PORTABLE GENERATORS AND CARBON MONOXIDE POISONING

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U.S. Consumer Product Safety Commission

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U.S. Consumer Product Safety Commission

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- Independent, federal agency
- Established in 1973
- 5 Commissioners
- Over 500 staff
- Headquarters in Bethesda, MD
- Laboratory in Rockville, MD

CPSC's Mission:
Protecting the public against unreasonable risks of injury from consumer products through education, safety standards activities, regulation, and enforcement.

What Do We Regulate?

Consumer Products

". . . any article, or component part thereof, produced or distributed (i) for sale to a consumer for use in or around a permanent or temporary household or residence, a school, in recreation, or otherwise, or (ii) for the personal use, consumption or enjoyment of a consumer in or around a permanent or temporary household or residence, a school, in recreation, or otherwise…"[1]








[1] Section 3(a)(5) of the Consumer Product Safety Act, 15 U.S.C. § 2052 (a)(5)

What Do We Not Regulate?

- Tobacco products (FDA)
- Drugs, cosmetics, food (FDA, USDA)
- Motor vehicles for road use (NHTSA), aircraft (FAA), boats and watercraft (USCG)
- Pesticides (EPA), medical devices (FDA), workplace products (OSHA and others)

Generator CO Poisoning Hazard

5kW generator

=

~ 450 cars

Typical engine powering a 5 kW generator emits a weighted average CO rate of nominally 1500 g/hr

Idling mid-size late 1990s model cars emit 2.4 – 5.4 g/hr of CO

Sources:

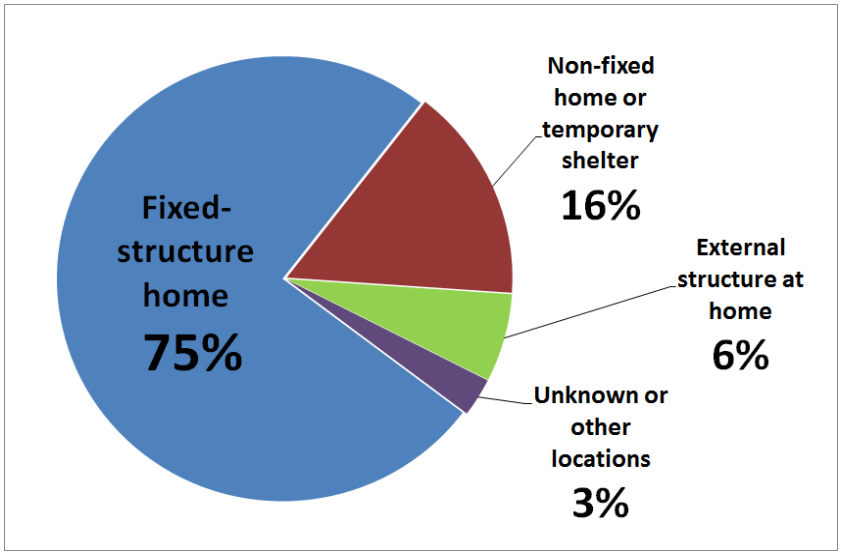
1. http://www3.epa.gov/otaq/certdata.htm#smallsi
2. Frey, H., et al., *On-Road Measurement of Vehicle Tailpipe Emissions Using a Portable Instrument*, Journal of the Air & Waste Management Association, Vol.53, August 2003.

Generator-Related CO Death Counts and CO Injury Estimates, 2004-2012

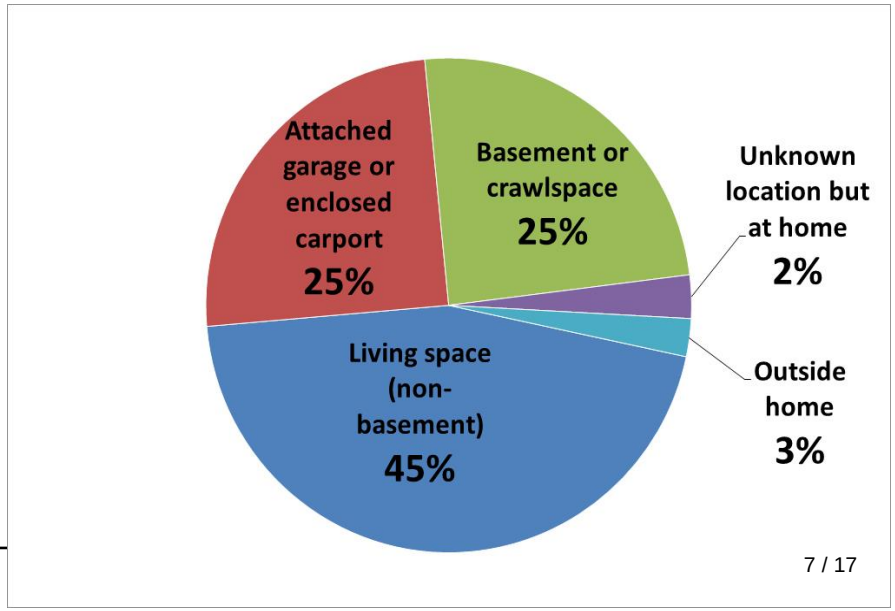
- 659 CO deaths (average 73 deaths/year)
- More than 25,000 estimated medically-treated CO Injuries (about 3,000 injuries per year)
- 25% of fatal incidents involved multiple fatalities, so these incidents account for 44% of all the deaths.

Hazard Patterns

Sites Where Generators Were Used that Caused Fatalities



Specific location of generator in incidents that occurred in fixed-structure homes



Staff Investigations of Reducing Portable Generators' CO Emission Rates

- CPSC prototype generator demonstration program
- EPA demonstration on engines to lower HC+NOx
- Staff testing of EFI generators

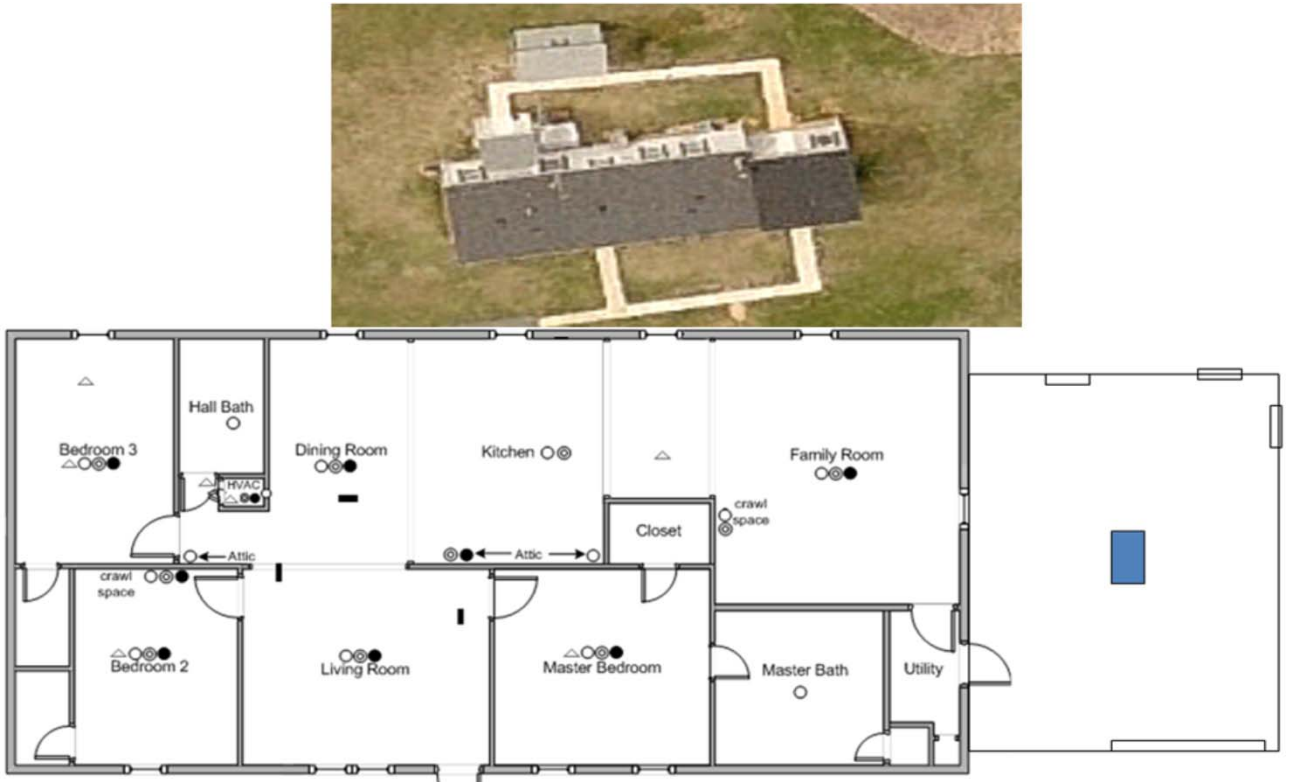
CPSC Prototype Generator Demonstration Program

Prototype Development and Durability:	**University of Alabama**
End-of-Life Emission Testing:	**Intertek Carnot Emission Services**
Scenario Testing :	**National Institute for Standards and Technology**

<u>Prototype configuration</u>:

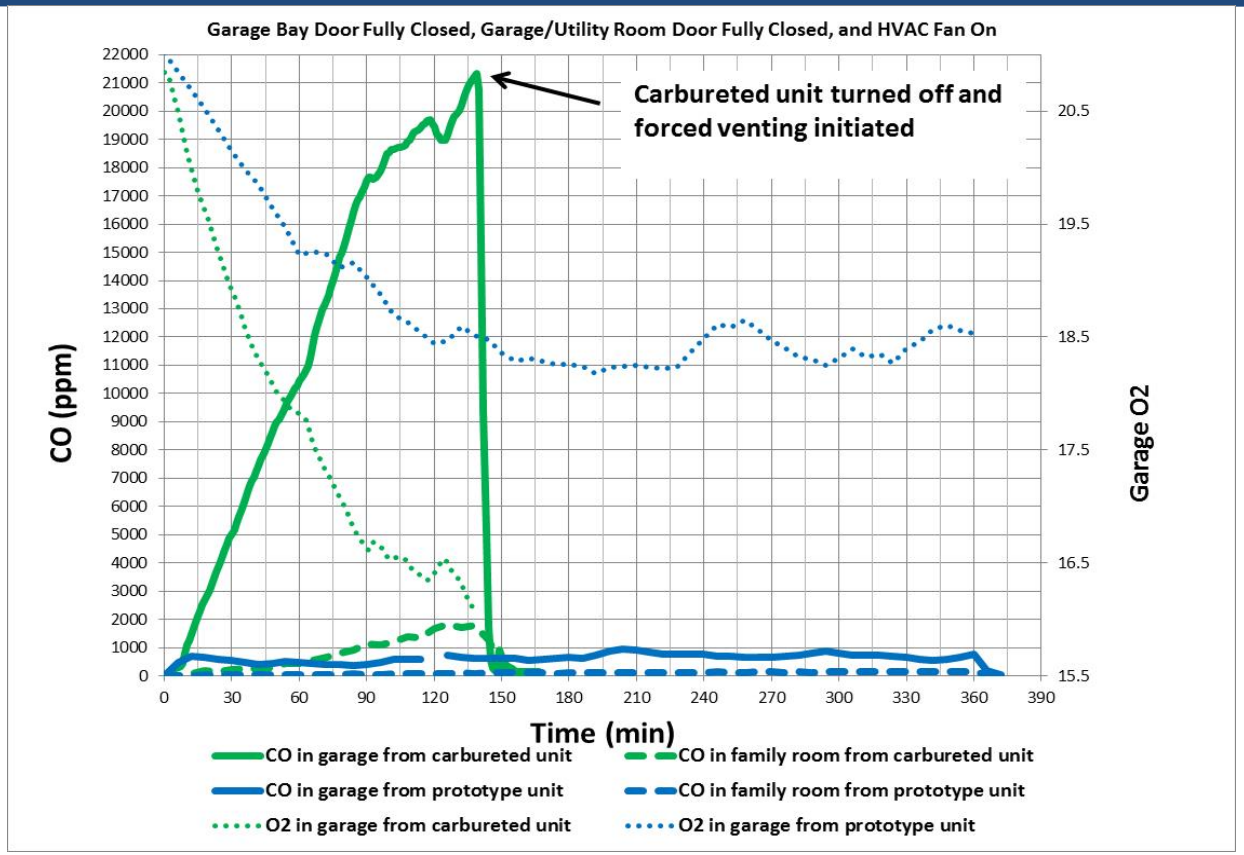
- **Modified 8.2 kW Class II engine with 500-hour rated useful life, certified to EPA Phase 2 standard**
- **Adapted EMS with closed loop EFI**
- **Calibrated for stoichiometric AFR at all loads**
- **Integrated 3-way catalyst, primarily to target NOx reduction, into shrouded muffler**

Hazard Characterization of Common Incident Scenario: Generator operation in SFH attached garage (NIST)



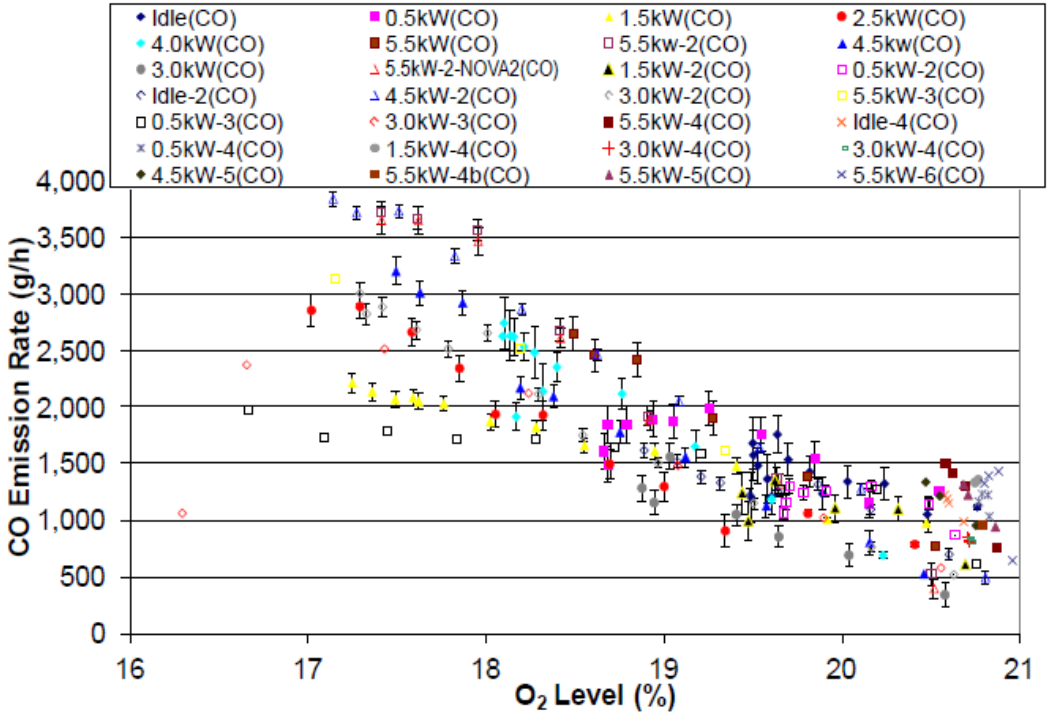
Source: S. J. Emmerich, A. K. Persily, and L. Wang, *Modeling and Measuring the Effects of Portable Gasoline Powered Generator Exhaust on Indoor Carbon Monoxide Level* (NIST Technical Note 1781), Feb 2013.

Garage and Family Room CO Concentration Profiles from Unmodified Carbureted 5 kW Unit and Prototype 5 kW Unit



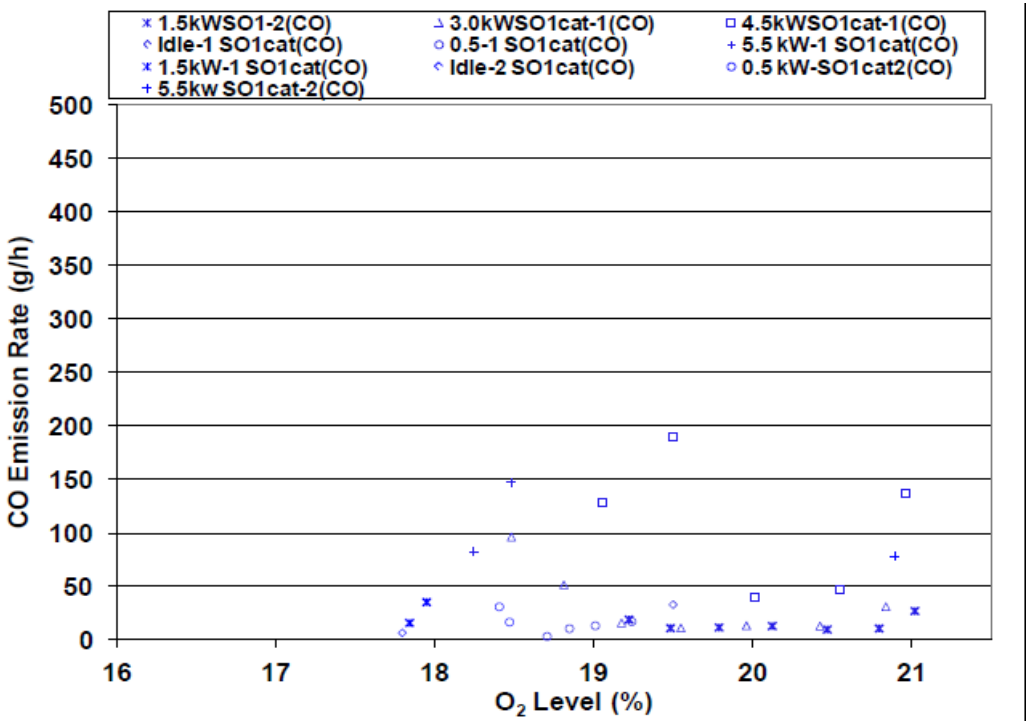
Generators' CO Emission Rates in Enclosed Space

CO Emission Rates of Unmodified Carbureted Generator



Generators' CO Emission Rates in Enclosed Space

CO Emission Rates of Prototype Generator



Conclusions from CPSC's Demonstration Program

- Prototype used same commercially available EMS being currently used in marketplace on small SI engines and on small scooters and motorcycles .
- Prototype met Phase 3 EPA exhaust emission standard for HC+NOx and reduced the CO emission rate by 93% - 97%.
- Weighted CO emission rate of carbureted unit increased 3-fold when oxygen in intake air is 17%. Prototype generator did not appear to increase CO rate in reduced oxygen.

CPSC Generator Categories

Generator Category	Engine
Handheld	≤ 80 cc
Class 1	>80 cc to <225 cc
Class 2 single cylinder	≥225 cc, up to 25 kW maximum engine power and 1 cylinder
Class 2 twin cylinder	≥225 cc, up to 25 kW maximum engine power and 2 cylinders

Proposed Performance Standard by Generator Category

Generator Category	Draft Proposed CO Emission Rate Limit, g/hr
Handheld	75
Class 1	75
Class 2 single cylinder	150
Class 2 twin cylinder	300

Rates are weighted CO emission rates calculated based on six specified loads applied to generator operating in atmosphere with normal oxygen content

Current Status of NPR

- **Staff delivered NPR package to Commission on 10/5/2016:**

https://www.cpsc.gov/s3fs-public/ProposedRuleSafetyStandardforPortableGenerators.pdf
(cut and paste this link into your browser window)

- **Staff briefed Commission on the NPR package on 10/19/2016:**
  https://www.cpsc.gov/newsroom/video/portable-generators-notice-of-proposed-rulemaking

- **Commission held decisional meeting on 11/2/2016 and voted (4-1) to approve the NPR :**
  https://www.cpsc.gov/content/commission-meeting-minutes-decisional-matter-proposed-rule-portable-generators and https://www.cpsc.gov/Newsroom/Video/commission-meeting-decisional-matter-portable-generators

- **Notice will soon be published in Federal Register, officially starting 75-day comment period on NPR.**

- **Contact me if you want to be notified of latest status on NPR:**

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