UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MD 20814

Memorandum

This document has been electronically approved and signed.

Date: November 1, 2016

TO : The Commission
Todd Stevenson, Secretary

THROUGH: Mary T. Boyle, General Counsel
Patricia H. Adkins, Executive Director
DeWane Ray, Deputy Executive Director for Safety Operations

FROM : George A. Borlase, Ph.D., P.E., Assistant Executive Director
Office of Hazard Identification and Reduction
Janet Buyer, Project Manager
Directorate for Engineering Sciences

SUBJECT : Staff Responses to Questions for the Record about the Notice of Proposed Rulemaking (NPR) for Portable Generators

This memorandum provides staff responses to questions for the record from Commissioner Mohorovic and Commissioner Buerkle about the NPR for portable generators.

Questions from Commissioner Mohorovic:

1. Handheld Weight

Weight increase impact on utility

The staff briefing package suggests a possible increase in weight to comply with the performance standard set for portable generators. If the average weight of handhelds increases by 25%, what will the impact be [on] products' utility?

Staff has not verified that a 25% increase in weight is what should be expected for small generators that are designed to be easily hand carried with one hand (which includes both categories of handheld generators and some class 1 generators). Staff believes this estimate is likely due in large part to the expectation that a battery will be needed; however, staff is aware of development work being done by different manufacturers to eliminate the need for

a battery. Also, if a manual-start is used for a battery-system, then a smaller battery could be used to power only the EFI and oxygen sensor.

Assuming an increase in weight of 25%, existing lightweight models powered by handheld engines that are currently less than 30 lbs would increase to 37 lbs. This is less than the current weight of the larger hand carry-type generator powered by a Class I engine that can be more than 45 lbs. Staff believes it is possible that some of the larger hand carry-type class 1 generators may be too heavy for some consumers to easily carry with one hand. Staff notes, however, that some models of these hand carry-type generators also come with two wheels on one end and a retractable handle on the other end so that the user has the option of pulling the generator rather than carrying it. So while staff acknowledges it is possible that the generator may be heavier, and this would result in some unquantifiable reduction in utility to the consumer, staff believes the consumers would still be able to move generators where they are needed.

2. *Lost Consumer Surplus per Unit*

a. *Loss of power*

In our demonstration program stated objectives, (FR 27) we sought out a prototype that would not "negatively impact the engine's power output, durability, maintainability, fuel economy and risk of fire and burn." We state in several places that we expect generators under the new rule to run at stoichiometric. Will this create a loss of power?

No. By comparing manufacturers' published exhaust emission certification data, staff sees that the maximum engine power on fuel injected engines actually increased by anywhere from 2% to 8% compared to the carbureted versions of the same engines. Staff also has CBI data from a manufacturer that supports this.

b. *Weight factor*

Should the increase in weight be factored into lost consumer surplus? Can a 25% increase in the weight of a handheld be monetized, analyzed as impacting lost consumer surplus, and factored into the BCA for handhelds, in particular?

An increase in the weight of handheld generators resulting from the draft proposed rule could affect the utility of the handheld products to consumers by reducing their portability to some extent. Advertised weights of generators with handheld engines made by three members of the Portable Generator Manufacturers Association (PGMA) are about 28 pounds (with a 50 cc engine), 29 pounds (with a 49 cc engine) and 44 pounds (with a 79 cc engine). Based on these reported weights, an increase of 25 percent would range from about 7 to 11 pounds per unit.

As was noted during the Commission briefing, manufacturers of generators with handheld engines and Class I engines may, in the near future, be able to use battery-less EFI systems, which should moderate the increases in product weights for complying units. Also, while utility might be adversely impacted by increased weights, complying products with EFI could have some off-setting gains in utility for consumers because of greater ease of starting in a variety of conditions, as well as having modest gains in fuel efficiency. Although staff would attempt to describe likely changes in utility of handheld units in a final regulatory analysis, should the Commission decide to propose the draft standard, staff does not now have a basis for monetizing these changes in utility. However, staff would welcome additional information from the public related to these issues.

c. Price elasticity

Is recreational usage of portable generators highly elastic to price sensitivity? Did we undervalue the lost consumer surplus in the cost determination especially for handhelds? Because we broke this down by generator class, is it possible to reconsider the price elasticity for handheld generators versus the larger, more expensive classes? At what price point will it cause consumers not to buy a handheld?

Because the draft proposed standard could result in substantial price increases, staff considered it important for our analysis to attempt to account for the possible lost sales and lost consumer surplus that could result. Our preliminary regulatory analysis noted that staff was not aware of precise estimates of the price elasticity of demand for portable generators; however, the nature of the product could argue for a relatively inelastic demand (similar to that estimated for refrigerators, clothes washers & dishwashers). Therefore, staff based our estimates on a price elasticity of demand of -0.3. If staff were to assume that the price elasticity of demand for handheld generators is not as inelastic as that of larger generators (based on different typical use patterns, for instance), the resulting decrease in sales from the standard would be greater, as would the lost consumer surplus. As an illustration, if staff assumes price elasticity of demand for handheld generators is similar to that estimated by Taylor and Houthakker (2010) for expenditures for recreation, -1.16 (which suggests that a price increase of 1 percent would reduce the quantity demanded by 1.16 percent), the quantity of handheld generators demanded might decline by about 40 percent, to about 8,900 units from about 15,000 per year. The estimated lost consumer surplus might amount to about $350,000, or about $39 per remaining unit sold. Staff notes that the reduction in sales should be less for more expensive handheld units with inverter technology, which may account for a significant proportion of this category. Reduced sales resulting from higher prices of

complying units would be more severe for less-expensive products currently on the market.

Generators with handheld engines could have a variety of primary uses other than recreation by the consumers who purchase them, such as powering electric tools around their property, charging car batteries, and powering computers and other consumer electronic equipment. Consequently, we could assume an average price elasticity between that estimated for household appliances and recreation, such as –0.7. Based on this elasticity, the quantity of handheld generators demanded might decline by about 24%, to about 11,000 units. Lost consumer surplus would amount to about $210,000, or about be about $18 per remaining unit.

3. *Increased Consumer Surplus per Unit*

Fuel efficiency

Can we monetize the increased consumer surplus from increased fuel economy due to the use of EFI?

The preliminary regulatory analysis noted that there would likely be modest savings in fuel costs as an ancillary benefit of the draft standard. Staff will seek additional information on consumer use (such as frequency and duration of use, and average power loads during use) that might enable us to monetized these additional benefits, should the Commission propose a safety standard based on the draft presented by the staff.

4. *Foreseeable Misuse*

Noise reduction

Does an EFI and a catalyst increase or suppress noise? If so, will the lower noise contribute to foreseeable misuse and hazard latency?

Staff does not currently know if EFI and a catalyst will increase or suppress noise, but has no reason to believe it will impact the noise level. Staff notes, however, that many current generators advertise that they have very low noise levels so their noise levels may already be contributing to the hazard patterns seen in our incident data.

5. *Two-cylinder, Class II Engines*

Manufacturers

How many two-cylinder, Class II manufacturers are there? How many small businesses are there that manufacture two-cylinder, Class II portable generators?

Based on information obtained from Power Systems Research (PSR), Inc., and other sources, there are perhaps nine U.S. manufacturers of portable generators with two-cylinder, Class II engines; perhaps six of these firms would be considered small businesses under SBA guidelines. Staff does not have information on the number of U.S. importers of generators with two-cylinder Class II engines. PSR data also indicates that there are nearly 30 foreign manufacturers of these types of generators that have been imported to the United States in recent years. (While staff does not have information on the sizes of these firms, the Regulatory Flexibility Act is only concerned with the impacts of regulations on small domestic businesses.)

Questions from Commissioner Buerkle:

1. *Does the Environmental Protection Agency (EPA) currently regulate carbon monoxide (CO) emissions from the engines used in portable generators? If so, are these regulations promulgated under the Clean Air Act?*

   The EPA regulates emissions from small spark-ignited engines irrespective of the product they are used in. These small spark-ignited engines are used in portable generators and other products. The EPA regulates these engines under the Clean Air Act in order to address overall ambient air quality and air pollution. The EPA's regulation of carbon monoxide emissions from engines used in portable generators does not address the acute risk of injury to consumers posed by carbon monoxide emissions from portable generators.

2. *How does EPA's existing CO standard differ from the standard being proposed by staff? For example, the staff's standard is expressed as grams per hour (g/h)]; how does EPA's standard differ? Are there other differences in terms of durability requirements, the engines that are covered by the standards, the test methods used to measure emissions?*

   The EPA's CO emission standards are expressed in g/kW-hr. The emission standard for Class I and Class II generators engines is 610 g/kW-hr (for 2 to 24 kW engines typical of Class 1 and Class 2 generators, this allows about 600 to 6800 g/hr weighted CO emission rate), for handheld Class V engines it is 603 g/kW-hr, and for handheld Class III and Class IV engines it is 805 g/kW-hr (for 1.5 to 2.5 kW engines typical of handheld generators, this is about 400 to 700 g/hr). (40 CFR § 90.103; 40 CFR § 1054.103; 40 CFR § 1054.105). There is one exception. EPA has a more stringent CO standard for small engines used in marine generators (which are not consumer products). The emission standard for these water-cooled engines is 5 g/kw-hr.

These are weighted CO emission rates that are emitted from the engine divided by the weighted power while the engine is mounted on a dynamometer (as opposed to tailpipe emissions from a generator). The weighted CO rate is calculated from the CO emission rates measured when the engine is delivering each of 6 specific power settings and the weighted power is calculated from those power settings. The 6 power settings are based on maximum engine power, when the throttle is wide open (commonly referred to as WOT).

Measuring the CO emission rate at WOT and using it in the calculation for the weighted CO emission rate is a significant way in which the EPA's standards and test procedures differ from that being proposed by staff. WOT is the load point on any engine where CO emissions are highest and is also where decreasing the CO emission rate is most challenging. The test method that staff describes in the NPR briefing package and that staff plans to use in evaluating compliance measures the CO emission rates from the engine when it is installed in the generator and based on the maximum power the generator is capable of sustaining, which is below the WOT position because the engine in a generator should not get to WOT if its circuit breaker is performing properly. As for durability requirements, EPA requires that an engine has to be certified for meeting the EPA's standards until the end of the manufacturer's declared rated useful life of the engine before it is sold including when it is part of a generator. Staff's proposed standard does not impose any additional durability requirements.

3. *What other emissions from portable generator engines besides carbon monoxide does EPA regulate?*

   The EPA also regulates hydrocarbons and oxides of nitrogen, commonly referred to as HC+NOx.

4. *How would a tighter CO emissions standard, such as the proposed CPSC standard, affect the ability to comply with EPA regulations limiting emissions of other pollutants*?

   Staff demonstrated that the UA prototype was able to comply with both reduced CO emissions, as well as EPA regulations for HC+NOx. The prototype employed a catalyst to decrease all three exhaust constituents (CO, HC, and NOx), and HC+NOx was lowered significantly below the EPA's standards. This decrease in HC+NOx with the catalyst provides an environmental benefit from our draft proposed rule, which staff has not accounted for in our cost benefits analysis.