lonestar™, as exempted by ARB, which adversely affect the performance of the vehicle's pollution control system invalidate this conditional verification.

Marketing of Lonestar™ using identification other than that shown in this conditional verification letter or for an application other than that listed in this conditional verification letter is prohibited unless prior approval is obtained from ARB.

This conditional verification does not apply to any Lonestar™ advertised, offered for sale, sold with, or installed on a motor vehicle prior to or concurrent with transfer to an ultimate purchaser.

ARB estimates that Lonestar™ might cause a fuel economy penalty between four and nine percent depending on the application.

As specified in the Procedure, ARB assigns each diesel emission control strategy a family name. The designated family name for the conditional verification as outlined above is:

CA/CLE/2008/PM3+/N40/OF/LNF01

As stated in the Procedure, Cleaire is responsible for recordkeeping requirements (Section 2702), honoring the required warranty (Section 2707), and conducting in-use compliance testing (Section 2709).

Proper engine maintenance is critical for the proper functioning of the diesel emission control strategy. The owner of the vehicle on which the diesel emission control strategy is installed is strongly advised to adhere to all good engine maintenance practices. Failure to document proper engine maintenance, including keeping records of the engine's oil consumption, may be grounds for denial of a warranty claim.

This conditional verification is valid provided that the diesel fuel used in conjunction with the device complies with Title 13, CCR, Sections 2281 and 2282, and if biodiesel is used, the biodiesel blend must be 20 percent or less subject to the following conditions:

- The biodiesel portion of the blend complies with the American Society for Testing and Materials specification D6751 applicable for 15 ppm sulfur content; and
- The diesel fuel portion of the blend complies with Title 13, CCR, Sections 2281 and 2282.

Other alternative diesel fuels such as, but not limited to, ethanol diesel blends and water emulsified diesel fuel are excluded from this conditional verification.

Cleaire must provide a copy of this conditional verification letter to each purchaser at the time of sale.

Systems conditionally verified in this letter must conform to all applicable California emissions regulations.

This conditional verification does not release Cleaire from complying with all other applicable regulations.

Violation of any of the above conditions is grounds for revocation of this conditional verification.

This conditional verification letter supersedes the letter 09-661-343 (dated December 30, 2009) and the letter 08-661-461 (dated December 23, 2008).

Thank you for participating in ARB's diesel emission control strategy verification program. If you have any questions or comments, please contact Ms. Shawn Daley, Manager, at (626) 575-6972 or by email at sdaley@arb.ca.gov.

Sincerely,

Robert H. Cross, Chief
Mobile Source Control Division

Attachment 1: ARB-Approved Engine Families for the Cleaire Lonestar System
Attachment 2: Parts List for the Cleaire Lonestar System
Attachment 3: Label for the Cleaire Lonestar System

cc: Ms. Shawn Daley, Manager
Heavy-Duty Diesel In-Use Strategies Branch