

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-717

Relating to Exemptions under
Section 27156 of the Vehicle Code

NRG Logistics, LLC
G2 Hydrogen On-Demand System

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-02-003;

IT IS ORDERED AND RESOLVED: That installation of the G2 Hydrogen On-Demand System device, manufactured by NRG Logistics, LLC (700 Commerce Drive, Suite 500, Oakbrook, Illinois 60523), has been found not to reduce the effectiveness of the applicable vehicle pollution control systems, and therefore, the G2 Hydrogen On-Demand System device is exempt from the prohibitions in Section 27156 of the Vehicle Code for all 1998-2009 model year light/medium/heavy heavy-duty on-road diesel engines between 5.0 liters to 15.0 liters.

The G2 Hydrogen On-Demand System device consists of a metal case containing a 10-quart water reservoir, a dual cell electrolysis generator, various electrical components, electrical wiring and connectors, an electrolyte, and rubber supply hose for the hydrogen gas.

This Executive Order is based on emission test results using Heavy-Duty Federal Test Procedure Transient Cycle test, Euro III European Stationary Cycle test, and "Not-to-Exceed" test submitted by NRG Logistics, LLC with the G2 Hydrogen On-Demand System device.

If evidence provides the Air Resources Board with reasons to suspect that the G2 Hydrogen On-Demand System device will affect the durability of the emission control system, NRG Logistics, LLC. shall be required to submit durability data to show that the durability of the vehicle emission control system is not, in fact, affected and/or that the add-on or modified parts demonstrate adequate durability.

This Executive Order is valid provided that installation instructions for the G2 Hydrogen On-Demand System device do not recommend tuning the vehicles to specifications different from those of the vehicle manufacturer.

Changes made to the design or operating conditions of the G2 Hydrogen On-Demand System device, as exempt by the Air Resources Board, which adversely affect the performance of the vehicle's emission control system, shall invalidate this Executive Order.

Marketing of the G2 Hydrogen On-Demand System device using identification other than that shown in this Executive Order or for an application other than that listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board.

Exemption of the G2 Hydrogen On-Demand System device shall not be construed as exemption to sell, offer for sale, or advertise any component of the kit as an individual device.

This Executive Order shall not apply to any G2 Hydrogen On-Demand System device advertised, offered for sale, sold with, or installed on a motor vehicle prior to or concurrent with transfer to an ultimate purchaser.

This Executive Order does not constitute any opinion as to the effect the use of the G2 Hydrogen On-Demand System device may have on any warranty either expressed or implied by the vehicle manufacturer.

No claim of any kind, such as "Approved by the Air Resources Board," may be made with respect to the action taken herein in any advertising or other oral or written communication.

In addition to the foregoing, the Air Resources Board reserves the right in the future to review this Executive Order and the exemption provided herein to assure that the exempted add-on or modified part continues to meet the standards and procedures of California Code of Regulations, Title 13, Section 2222, et seq.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF NRG LOGISTICS, LLC'S G2 HYDROGEN ON-DEMAND SYSTEM DEVICE.

Violation of any of the above conditions shall be grounds for revocation of this Executive Order. The Executive Order may be revoked only after a ten day written notice of intention to revoke the Executive Order, in which period the holder of the Executive Order may request in writing a hearing to contest the proposed revocation. If a hearing is requested, it shall be held within ten days of receipt of the request, and the Executive Order may not be revoked until a determination is made after the hearing that grounds for revocation exist.

Executed at El Monte, California, this 8th day of October 2013.


Erik White, Chief

Mobile Source Operations Division

EVALUATION SUMMARY

Manufacturer Name: NRG Logistics, LLC

Name of Device: G2 Hydrogen On-Demand System

Background:

NRG Logistics, LLC of 700 Commerce Drive, Suite 500, Oakbrook, Illinois 60523 has applied for exemption from the prohibitions in Section 27156 of the California Vehicle Code for its G2 Hydrogen On-Demand System device. The device is designed for all 1998-2009 model year (MY) light/medium/heavy heavy-duty on-road diesel engines between 5.0 liters to 15.0 liters.

Recommendation:

Grant exemption to NRG Logistics, LLC as requested and issue Executive Order D-717.

Device Description:

The G2 Hydrogen On-Demand System device produces hydrogen through an electrolysis process by supplying water from a reservoir containing distilled water and an activator (potassium hydroxide) to electrolysis dry cells containing stainless steel plates that are supplied electricity from the vehicle's battery. The device consists of a 10-quart water reservoir, a dual cell electrolysis generator (which contain the positive, negative, and neutral metal plates), various electrical components, electrical wiring and connectors, and a rubber supply hose for the hydrogen gas. The device is connected to the vehicle's oil pressure circuit so that hydrogen gas is only produced when the engine is operating.

Discussion/Basis for the Recommendation:

This exemption is based on the following emission tests conducted on two heavy-duty diesel engines with NRG Logistics, LLC's G2 Hydrogen On-Demand System device installed:

1. FTP transient cycle test on a 1999 MY Mack E7 Series 11.9 liter diesel engine.
2. FTP transient cycle, Euro III ESC 13-mode steady-state, and NTE tests on a 2007 MY Caterpillar C15 Series 11.9 liter diesel engine.

The emission test results are shown below:

Hot-Start FTP Transient Cycle Emission Test
1999 MY Mack E7 Series 11.9 liter Diesel Engine
Engine Family XMKXH11.9E54

	FTP Transient Cycle Emissions (grams/bhp-hr)			
	HC	NOx	CO	PM
FTP baseline results for engine	0.21	4.31	0.90	0.078
FTP results w/ G2 Hydrogen On-Demand System installed	0.21	4.41	0.80	0.075
Percentage change	0%	+2.3%	-11.1%	-3.8%

Hot-Start FTP Transient Cycle Emission Test
2007 MY Caterpillar C15 Series 11.9 liter Diesel Engine
Engine Family 7CPXH0928E1K

	FTP Transient Cycle Emissions (grams/bhp-hr)				
	NMHC	NOx	NMHC+NOx	CO	PM
FTP baseline results for engine	-0.002	1.41	1.408	0.31	0.0044
FTP results w/ G2 Hydrogen On-Demand System installed	0.004	1.44	1.444	0.31	0.0044
Percentage change	(1)	+2.1%	+2.6%	0%	0%

Note (1): Instrumentation tolerance prevented comparison.

Euro III ESC 13-Mode Steady-State Emission Test
2007 MY Caterpillar C15 Series 11.9 liter Diesel Engine
Engine Family 7CPXH0928E1K

	Euro III ESC Emissions (grams/bhp-hr)				
	NMHC	NOx	NMHC+NOx	CO	PM
ESC Emission Standards	0.14	1.16	1.3	15.5	0.01
ESC Test Results w/ G2 Hydrogen On-Demand System Installed	0.00	0.94	0.94	0.12	0.0045
Pass/Fail	Pass	Pass	Pass	Pass	Pass

NTE Emission Test
2007 MY Caterpillar C15 Series 11.9 liter Diesel Engine
Engine Family 7CPXH0928E1K

	NTE Emissions (grams/bhp-hr)				
	NMHC	NOx	NMHC+NOx	CO	PM
NTE Emission Standards	0.21	1.74	2.0	19.4	0.02
Point 1 NTE Test Results w/ G2 Hydrogen On-Demand System Installed	0.00	0.74	0.74	0.07	0.0032
Point 2 NTE Test Results w/ G2 Hydrogen On-Demand System Installed	0.00	0.96	0.96	0.06	0.0024
Point 3 NTE Test Results w/ G2 Hydrogen On-Demand System Installed	0.00	0.75	0.75	0.06	0.0022
Pass/Fail	Pass	Pass	Pass	Pass	Pass

Notes: 1. NTE Point 1 is 50% Torque/90% RPM

NTE Point 2 is 85% Torque/80% RPM

NTE Point 3 is 65% Torque/70% RPM

2. All testing was conducted at Olson-EcoLogic Engine Testing Laboratories in Fullerton, California

FTP transient cycle testing on the 1999 MY Mack E7 Series engine and 2007 MY Caterpillar C15 Series engine modified with the G2 Hydrogen On-Demand System device did not cause emissions to exceed baseline by more than the allowed limits of 10 percent for HC, NMHC, and NOx and 15 percent on CO and PM which is acceptable for exemption. Euro III ESC and NTE emission testing on the 2007 MY Caterpillar C15 Series engine modified with the G2 Hydrogen On-Demand System device showed that the modified engine met the exhaust emission standards. Similar results are expected when NRG Logistics, LLC's G2 Hydrogen On-Demand System device is used on the 1998-2009 MY light/medium/heavy heavy-duty on-road diesel engines between 5.0 liters to 15.0 liters as stated in this application.