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SUBJECT: MECA Comments on CPSC's Test Report Titled "Technology Demonstration of a Prototype Low CO Emission Portable Generator"

TO: U.S. Consumer Product Safety Commission
Office of Secretary
Washington, DC 20207-0001
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FROM: Dr. Joseph Kubsh, Executive Director, MECA (e-mail: jkubsh@meca.org)

The Manufacturers of Emission Controls Association (MECA) is pleased to provide our comments on the CPSC's summary report demonstrating the performance of a prototype portable generator that emits low levels of CO emissions. MECA is a non-profit association of the world's leading manufacturers of emission control technology for motor vehicles and stationary internal combustion engines. Our members have nearly 40 years of experience and a proven track record in developing and manufacturing emission control technology for a wide variety of on-road and non-road vehicles and engines. A number of our members have extensive experience in the development, manufacture, and commercial application of CO emission control technologies for stationary engines, as well as, expertise in applying catalyst technologies to small spark ignited engines less than 25 hp.

We thank the CPSC for this opportunity to review the report and provide our comments. MECA has been engaged in the commission's efforts to improve the safety of portable generators in marine and domestic applications by reducing the level of CO emitted by these small, spark-ignited four stroke engines. Recent events associated with Hurricane Sandy on the east coast of the U.S. once again point to the potential deadly outcomes of operating gasoline generators that emit high levels of CO without proper ventilation. MECA has previously provided comments about the available technology for portable generator applications in response to CPSC's request for information on techniques to reduce CO from gasoline portable generators (MECA letter dated April 28, 2006) and MECA's written comments to CPSC's ANPRM on portable generators (dated February 11, 2007). We commend the commission on its decision to demonstrate the effectiveness of state of the art combustion controls in combination with catalyst technologies to achieve CO reduction of over 90% from common portable gasoline generators. We believe that the demonstration program was well designed, well executed and meticulously documented in this final report. The test method used is sound and consistent with accepted practices in the field. The results of emission measurements on the baseline and modified pre and post-catalyst engines are logical and consistent with published ranges for the

technologies tested. MECA agrees with CPSC that the benefit of a catalyst-based emission control system on generators is not encourage the use of these generators in an enclosed environment, but rather to allow a person experiencing mild CO poisoning the additional time to respond to their symptoms before they become incapacitated.

The conclusions support the experience of catalyst manufacturers and the recommendations provided by MECA on the effectiveness of the use of catalysts to reduce CO emissions and improve the safety of portable generators. Catalyst technology is a cost-effective technique for substantially reducing CO exhaust emissions from spark-ignited, gasoline portable generators. Catalyst technology for small gasoline engines like those used in portable generators draws from nearly 40 years of successful experience in the U.S. with catalytic converters applied to light-duty gasoline cars and trucks. Similar catalyst technology has been successfully applied to a wide variety of smaller, two-stroke and four-stroke gasoline engine applications including handheld equipment (e.g., chainsaws, leaf blowers, string trimmers), non-handheld equipment (e.g., lawn mowers), motor scooters, motorcycles, marine engines, and forklift trucks. In many cases these catalyst systems have been engineered to provide high reductions of CO emissions as well as reductions in hydrocarbon and NOx emissions. The U.S. EPA in its small engine test program that was completed in advance of their Phase 3 small engine regulations (Phase 3 small engine emission regulations published in October 2008) clearly demonstrated that catalysts can be safely incorporated on Class 1 and Class 2 gasoline engines without any significant increase in muffler surface temperatures. MECA and MECA members were active participants in EPA's small gasoline engine test program.

The published experience of catalyst performance on four-stroke gasoline engines indicates that high efficiencies for reducing CO emissions are strongly influenced by the air/fuel stoichiometry in the exhaust upstream of the catalyst. Maximum reduction efficiencies for all three regulated pollutants (hydrocarbons, CO, NOx) can be obtained if the air/fuel ratio of the exhaust stream is controlled to be near the stoichiometric ratio of reducing and oxidizing components in the exhaust stream. At or near this stoichiometric air/fuel ratio, catalyst efficiencies can be well in excess of 90% for all three pollutants provided that the catalyst temperature is above its activation temperature (typically 350^{o}C or higher), and that a reasonable catalyst volume relative to the volumetric flow of exhaust gas is contained in the system. Catalyst formulations can be optimized for these small engine applications to deliver maximum CO reductions and/or NOx reductions depending on the final emissions target. Precious metal costs for these small engine catalysts are typically less than half the total cost of the finished catalyst. The addition of a catalyst to a small engine would have only a very small impact on the cost of a gasoline generator.

The most widely used method for accurate, and cost effective, air/fuel ratio control is through the use of fuel injector technology in combination with a closed-loop control strategy that employs a simple engine control unit (ECU) and an oxygen sensor present in the exhaust, upstream of the catalyst. The sensor provides a feedback loop to the engine's intake air and fuel metering system. The combination of closed-loop, electronic fuel injection with a catalyst reduces engine-out emissions and ensures consistent engine operation. This more stable, reduced engine-out emissions operation reduces the thermal stress on the catalyst and improves the catalyst durability. Such an approach has been applied to a whole range of spark-ignited engines from passenger cars to handheld lawn and garden equipment and effectively demonstrated on a small gasoline powered portable generator in CPSC's demonstration program.

MECA is aware of two manufacturers of four-stroke, gasoline generators that are already using properly designed exhaust systems with catalysts to reduce CO emissions by more than 90% compared to uncontrolled levels: Westerbeke Corporation and Kohler Power Systems. Both of these companies have targeted marine applications for these ultra-low CO emission generators. The same strategy is applicable to portable generators for home use. MECA believes that the ultra-low CO emission generators offered by Westerbeke and Kohler employ the same type of strategy (controlled exhaust air/fuel ratio near the stoichiometric point) to achieve high CO conversion efficiencies across a catalyst as documented in the subject report.

In summary, the commission has effectively demonstrated, documented and concluded in the subject report that catalyst-based exhaust emission controls are a proven, cost-effective, durable, and safe strategy for reducing CO emissions from small, four-stroke gasoline engines like those used in portable generators. The combination of precious metal-based, three-way catalyst formulations and precise air/fuel control has been shown to provide CO conversion efficiencies well in excess of 90% on a small four-stroke gasoline engine in a portable home generator. MECA strongly supports the CPSC's efforts in urging portable generator manufacturers to voluntarily implement these cost effective strategies to reduce CO emissions and improve the safety of home portable generators. In the absence of a voluntary standard, MECA believes that EPA should strongly consider adoption of a mandatory, low CO emission standard for gasoline generators.

Sincerely,

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cc: Janet Buyer, CPSC