State of California
AIR RESOURCES BOARD

Staff Report: Initial Statement of Reasons for Proposed Rulemaking

ADOPTION OF EVAPORATIVE EMISSIONS CONTROL REQUIREMENTS FOR SPARK-IGNITION MARINE WATERCRAFT

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EXECUTIVE SUMMARY

BACKGROUND

The Federal Clean Air Act (CAA) grants California the unique authority to adopt and enforce rules to control mobile source emissions within the State. In order to attain the State and federal ambient air quality standards by the earliest practical date as required by the California Clean Air Act (CCAA), the California Air Resources Board (ARB or Board) seeks the maximum cost-effective emissions reductions possible from all sources, including vehicular and other mobile sources to protect the health and welfare of all California residents.

ARB's Proposed State Strategy for California's 2007 State Implementation Plan (SIP) (2007a, p.9) contains a specific control measure aimed at reducing emissions from spark-ignition marine watercraft with installed fuel tanks (SIMW or marine watercraft). This category includes, but is not limited to, inboard, outboard, and sterndrive marine watercraft. Personal watercraft such as jet skis are also included in the category. The SIMW category does not include any marine watercraft that uses portable outboard marine fuel tanks. Marine watercraft using portable outboard marine fuel tanks are typically equipped with engines less than 30 kilowatts (kW) and have been regulated by ARB since September 2008.

Based on the 2007 SIP commitment, staff investigated the feasibility of controlling evaporative emissions from SIMW. The investigation was formally initiated in 2007 because there were no federal and State rules or regulations in place to control evaporative emissions from SIMW. However, ARB was aware that the U.S. Environmental Protection Agency (U.S. EPA) was considering national evaporative standards. In October 2008, U.S. EPA finalized evaporative emissions standards for all SIMW. Implemented in 2009, the federal rule set new evaporative emissions design standards for fuel system components. The new federal standards are estimated to control 57 percent of the uncontrolled hot soak, and 56 percent of the uncontrolled diurnal hydrocarbon (HC) evaporative emissions from marine watercraft fuel systems. However, ARB's investigation revealed that lower standards are technically feasible. By setting more stringent standards than those adopted by U.S. EPA, ARB can obtain additional emissions reductions needed to meet California's unique air quality challenges.

In December 2007, the United States economy entered into the longest economic recession since World War II (BLS, 2012). The loss of jobs and the housing market collapse cut deeply into marine watercraft sales (Haynes, 2010). Data from the National Marine Manufacturers Association (NMMA) shows that in California, sales of new watercraft fell by 52 percent in 2009 when compared to 2008 sales (NMMA, 2009). Although sales of watercraft are beginning to recover, it is unclear how long it will be before they return to pre-recession levels. Staff worked closely with marine stakeholders to develop a proposal that would minimize the impact on the marine industry and still provide ARB with needed emissions reductions. The proposal presented in this report is a culmination of those efforts.

STAFF PROPOSAL

Staff is proposing a regulation that sets more stringent evaporative emissions control design standards than those set forth by the U.S. EPA's 2008 rule for gasoline-fueled SIMW configured with engines greater than 30 kW. Based on internal ARB emissions testing, staff determined that hot soak and diurnal HC emissions could be cost-effectively reduced by an additional eight and nine percent, respectively, over and above emissions reductions achieved by the U.S. EPA rule. Furthermore, the adoption of the proposed regulation will grant ARB the authority to enforce compliance in California. This will ensure emissions reductions resulting from U.S. EPA and ARB regulations are realized. In summary, staff proposes the following:

- Harmonize with U.S. EPA evaporative design standards for marine watercraft less than or equal to 30 kW for model year (MY) 2018 and later MYs.
- Set more stringent evaporative emissions control component design standards for marine watercraft greater than 30 kW for MY 2018 and later MYs.
- Require evaporative certification for all MY 2018 and later MY SIMW.

This proposal is based on the transfer of evaporative emissions control technologies from on-road vehicles that have a proven track record of emissions control. These technologies can be readily applied to SIMW. The proposed regulation provides sufficient flexibility to allow SIMW manufacturers to incorporate various evaporative emissions control technologies into marine watercraft fuel systems to meet California's air quality goals.

The proposed testing requirements for SIMW rely on the adoption of five test procedures (TP) to evaluate conformance to the proposed performance standards:

- TP-1501, *Test Procedure for Determining Diurnal Evaporative Emissions from Spark-ignition Marine Watercraft*
- TP-1502, *Test Procedure for Determining Hot Soak Evaporative Emissions from Spark-Ignition Marine Engines*
- TP-1503, *Test Procedure for Determining Diurnal Vented Emissions from Installed Marine Fuel Tanks*
- TP-1504, *Test Procedure for Determining Permeation Emissions from Installed Marine Fuel Tanks, Marine Fuel Hoses and Marine Fuel Caps*
- TP-1505, *Test Procedure for Determining Pressure Relief Valve Performance*

EMISSIONS REDUCTIONS AND COST IMPACTS

Staff estimates that setting more stringent evaporative emissions control component design standards will effectively control hot soak and diurnal emissions by 65 percent with U.S. EPA and ARB controls combined. Requiring engines to be fuel injected will result in additional exhaust benefits above those already achieved by existing exhaust regulations for sterndrive and inboard marine watercraft. California's SIP lists SIMW as one of the top ten mobile sources for reactive organic gases (ROG). Based on the latest SIMW emissions inventory model (PC2014), staff estimates the proposed rule will provide the following ozone season ROG emissions reductions in tons per day (TPD):

Summer ROG Emissions Reductions in 2023[1]
with 12% Fleet Turnover (TPD)

	U.S. EPA Controls	ARB Additional Controls	Total
San Joaquin Valley Air Pollution Control District	0.47	0.05	0.52
South Coast Air Quality Management District	0.69	0.07	0.76
Statewide	3.38	0.34	3.72

[1] Ozone emissions reduction target year in 2007 SIP.

Summer ROG Emissions Reductions in 2037[2]
with 46% Fleet Turnover (TPD)

	U.S. EPA Controls	ARB Additional Controls	Total
San Joaquin Valley Air Pollution Control District	1.14	0.17	1.31
South Coast Air Quality Management District	1.65	0.24	1.89
Statewide	8.10	1.18	9.28

[2] Target year for calculating emissions reductions after 20 years of implementation (based on MY 2018 implementation).

Emissions reductions for the year 2023 are shown because it represents the attainment year for the federal 8-hour ozone standard of 0.08 ppm in the 2007 SIP. The 2023 carrying capacities for ROG and NOx in the South Coast and San Joaquin Valley Air Basins represent the emissions levels that are required to meet the standard. The year 2037 was chosen because it represents emissions reductions 20 years after a MY 2018 implementation. Benefits of the rule are highly dependent on fleet turnover. Current estimates are conservative in assuming a relatively low rate of new boat sales and long lifetimes. If sales are higher than projected, then fleet turnover will be higher and benefits of the regulation will be greater than assumed here.

Staff estimates that the proposed regulations will cost California consumers and boat builders about $8.3 million over the total lifetime of the proposed regulation. The expected increase in retail price ranges from $28 to $45 per marine watercraft. The average increase in retail price for all marine watercraft categories represents approximately 0.2 percent of the average total marine watercraft retail price. This minimal increase is not expected to have a significant impact on new retail sales.

The cost per pound of emissions reductions was calculated for various marine watercraft to determine category-specific cost-effectiveness estimates. The average cost-effectiveness estimate for SIMW is $4.96 per pound of ROG reduced. Staff's proposal is cost-effective when compared with other adopted control measures for ROG such as those for off-highway recreational vehicles and large spark-ignited engines.

STAFF RECOMMENDATIONS

Staff recommends that the Board adopt this regulatory proposal to reduce evaporative ROG emissions from SIMW.

Staff considered alternatives to the current proposal, including complete harmonization with the U.S. EPA rule, and setting more stringent standards. Complete harmonization would achieve no additional emissions reductions. Therefore, this alternative was rejected. Staff also considered setting more stringent standards than those proposed. This alternative was rejected because it was not cost-effective. Staff determined that adopting the current proposal is both technologically feasible and cost-effective.

Staff held five public workshops to allow for public input throughout the development of the proposed regulation.

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LIST OF ACRONYMS

ARB	[California] Air Resources Board
AAQS	Ambient Air Quality Standard
ABYC	American Boat and Yacht Council
CAA	[Federal] Clean Air Act
CCAA	California Clean Air Act
CEQA	California Environmental Quality Act
Cal. Code Regs.	Code of Federal Regulations
DMV	[California] Department of Motor Vehicles
ECARS	Emissions Compliance, Automotive Regulation and Science Division
HC	Hydrocarbon
HNBR	Hydrogenated Nitrile Butadiene Rubber
Health & Saf. Code	[California] Health and Safety Code
IBEX	The International Boatbuilders Exhibition and Conference
ICOMIA	International Council of Marine Industry Associations
ISOR	Initial Statement of Reasons
KW	Kilowatt
MY	Model Year
NBR	Nitrile Rubber
NMMA	National Marine Manufacturers Association
NOx	Oxides of Nitrogen
OB	Outboard
OEM	Original Equipment Manufacturer
OMT	[Portable] Outboard Marine Tanks
ORVR	On-Board Refueling Vapor Recovery
PPM	Parts Per Million
PSI	Pounds per Square Inch
PWC	Personal Watercraft
ROG	Reactive Organic Gases
RVP	Reid Vapor Pressure
SCAQMD	South Coast Air Quality Management District
SD/I	Sterndrive/Inboard
SHED	Sealed Housing for Evaporative Determination
SIME	Spark-Ignition Marine Engine
SJVAPCD	San Joaquin Valley Air Pollution Control District
SIMW	Spark-Ignition Marine Watercraft
SIP	State Implementation Plan
SORE	Small Off-Road Engine
TP	Test Procedure
TPD	Tons per Day (emissions rate)
UCLA	University of California, Los Angeles
U.S.C.	United States Code
USCG	United States Coast Guard
U.S. EPA	United States Environmental Protection Agency

U.S. EPA RIA	United States Environmental Protection Agency Regulatory Impact Analysis
UV	Ultraviolet
XLPE	Cross-Linked Polyethylene

I. `INTRODUCTION AND BACKGROUND

The proposed regulation focuses on marine watercraft with permanently installed fuel tanks powered by gasoline-fueled spark-ignited marine engines. This category is abbreviated as “marine watercraft” or “spark-ignition marine watercraft” (SIMW) throughout the remainder of this report. The proposal does not apply to marine watercraft that use portable outboard marine fuel tanks (OMT) or marine watercraft powered by diesel engines. Diesel engine equipped marine watercraft are typically greater than 26 feet in length (Figure I-1) and have minimal evaporative emissions because of the characteristic low Reid Vapor Pressure (RVP) of diesel fuel. Marine watercraft include: personal watercraft (PWC) (Figure I-2), marine watercraft with outboard engines (OB) (Figure I-3), marine watercraft with jet drive propulsion (Figure I-4), and marine watercraft with sterndrive/inboard engine (SD/I) (Figure I-5).

Figure I-1: Marine Watercraft Greater than 26 Feet in Length

Figure I-2: Personal Watercraft (PWC)

Figure I-3: Marine Watercraft with Outboard Engine (OB)

Figure I-4: Marine Watercraft with Jet Drive Propulsion

Figure I-5: Marine Watercraft with Sterndrive/Inboard Engine (SD/I)

California's 2007 State Implementation Plan (SIP) (ARB, 2007a, p.9) lists marine watercraft as being one of the top ten mobile sources for emissions of Reactive Organic Gases (ROG). ROG emissions result primarily from incomplete fuel combustion and the uncontrolled evaporation of fuel. Unburned hydrocarbons are precursors in the formation of ozone and contribute to exceedances of federal and State ozone standards.

In October 2008, U.S. Environmental Protection Agency (U.S. EPA) adopted evaporative emissions design standards in 40 Code of Federal Regulations (CFR) Part 1060 for marine watercraft. These standards, which were phased-in on January 1, 2009, will effectively control 57 percent of the uncontrolled hot soak and 56 percent of the uncontrolled evaporative diurnal emissions when fully implemented.

This report demonstrates the feasibility of setting more stringent evaporative standards to meet California's need for additional ROG emissions reductions. This document addresses the need for the proposed regulation, evaluates the sources of evaporative emissions, investigates control technology, provides a summary of the proposed regulation, presents environmental and economic impacts of the proposal, and discusses alternatives considered.

In order to control air pollution in California, the Legislature granted ARB the authority to regulate mobile source emissions. The next section describes the need for regulating mobile source emissions in California, ARB's legal authority, and the regulatory history of SIMW.

A. SPECIFIC PURPOSE FOR THE ADOPTION, AMENDMENT, OR REPEAL

Mobile sources have historically been the largest contributor of ROG emissions in California. As on-road mobile sources have become progressively cleaner, the emissions from off-road sources, as well as mobile sources under federal and international jurisdiction (e.g., ships, locomotives, and aircraft) have become relatively more significant. To attain the 8-hour National Ambient Air Quality Standard for ozone, which is both more challenging and more protective of public health than the previous standard, it is necessary to pursue strategies to further control emissions from off-road mobile sources, including marine watercraft.

Fortunately, technologies that have been successfully used for controlling evaporative emissions from on-road vehicles are readily available, and can substantially reduce evaporative emissions from marine watercraft. It is critical that ARB achieve these readily available evaporative emissions reductions from marine watercraft, particularly given the magnitude of California's ozone problem.

B. REGULATORY AUTHORITY AND HISTORY

1. LEGAL AUTHORITY

In 1988, the Legislature enacted the California Clean Air Act (CCAA) which declared that attainment of federal and State ambient air quality standards was necessary to promote and protect public health, particularly the health of children, older people, and those with respiratory diseases. The Legislature also directed that these standards be attained by the earliest practical date.

Health and Safety Code sections 43013 and 43018 direct ARB to achieve the maximum feasible and cost-effective emissions reductions from all mobile source categories, which includes marine watercraft.

Authority to adopt and enforce the proposed regulation is granted to ARB through a combination of federal and State laws. ARB's legal requirement to submit a SIP is also articulated by both federal and State legislation. In 2007, the Board adopted amendments to California's SIP that commits ARB to comprehensively address SIMW evaporative emissions (ARB, 2007b, pp.14-15).

The federal and State laws that grant ARB legal authority to regulate all mobile source emissions are discussed in the next section.

a. Authority to Control Mobile Sources Under Federal Clean Air Act

Under section 209(b) of the Federal Clean Air Act (CAA), the State of California has the singular distinction of being granted the power to adopt and enforce rules to control emissions from new mobile sources. California is allowed an exemption from CAA provisions that otherwise prevent states from setting their own standards for motor vehicle emissions. The exemption also recognizes California's long-standing air pollution challenges and honors the State's pioneering efforts to reduce motor vehicle emissions (NRC, 2006).

b. Legal Requirement to Submit a SIP

CAA requires each state, including California, as codified in 42 United States Code (U.S.C.) section 7410, to submit a plan to U.S. EPA providing for the "implementation, maintenance, and enforcement" of primary as well as secondary air quality standards. These standards are designed to protect the public health and welfare within each air quality region of the State. CAA also requires SIPs to be submitted within three years of the promulgation or revision of a national ambient air quality standard (AAQS).

c. Regulatory Powers and Responsibilities Conferred by State Law

As named in the Health and Safety Code sections 39500 and 39602, ARB is the air pollution control agency responsible for controlling emissions from motor vehicles "for all purposes set forth in federal law." Specifically named among ARB's general duties and powers (Health & Saf. Code §§ 39600-39619.8) are the responsibilities to prepare California's SIP and to coordinate all local air quality management district activities necessary to comply with CAA. Furthermore, ARB must achieve the maximum feasible, cost-effective reductions of emissions from all mobile source categories under its jurisdiction (Health & Saf. Code §§ 43013, 43018).

d. Commitments under 2007 Amendments to the SIP

In September 2007, the Board adopted SIP amendments. The SIP serves as a roadmap for State and local air quality planning in order to attain the AAQSs. The 2007 SIP revised the 8-hour AAQS for ozone (0.08 parts per million (ppm)). In 1997, U.S. EPA set a new federal AAQS for ozone in response to scientific evidence substantiating adverse health effects at lower levels than had previously been established. Due in part to litigation, as well as the extensive process required to establish area designations and boundaries, the 8-hour ozone standard was not finalized until 2004.

The 8-hour ozone standard is more stringent than the previous 1-hour standard and calls for more extensive emissions control strategies. Although California has significantly reduced ambient ozone concentrations, the challenges posed by the more stringent standard prompted the reclassification of the San Joaquin Valley Air Pollution Control District (SJVAPCD) and South Coast Air Quality Management District (SCAQMD) nonattainment designations. Both regions are now classified as "extreme nonattainment" with regard to the 8-hour standard. "Extreme nonattainment" areas rely on the development of new technologies or improvement of existing technologies, in addition to other enforceable commitments, to reduce emissions of ozone precursors, namely oxides of nitrogen (NO_X) and ROG (CAA §182(e)(5)).

The 2007 State Strategy included a new SIP measure for controlling evaporative emissions from SIMW. The SIMW evaporative emissions measure is projected to deliver necessary ROG emissions reductions statewide by 2023, including California's most challenging regions with regard to ozone control, namely the San Joaquin Valley and South Coast air basins.

Pursuant to the 2007 SIP Amendments, the Board was expected to take action on the evaporative emissions measure from SIMW by 2009, with implementation beginning in the 2012 timeframe. However, the rulemaking was postponed because more time was needed to conduct an activity and usage survey, complete SIMW emissions testing, and to develop a stand-alone inventory model (PC2014) in support of the proposed regulation. The existing emissions inventory for SIMW was developed using the OFFROAD2007 emissions inventory model. However, the algorithm in OFFROAD2007 was unable to simulate marine watercraft age distributions, which is critical in estimating emissions from in-use SIMW. The updated inventory developed using PC2014 was completed in August of 2014. The Board action is now scheduled for February 2015, with implementation beginning in the MY 2018 timeframe.

2. REGULATORY HISTORY

U.S. EPA first adopted exhaust emission standards for PWC and OB in 1996. Because of California's unique and severe air quality problems, more stringent standards were necessary to meet the State's air quality goals and SIP obligations. In 1998, ARB approved exhaust emission regulations for spark-ignition marine engines (SIME) that accelerated implementation of the 2006 federal standards for PWC and OB marine engines in California to 2001. Finding that these engines contributed significantly to ozone-forming emissions in California, the Board adopted emission standards for PWC and OB marine engines.

In 2001, ARB adopted emission standards for sterndrive and inboard marine engines. These regulation set exhaust standards for ROG and NOx. In 2002, U.S. EPA initially proposed a rule to control evaporative emissions from SIMW. This 2002 proposal was limited to control of permeation emissions from fuel tanks and fuel hoses. The proposal did not control vented fuel tank emissions, which account for approximately 50 percent of the evaporative emissions from SIMW. ARB commented on the proposal and requested that U.S. EPA consider controlling vented tank emissions with a carbon canister as well as setting more stringent permeation design standards. In 2003, U.S. EPA began an investigation into the feasibility of controlling vented tank emissions with a carbon canister.

In 2007, the EPA Administrator granted California authorization to enforce ARB's regulations for OB/PWC engines and Tier 1 of the California inboard and sterndrive marine engine emissions standards pursuant to section 209(e)(2) of the CAA.

Because there were no federal rules in place regulating evaporative emissions from SIMW in 2006, and since the category is a major source of uncontrolled hydrocarbon emissions, the SIP was revised in 2007 to include a specific measure for controlling evaporative emissions from marine watercraft. Based on the need for ROG emissions reductions described in the revised 2007 SIP, ARB began work on the development of a regulation to control evaporative emissions from SIMW in 2007.

On July 24, 2008, ARB amended the exhaust regulations and test procedures for new SIME by providing an alternate HC+NOx exhaust standard for small and non-qualifying intermediate volume manufacturers of high performance engines (sterndrive engines > 373 kW (kilowatt)). This amendment reduced the stringency of the existing HC+NOx standard from 5.0 g/kW-hr (grams per kilowatt hour) to 16.0 or 22.0 g/kW-hr, depending on power category. However, in order to certify to this less stringent alternate exhaust standard, engine manufacturers were required to introduce carbon canister-based evaporative emissions control systems on all marine watercraft in which high performance engines were installed, beginning in 2009, to offset the emissions benefits lost as a result of the less stringent alternate exhaust standard. Manufacturers of high performance sterndrive SIMW were unable to meet the original 5.0 g/kW-hr HC+NOx exhaust standard because it essentially required the use of a catalytic converter, which had not been successfully developed for use on high performance engines as anticipated. Therefore, a more flexible approach became necessary to ensure that manufacturers could continue certifying high performance engines in California while maintaining the overall emissions benefits of the original regulation.

Other amendments adopted by ARB during this rulemaking included the adoption of: carbon monoxide standards, revised testing procedures, hardship allowance provisions, and a voluntary five-star standard to encourage the development of engines cleaner than those required by the regulation.

In September 2008, the Board adopted regulations that set permeation and venting standards for OMTs that harmonized with those approved by U.S. EPA. However, this regulation did not set standards for SIMW with permanently installed fuel tanks. In October 2008, U.S. EPA adopted a rule to control evaporative and exhaust emissions from all SIMW. This rule set design standards for fuel hose permeation, fuel tank permeation, and fuel tank venting control. The standards could easily be met with existing control technologies. However, U.S. EPA did not maximize the feasible emissions reductions being sought by ARB. With regard to certification, the U.S. EPA rule only requires manufacturers to keep records showing that all evaporative system components used on their marine watercraft meet the applicable design requirements.

In 2011, the U.S. EPA Administrator granted California authorization to enforce ARB's Tier II exhaust emission standards for spark ignited inboard and sterndrive marine engines. On December 16, 2011, the Board amended the certification test fuel requirements for SIMEs. The amendments required the use of certification test fuel with a 10 percent ethanol content (E10) beginning with model year (MY) 2020. The certification test fuel must be consistent with the fuel specifications as outlined in California Code of Regulations, title 13, section 1961.2, and the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures for 2015 and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles." The amendments also permit the use of other renewable fuel formulations (e.g., isobutanol) that have been certified by ARB as yielding test results equivalent to or more stringent than, those resulting from the E10 fuel specified above, and which are appropriate for the certification of spark-ignition marine engines.

3. FEDERAL EVAPORATIVE EMISSIONS DESIGN REQUIREMENTS

The current U.S. EPA rule controls evaporative emissions from fuel system components on SIMW (U.S. EPA, 2008b). These standards are based upon specific design requirements for three primary fuel system components. The rule requires the use of low permeation fuel tanks and fuel hoses, and fuel tank venting loss control components. To meet the fuel tank venting loss control requirement, manufacturers are likely to use a carbon canister or a pressure relief valve.

According to a survey conducted by the Institute for Social Research, SIMW are mostly stored at home, in storage facilities, or on the water (Appendix H). Fuel tank temperatures for marine watercraft stored in garages can vary significantly from those kept at a marina as indicated in the U.S. EPA Regulatory Impact Analysis (U.S. EPA, 2008a). In order to distinguish between fuel tank temperature variations from marine watercraft stored in a garage to those kept at a marina, U.S. EPA created two categories of SIMW: trailerable and nontrailerable. Trailerable SIMW are defined as marine watercraft less than 26 feet in length and less than 8.5 feet in width. U.S. EPA set specific evaporative emissions standards for both categories. Nontrailerable SIMW are defined as marine watercraft that are greater than or equal to 26 feet in length, or greater than 8.5 feet in width. The U.S. EPA standards and implementation schedule for trailerable and nontrailerable SIMW with installed fuel tanks are listed in Tables I-1 and I-2, respectively.

Table I-1: U.S. EPA Trailerable and Nontrailerable SIMW Evaporative Emissions Design Standards

Evaporative Emissions Control	Trailerable Standards	Nontrailerable Standards
Fuel Tank Permeation	2.5 $g/m^2/day$[a] at 40°C or 1.5 $g/m^2/day$ at 28°C[b]	2.5 $g/m^2/day$ at 40°C or 1.5 $g/m^2/day$ at 28°C
Fuel Hose Permeation	15.0 $g/m^2/day$ at 23°C	15.0 $g/m^2/day$ at 23°C
Diurnal Tank Venting Loss Control	0.40 g/gal/day[c]	0.16 g/gal/day

Source: 40 CFR Part 1060.

[a] $g/m^2/day$ - grams per meter-squared per day.

[b] U.S. EPA allows for equivalent standards at different test temperatures.

[c] g/gal/day - grams per gallon per day.

Table I-2: U.S. EPA SIMW Standard Implementation Dates

	Fuel Hose Permeation	Tank Permeation	Diurnal Tank Venting Loss Requirement
Standard Level	**15 g/m²/day**	**1.5 g/m²/day**	**0.40 g/gal/day**
Portable Tanks	2009[a]	2011	2010[b]
PWC	2009	2011	2010
Other Installed Tanks	2009[a]	2012	2011[c,d]

Source: 40 CFR Part 1060.

[a] 2011 for primer bulbs. Phase-in for under cowl fuel hoses, by total length of fuel lines, on OB engines: 30 percent in 2010, 60 percent in 2011, 90 percent in 2012, 100 percent in 2015.

[b] Design standard.

[c] Fuel tank installed in nontrailerable marine watercraft (≥26 ft. in length or >8.5 ft. in width) may meet a standard of 0.16 g/gal/day over an alternative test cycle.

[d] The standard is effective July 31, 2011. For marine watercraft with installed fuel tanks, this standard is phased-in for 50 percent of production in the first year and 100 percent of production in the following year.

Since temperature profiles between trailerable and nontrailerable SIMW differ based on storage location (U.S. EPA, 2008a), the fuel tank venting loss control requirements are adjusted to accommodate for similar control percentages with different testing temperature profiles. Most nontrailerable SIMW are stored on the water and are subjected to smaller temperature variations because of the moderating effect of the water. Fuel tank vented emissions are proportional to the daily fuel temperature variations. Therefore, the standard for nontrailerable marine watercraft was set accordingly.

II. STATEMENT OF REASONS

A. DESCRIPTION OF PROBLEM PROPOSAL IS INTENDED TO ADDRESS

1. BACKGROUND

Under the CAA, all nonattainment areas must submit SIPs that detail how they plan to improve air quality to meet federal ambient air quality standards. In 1994, ARB adopted a SIP to control ozone from six major areas in California. The 1994 Ozone SIP described a long-term strategy to dramatically reduce emissions and meet federally required attainment dates for the 1-hour ozone standard. Since 1994, most of the SIP measures have been implemented, along with additional control measures (that had not been identified in 1994) to reduce emissions. Despite ARB's efforts, many areas within California still exceed the federal ambient air quality standards for ozone.

2. 2007 SIP UPDATE

In 2007, ARB adopted an updated statewide strategy as part of the SIP to transition from the federal 1-hour ozone standard to the more stringent 8-hour ozone standard. The 2007 SIP outlined ARB's commitment to pursue several new ROG control measures and specifically included a commitment to set new evaporative emissions standards for SIMW and to pursue an aggregate ROG emission reduction from these new measures. The proposal in this staff report implements a strategy that further reduces evaporative emissions over those expected from the U.S. EPA rule by achieving a combined total of 65 percent reduction in evaporative emissions.

3. EMISSIONS INVENTORY

ARB staff has developed a regulatory proposal designed to reduce ROG emissions from SIMW in order to help meet ozone air quality standards across the State. As part of the regulatory process, ARB staff has updated the SIMW emissions inventory. The SIMW emissions inventory is a statewide accounting of the number of marine watercraft, their activity, and emissions. A new SIMW inventory model (PC2014) was developed to replace the previous model, OFFROAD2007. The new SIMW inventory contains updates for important inventory inputs including population, hours of use (activity), growth rates, emissions factors and the split between 2- and 4-stroke outboard engines. In addition, the SIMW inventory update accounts for the steep drop in SIMW sales that resulted from the economic recession that began in December 2007 and ended in June 2009 (BLS, 2014). Revised population estimates used in the inventory update are based upon new information from the California Department of Motor Vehicles (DMV, 2013), a survey conducted by the California State University, Sacramento (Appendix H), the University of California, Los Angeles (UCLA) Economic Forecast (UCLA, 2014), and emissions testing of representative SIMW conducted by ARB staff (Appendix J).

In 2008, U.S. EPA adopted evaporative emissions control standards for SIMW. Staff's proposal would require new SIMW to meet more stringent evaporative emissions standards than those promulgated by U.S. EPA. Because of the relatively long useful life of SIMW, as well as the relatively slow rate of new SIMW California sales, the overall emissions benefits will increase slowly as the fleet turns over. If the proposed regulation is adopted, staff estimates that by 2037, summertime evaporative ROG emissions will decrease by approximately one ton per day, statewide. Obtaining summertime emissions reductions is particularly important because that is when most ozone non-attainment days occur.

B. RATIONALE SUPPORTING THE PROPOSED STANDARDS

1. SOURCES OF EMISSIONS

The major contributors to evaporative emissions are diurnal, hot soak, and running loss processes. Additional minor sources include background emissions, refueling emissions, and fuel leakage from fittings and connectors. A description of each of these evaporative processes is provided below.

a. Diurnal Emissions

Diurnal emissions (which include resting loss emissions) are evaporative emissions from the fuel system components such as fuel tanks, fuel hoses, and carburetors when the marine watercraft is stored. Diurnal emissions result from normal daily ambient temperature variations. Sources of diurnal emissions also include vented emissions, permeation emissions and fuel leakage emissions.

b. Hot Soak Emissions

Hot soak emissions result from engine heat being transferred to the fuel system immediately after the engine is shut down. This causes an increase in evaporative and permeation emissions from fuel system components. The majority of hot soak emissions occur during the first hour after an engine is shut down. ARB testing has identified vented and carburetor emissions as the primary sources of hot soak emissions. Leaks and permeation emissions also contribute to hot soak emissions, but are small when compared to the vented and carburetor emissions.

c. Running Loss Emissions

Running loss emissions occur as a result of engine heat being transferred to the fuel system during engine operation. Leaks from gaskets and clamps, and permeation from the fuel system also contribute to running loss emissions.

d. Background Emissions

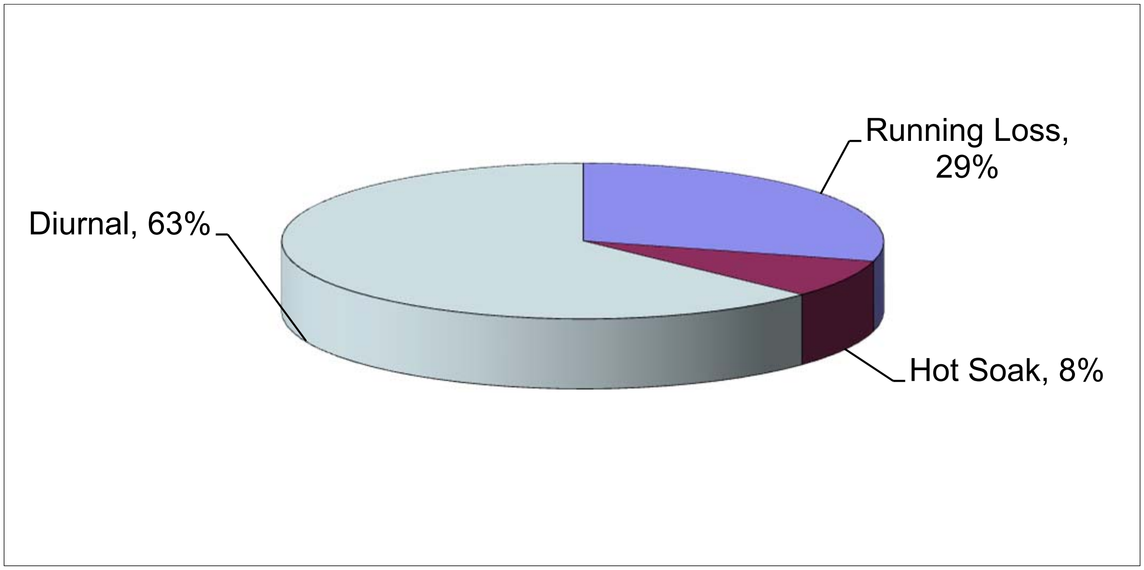
Background emissions from new marine watercraft vary depending on types of solvents, amount of carpeting, and adhesives used in the boat building process. Immediately after a marine watercraft is manufactured, background emissions can be relatively high but diminish over time.

e. Refueling Emissions

Refueling emissions are emissions displaced from the fuel tank and fuel delivery system during a refueling event.

Figure II-1 shows the uncontrolled emissions from the major evaporative emissions sources in SIMW estimated using ARB's PC2014 model. It does not show background, refueling, and fuel leakage emissions, which are minor sources. The proposed regulation will mainly control evaporative emissions from diurnal and hot soak sources, which account for nearly 71 percent of the top three processes for SIMW evaporative emissions.

Figure II-1: Uncontrolled Evaporative Emissions by Source Category



2. MEASUREMENT OF UNCONTROLLED EMISSIONS

ARB staff performed various tests to quantify the uncontrolled sources of evaporative emissions. Testing was conducted on multiple SIMW from different marine watercraft categories. A complete listing of all SIMW tested is detailed in Appendix G.

a. Diurnal Emissions

Staff tested various configurations of controlled and uncontrolled fuel systems to determine individual sources of diurnal emissions. Staff then used measured values of permeation rates to determine emissions from other diurnal emissions sources.

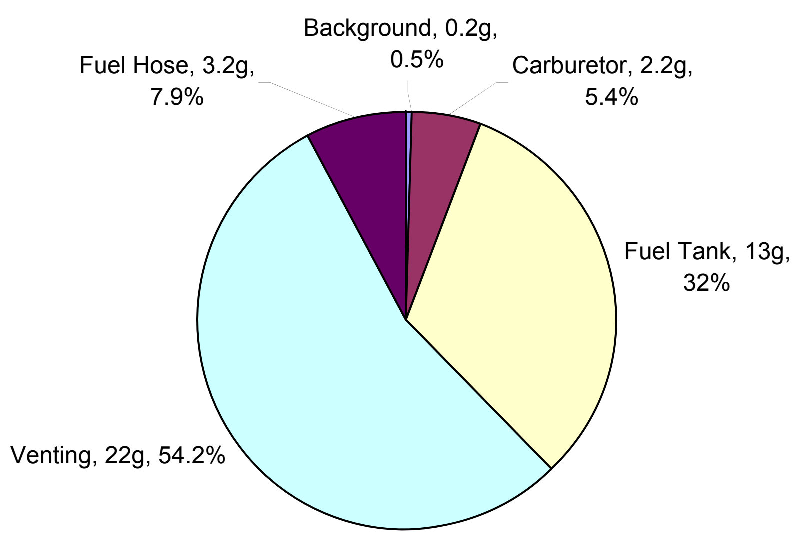
Effective control technologies for diurnal emissions target the fuel system components, which are the primary contributors to diurnal emissions. Diurnal emissions include vented, permeation, and leakage emissions. Staff used a step-wise technique to isolate and quantify diurnal emissions sources.

Diurnal emissions were measured in a SHED using a variable (65ºF – 105ºF – 65ºF) temperature profile over a 24-hour period. Staff tested an original equipment manufacturer (OEM) configuration with no controls and conducted the following test scheme to determine emissions from fuel system components.

1. Vented emissions were quantified by diurnal testing a SIMW configured with a new fuel tank and new fuel hoses before permeation breakthrough had occurred. Measured vented emissions corresponded well with theoretical calculations using the Reddy equation (Reddy, 2004).
2. After 30 days of soaking with fuel, staff performed another series of repeated diurnal tests. These repeated tests demonstrated that the permeation rates had stabilized. The results were then subtracted from the previous vented test results to obtain the permeation emissions.
3. Next, staff operated the engine and then tested the marine watercraft again. The additional emissions from the latest tests were determined to be from the carburetor.
4. In order to separate the fuel tank permeation from the fuel hoses, staff performed a test of the fuel tank only.
5. Finally, staff calculated the fuel hose permeation by subtracting all the other fuel system component evaporative emissions.

The breakdown of uncontrolled emissions by fuel system component from the 2006 Crestliner SportAngler 1750 outboard marine watercraft is shown in Figure II-2.

Figure II-2: Uncontrolled Evaporative Emissions by Source Category



2006 Crestliner SportAngler 1750 Outboard Uncontrolled Diurnal Emissions (40.6 g/day)

As shown in Figure II-2, venting emissions are the largest source of uncontrolled diurnal evaporative emissions followed by fuel tank permeation and fuel hose permeation. Section 3 details the control technology to reduce diurnal vented emissions, diurnal permeation emissions, and diurnal leakage emissions.

b. Hot Soak Emissions

Hot soak emissions from marine watercraft were measured following accepted practices as described in Appendix I. Hot soak testing was conducted in a SHED immediately following the operation of the engine for 15 minutes at 50 percent of throttle. The marine watercraft was then shut off, immediately pushed into a SHED pre-heated to 105ºF, and tested for 3 hours. Staff determined that a test duration of 3 hours was sufficient to capture a hot soak event. This result is consistent with earlier studies (Appendix I). The emissions results of these hot soak tests comparing carbureted to fuel-injected PWC and OB marine watercraft are shown in Figures II-3 and II-4, respectively. Figure II-5 compares the hot soak results of a carbureted sterndrive and a carbureted inboard SIMW. The test data in Figures II-3, II-4, and II-5 are combined averages over multiple SIMW. All related test data is in Appendix G.

The test results indicate that hot soak emissions are a significant source of evaporative and permeation emissions. The results also confirm that SIMW operating with fuel injected engines have hot soak emissions approximately 50 percent lower than those being operated with carbureted engines.

Figure II-3: Hot Soak Personal Watercraft Emissions Data

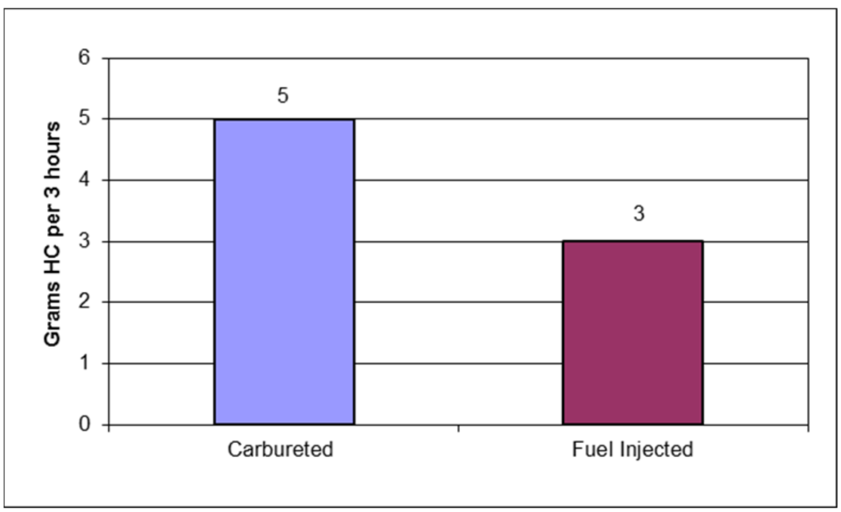


Figure II-4: Hot Soak Outboard Marine Watercraft Emissions Data

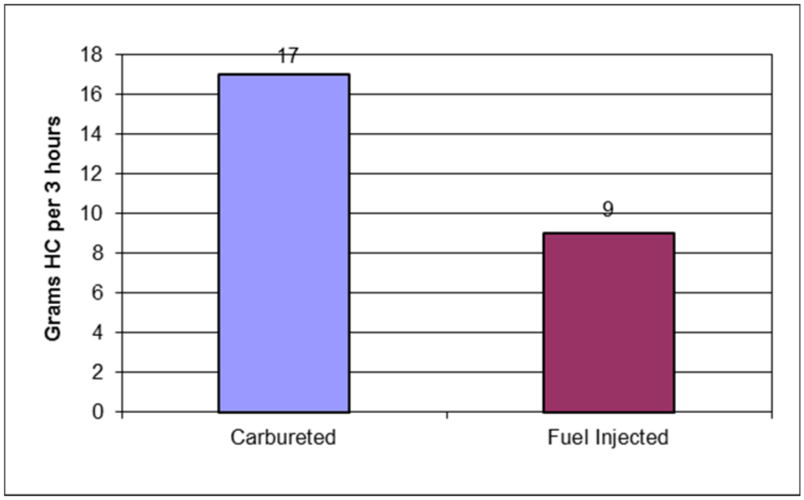
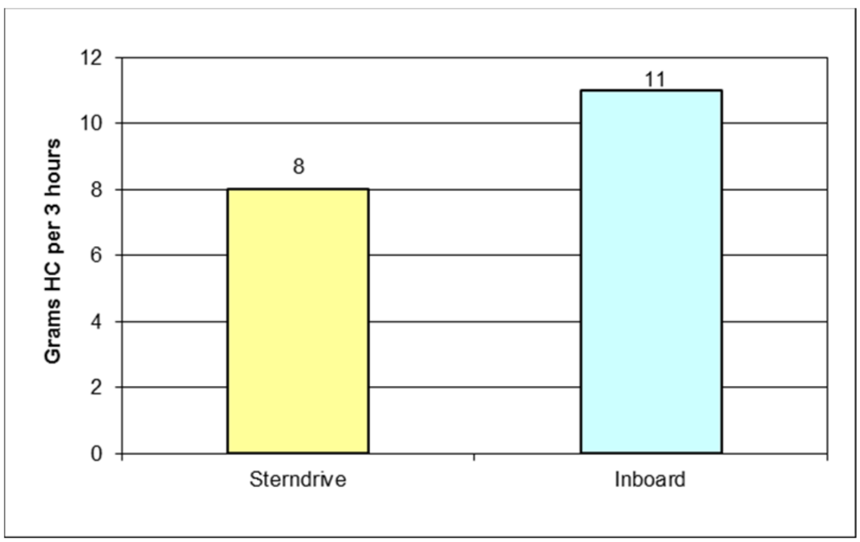


Figure II-5: Hot Soak Emissions from Sterndrives and Inboards with Carbureted Engines



c. Running Loss Emissions

Running loss emissions from SIMW are extremely difficult to measure in a SHED. In order to measure running loss emissions in a SHED, exhaust emissions and heated water must be captured while intake air and cooling water is continuously supplied to the marine watercraft. Due to these difficulties, staff performed running loss testing without the use of a SHED. Staff quantified running loss emissions utilizing alternative methods that have been previously used to quantify running loss emissions from forklifts and other large equipment in prior evaporative emissions test programs (Carroll and White, 1998).

Running loss emissions were estimated using the following alternative tests:

- Gravimetrically measuring the vented emissions from the fuel tank.
- Gravimetrically measuring the emissions emitted from the bilge area.
- Measuring the emissions emitted from under the cowl (engine cover) of outboard engines.
- Measuring the increase in fuel temperature during a running loss event.

In order to measure vented running loss emissions, staff gravimetrically measured fuel vapors being emitted from the SIMW's fuel tank with a carbon canister while in operation. These tests were conducted following the International Council of Marine Industry Associations (ICOMIA) standard 36-88 operating mode profile (ICOMIA, 2014), which is an industry-accepted practice. However, this method only measured the vented emissions from the fuel tank. The testing did not measure evaporative emissions from permeation, the carburetor, or leaks from fuel connector fittings. The results of the running loss tests are shown in Table II-1. The weight loss results indicate negative pressure in the tank ullage volume, which leads to the canister being purged. Fuel tank ullage pressure is negative because the pressure buildup due to vapor expansion as the fuel tank temperature increases is less than the pressure decrease due to fuel consumption as the engine is operated. The results show no running loss emissions are vented from the fuel tank.

Table II-1: Fuel Tank Running Loss Emissions Test Results

Marine Watercraft Make and Model	Weight (grams)			Results
	Initial	Final	Difference	
2000 Kawasaki 1100 STX DI	1767.2	1766.4	-0.8	Weight Loss
2000 Kawasaki 1100 STX DI	1768.4	1767.8	-0.6	Weight Loss
1995 Sea Doo XP	1776.1	1774.9	-1.2	Weight Loss

Since gravimetric testing indicated that there were no evaporative emissions being emitted from the fuel tank, staff performed testing in the bilge area (Figure II-6) and under the cowl (Figure II-7) of PWC and OB engines to determine running loss evaporative emissions from permeation and fuel connector leaks. The test results for the bilge area and under the cowl emissions are shown in Tables II-2 and II-3, respectively. The weight loss results in Table II-2 show that the bilge area is not a source of running loss evaporative emissions for the three SIMW tested. The hydrocarbon concentrations in Table II-3 indicate that minimal running loss evaporative emissions are emitted from the engine cowl.

Figure II-6: Personal Watercraft with Engine Cover Lifted to Expose Bilge

Figure II-7: Outboard Engine Cowl with Latch

Table II-2: Bilge Area Gravimetric Test Results

Marine Watercraft Make and Model	Weight (grams)			Results
	Initial	Final	Difference	
1995 Sea Doo XP	1781.3	1780.6	-0.7	Weight Loss
1995 Sea Doo XP	1774.6	1774.1	-0.5	Weight Loss
1998 Yamaha Exciter	1779.1	1778.1	-1.0	Weight Loss

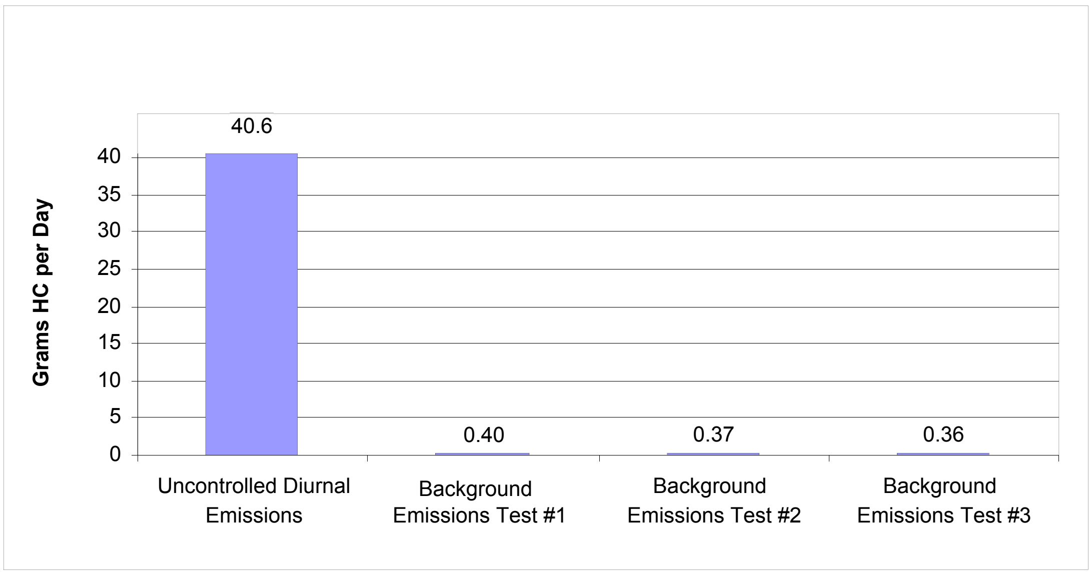
Table II-3: Under the Outboard Cowl Hydrocarbon Analyzer Test Results

Marine Watercraft Make and Model	Hydrocarbon (ppm)		
	Maximum	Minimum	Average
2006 Crestliner 1750 Sport Angler (FI)	2.8	0.9	1.2
2006 Crestliner 1750 Sport Angler (FI)	4.5	0.3	0.8

d. Background Emissions

Spark-ignition marine watercraft manufacturers expressed concern that background emissions from adhesives and manufacturing processes could bias diurnal emissions results. Staff measured background emissions by performing repeat diurnal evaporative emissions tests on a new 2006 OB in a sealed housing for evaporative determination (SHED) with no fuel in the fuel system. An OB SIMW was selected because it is very representative in the marine watercraft inventory. The test results are provided in Figure II-8.

Figure II-8: Background Emissions Testing Results



The test results indicate negligible amounts of background emissions compared to uncontrolled diurnal emissions. The background emissions were roughly one percent of the overall uncontrolled diurnal emissions from the OB marine watercraft when fuel was placed in the fuel system. The results show that background emissions are not a significant source of evaporative emissions and will not bias a diurnal emissions measurement. It should be noted, however, that the background emissions testing was performed on a SIMW nearly two years after the manufacturing date. It is possible that the background evaporative emissions may have been higher immediately after the SIMW was manufactured.

e. Refueling Emissions

A refueling emissions factor was developed using a motorcycle fuel system. Since the emissions factor is based on tank volume, staff could extrapolate the uncontrolled refueling emissions to a marine watercraft. Staff performed uncontrolled refueling emissions testing in a SHED with a fuel system and a fuel dispensing unit. Staff measured the uncontrolled fuel vapor in the SHED and calculated an emissions factor based on tank volume. The refueling emissions test results are shown in Table II-4.

Table II-4: Refueling Emissions Test Results for On-road Motorcycle Fuel Tank

Test Procedure 40 CFR 86.150-80.155	Test Number	Grams HC	Average (grams HC)	Emissions Factor (g/gallon filled)
Non-Vapor Recovery Nozzle / Non-ORVR tank (3.2 gallons filled)	1	11.22	11.31	3.53
	2	11.40		

3. TECHNOLOGY TO CONTROL EVAPORATIVE EMISSIONS

The proposed SIMW regulation is based on evaporative emissions control technologies that have a proven track record in the automotive sector. Recently, manufacturers have adapted evaporative emissions control technologies for use in off-road equipment and vehicles, including SIMW, as a result of federal and State requirements to control evaporative emissions. The following sections discuss the control technologies for SIMW and highlight those that are readily available.

a. Refueling Emissions Control Technology and Availability

Refueling emissions occur when gasoline vapors are displaced by rising liquid in the vehicle fuel tank during gasoline dispensing. These vapors are adsorbed in a carbon canister installed with an onboard refueling vapor recovery system (ORVR). The vapors stored on the carbon canister are then drawn into the engine's intake manifold when running (actively-purged) and combusted.

Staff investigated the feasibility of applying ORVR systems to SIMW, and determined the ORVR systems to be cost prohibitive. Currently, there are no SIMW installed with ORVR systems. Since ORVR systems rely on a system that actively purges a carbon canister and marine watercraft are used infrequently compared to on-road vehicles, most fuel systems require a redesign to accommodate an ORVR system. As an alternative, staff proposes the use of a Phase II compatible deck fill plate to capture some refueling emissions. A Phase II vapor recovery system collects fuel vapors from a vehicle's fuel tank while refueling at a gasoline dispensing facility. A properly designed deck fill plate captures refueling emissions by creating a seal between the plate and the Phase II nozzle boot. Staff estimates the proposed deck fill plate requirement will control nearly 95 percent of refueling emissions from SIMW when refueled at Phase II compliant gasoline dispensing facilities. Manufacturers have stated that compatible deck fill plates are currently available.

b. Fuel System Control Technology and Availability

Evaporative emissions from the fuel system can be controlled by using fuel injection. Standard carburetors do not optimize air/fuel ratios for all load/speed conditions, thereby reducing the overall fuel efficiency of the engine. Fuel injection can reduce or eliminate these issues. Fuel injection uses an engine control unit, sensors, and electronic fuel injectors to optimize the air/fuel ratio. Evaporative emissions are also significantly reduced because the fuel management system is sealed and does not vent into the atmosphere.

Fuel injection technology is available and already installed on most types of SIMW with engines greater than 30 kW. Exhaust emissions requirements adopted by ARB in 2008 prompted manufacturers of SD/I and inboard jet drive engines to switch to fuel injection systems in order to accurately control air/fuel ratios for catalytic exhaust systems. For PWC, manufacturers have already switched to fuel injection systems because the marine watercraft can continue to operate without leaking or flooding from a rollover event, in addition to the above benefits cited.

c. Diurnal Vented Emissions Control Technology and Availability

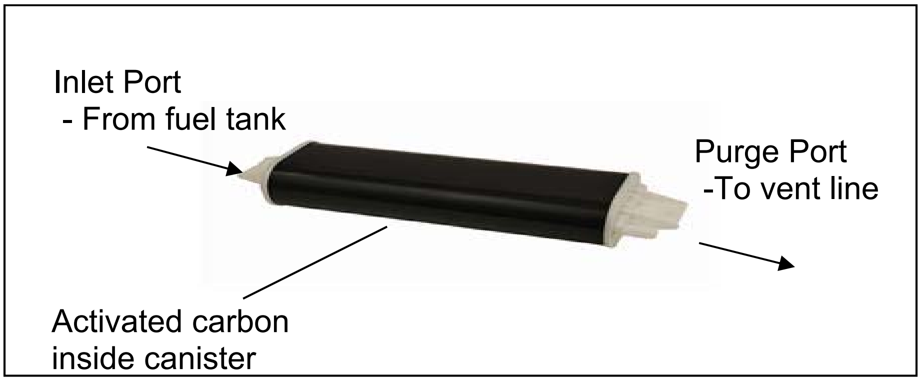
Four control options for reducing diurnal emissions from SIMW are discussed. These control technologies have been proven to be effective for on-road and off-road vehicles and equipment.

i. Carbon Canisters

Carbon canister technology is widely used to control ROG emissions from mobile and stationary sources. Carbon canisters capture fuel vapors in an activated carbon bed using electrostatic forces. As the fuel temperature increases inside a fuel tank, it builds pressure in the fuel tank ullage. Because of the increase in fuel tank ullage pressure, fuel vapors are directed to the activated carbon in the canister. Vapors captured on the activated carbon remain there until they are purged back into the tank when the fuel temperature decreases (passive purging) or until they are purged into the engine's air intake system and combusted (active purging). Typically, carbon canisters are actively purged through a vacuum hose connected to the intake manifold. After being actively purged by engine operation, carbon canisters regain their working capacity and are nearly 100 percent efficient. However, actively purging a canister from a marine watercraft is impractical because marine watercraft are used infrequently and stored for long periods of time compared to on-road vehicles. ARB's SHED testing has verified that after approximately 4 diurnal periods, a properly sized carbon canister (actively or passively purged) is only 65 percent efficient in controlling diurnal vented emissions.

The U.S. EPA worked with carbon manufacturers and industry to design a marine grade carbon that meets United States Coast Guard (USCG) standards, and is efficient at capturing gasoline vapors in a humid environment (U.S. EPA, 2008a). Therefore, the design and sizing of the carbon was optimized for durability, resistance to humidity, and efficient working capacity. However, staff is proposing the same durability requirements for marine carbon be met without prescribing any specific technology. A picture of a marine carbon canister is shown in Figure II-9.

Figure II-9: Marine Carbon Canister



Source: Attwood Marine

For the U.S. EPA rule, fuel tank venting control was required for PWC in 2010. In 2011, the venting control requirement was applied to all other marine watercraft. The rule included specific carbon pellet sizing requirements. Marine carbon canisters that meet the proposed U.S. EPA and ARB requirements are readily available from at least three major manufacturers.

ii. Pressure Relief Valve

A pressure relief valve opens above a designated set point. When installed on a fuel tank or in a vent hose, a pressure relief valve can be used to control vented tank emissions. The pressure relief valve opens when a specific pressure is reached within the fuel tank, and continues to vent fuel vapors to the atmosphere until the pressure drops below the set point. The current USCG safety regulations (U.S. EPA, 1987) require that fuel tanks in SIMW withstand a pressure of three pounds per square inch (psi). Also, fuel tanks must go through durability testing that requires a pressure impulse test and a static pressure test. Manufacturers have stated that fuel tanks are not designed to operate under pressure and can get deformed on broad flat tank surfaces at low pressures. This would affect how a fuel tank is mounted (U.S. EPA, 2008a). Staff is aware that pressure can cause deformation of fuel tanks not designed to withstand excessive pressures. However, USCG requires that fuel tanks withstand a pressure of three psi. Some marine watercraft, such as PWCs, already have fuel tanks designed to withstand increased pressure and currently use pressure relief valves to control higher fuel tank pressures than those proposed in this staff report. Therefore, staff expects no deformation issues with the proposed control set point of one psi. The set point of one psi corresponds to a level of diurnal venting control of approximately 65 percent, which is the same level of diurnal venting control expected from appropriately designed carbon canisters.

Pressure relief valves are available in many sizes and types for different applications. They are currently being used on marine watercraft to prevent excessive pressure from developing within a sealed fuel tank. Most major PWC manufacturers utilize pressure relief valves to control fuel tank pressure. Pressure relief valves are commercially available.

iii. Insulation

Evaporative emissions generated during a diurnal profile are dependent on fuel temperature and fuel temperature variation. Insulation works by reducing the fuel temperature variations within a fuel tank. Data from the U.S. EPA tests confirm the reduction of vapor generation with insulation (U.S. EPA, 2008a). Even though most marine watercraft have fuel tanks that are insulated to some degree by their location in the hull, additional insulation can be strategically added to further reduce temperature variation and therefore, diurnal emissions.

Insulation is inherent to the properties of a marine watercraft. As discussed in an earlier section, the marine watercraft hull acts to somewhat insulate the fuel system. Manufacturers can increase the amount of insulation, which is readily available in a variety of forms.

iv. Fuel Bladder

A collapsible fuel bladder can be used to replace a fuel tank in order to reduce vapor space, thereby reducing evaporative emissions. As fuel is drawn by the engine during operation, the bladder collapses and no vapor space is produced. Because vapor generation is a function of vapor space (Reddy, 2004), no diurnal vented evaporative emissions are generated. Fuel bladders are very effective in controlling diurnal vented evaporative emissions, but most current bladder marine fuel tanks are made out of polyurethane, which can have high permeation rates (U.S. EPA, 2008a). Figure II-10 shows a 25 gallon marine fuel bladder.

Figure II-10: 25 Gallon Marine Fuel Bladder

Source: Cyber Bridge Marine

Fuel bladder technology is currently available for use on all types of SIMW.

d. Diurnal Permeation Emissions Control Technology and Availability

Diurnal permeation emissions are primarily emitted from fuel tanks and fuel hoses. Control technologies for permeation emissions consist of integrating lower permeating materials on the inner layer of the component.

i. Fuel Tanks

Fuel tank permeation occurs when fuel vapors diffuse through the walls of the tank material and evaporate on the outer surface. Permeation rates from fuel tank materials are dependent upon temperature, material type, material thickness, and chemical composition of the fuel or fuel vapor.

Most permanently mounted fuel tanks used on SIMW are made from cross-linked polyethylene (XLPE) using a rotational molding process. In this process, XLPE powder is dropped into a mold base that rotates inside a heated oven. The XLPE powder is melted and distributed evenly throughout the mold as it rotates. The wall thickness of the fuel tank is determined by the amount of XLPE powder used. Once completed, the finished product has the following characteristics:

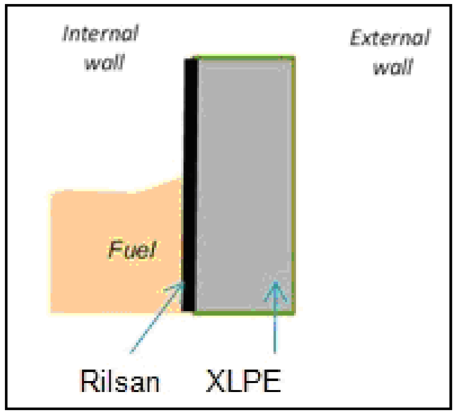
- Not subject to any rust or corrosion problems.
- Provides a longer life and less weight than metal tanks.
- One-piece seamless construction.
- Offers a wider variety of design configurations.
- Can be blended to produce different colors.

Although XLPE has many advantages in today's marine industry, the polymer structure of XLPE allows fuel molecules to permeate. Introduction of a less permeable barrier layer can reduce emissions significantly. One manufacturer, Moeller Marine, has created a rotational molding process where Rilsan® Roto 11 polyamide (produced by Arkema) is automatically dropped into the rotational molding process at a specified time and temperature using a Programmable Logic Controller. As the mold rotates within a heated oven it creates a low-permeation inner barrier. A picture and cross-section of a XLPE fuel tank with a low permeation inner barrier is shown in Figures II-11 and II-12, respectively. The Rilsan® Roto 11 is a black grade of polyamide (nylon) 11. Nylon 11 is known to be a low permeation barrier material used in fuel tanks.

Figure II-11: XLPE Fuel Tank with Low Permeation Inner Barrier

Source: Moeller Marine Corporation

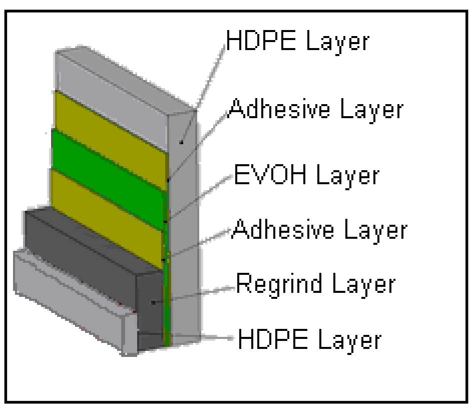
Figure II-12: Cross-section of XLPE Fuel Tank with Low Permeation Inner Barrier



Source: Moeller Marine Corporation

Another technology to control permeation from fuel tanks is multi-layer co-extrusion. Multi-layer co-extrusion fuel tank production involves technology that creates a multi-layered fuel tank. A low permeating barrier such as ethylene vinyl alcohol is extruded and sandwiched between layers of high density polyethylene and adhesives. Each layer is extruded separately and converges into one final layer at the end of the molding process. A diagram of a fuel tank layer that was produced using the multi-layer co-extrusion process is shown in Figure II-13. Manufacturers can produce fuel tanks up to 50 gallons using this process.

Figure II-13: Multi-layer Co-extrusion



Source: Agri Industrial Plastics Company

Other low permeation plastic fuel tank technologies include special polymers and barrier surface treatments, such as fluorination and sulfonation.

Most manufacturers will continue to use the rotational molding process with an inner barrier to meet the U.S. EPA standard. By increasing the permeation barrier thickness, this same technology can be used to meet the proposed ARB fuel tank permeation standard.

The current low permeation barrier technology for fuel tanks is available and is currently used on automobiles, small off-road engines, and other off-road sources. The rotational molding process that includes low permeating pellets to create an inner barrier is currently used in forming the fuel tanks for large lawn and garden equipment. Since implementation of the U.S. EPA fuel tank permeation standard in 2010, manufacturers already have the improved rotomolding process in place that is needed for meeting the proposed ARB fuel tank permeation standard. Staff anticipates that only an increase in the barrier thickness is needed to meet the proposed fuel tank permeation standard.

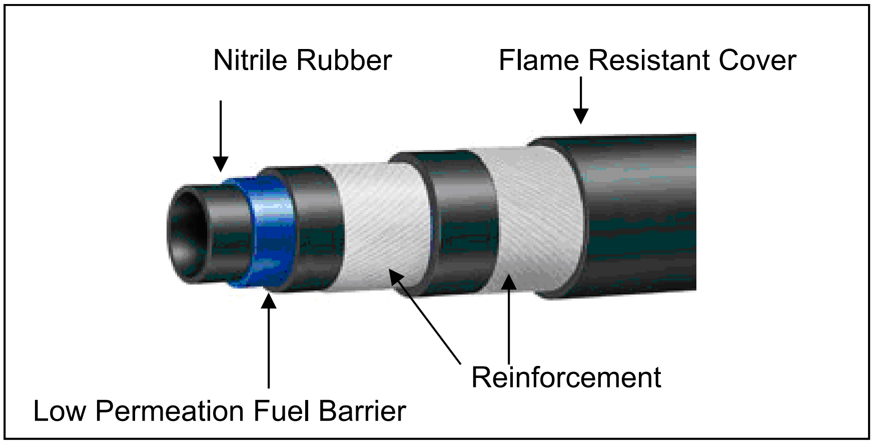
ii. Fuel Hoses

Similar to fuel tanks, permeation from fuel hoses occurs when fuel diffuses through the walls of the hose material and evaporates on the outer surface. Permeation rates for fuel hoses are dependent upon temperature, material type, hose thickness, and chemical composition of the fuel or fuel vapor.

Most marine fuel hoses are primarily composed of nitrile rubber (NBR) (U.S. EPA, 2008a). They also have an outer layer that is often composed of chloroprene for marine applications to increase fire resistance. Marine fuel hoses must meet USCG requirements, as specified in 33 CFR part 183. Marine hoses that meet a 2.5 minute flame resistance test are referred to as “Type A” marine fuel hose. All marine hoses that reside inside the hull of marine watercraft are required by the USCG to be Type A. Another marine hose type is a “Type 1” marine fuel hose which must not exceed a permeation rate of 100 g/m^2/day at 23° C when using CE10 as a test fuel. Most marine watercraft manufacturers exclusively use the combined “Type A1” fuel hose, which meets the requirements of Type A and Type 1, because it is not cost-effective to stock multiple hose types. The marine U.S. EPA fuel hose permeation requirement, implemented in 2009, set a permeation standard of 15 g/m^2/day at 23°C for Type A1 marine fuel hose, designated as “Type A1-15”.

Currently, the construction of low permeation marine fuel hoses includes an inner barrier made of a low permeating material (U.S. EPA, 2008a). The material of the inner barrier can be composed of materials such as nylon, THV (also known as tetrafluoroethylene, hexafluoropropylene, and vinyledene fluoride), Teflon, or other types of fluoroelastomers. A flouroelastomer is a synthetic rubber barrier material with good chemical resistance. These barriers are often sandwiched between two layers of NBR. As cited in the U.S. EPA Regulatory Impact Analysis (RIA), a 3/8 inch marine hose using Teflon (F200) as a low permeating barrier obtained a permeation rate of 5.0 g/m^2/day at 23°C with CE10 fuel (p.5-85). Other permeation rate comparisons were also made with hoses using THV and Teflon. Teflon, also known as, polytetrafluoroethylene, is a synthetic polymer used in a variety of applications but most notably used in the automobile industry for robust, yet flexible fuel hoses. THV and Teflon provide a more robust molecular structure that impedes the flow of ROG molecules through the fuel hose. A diagram cross-section of a low permeation hose is shown in Figure II-14.

Figure II-14: Low Permeation Marine Fuel Hose



Source: Goodyear Engineered Products

Another low permeating material used in the construction of low permeating fuel hoses is HNBR (hydrogenated nitrile butadiene rubber). HNBR is a special class of NBR that has been hydrogenated to increase saturation of the carbon polymer foundation. This saturation process makes it harder for ROG molecules to permeate through the outer layer. This improvement over NBR includes greater thermal stability, broader chemical resistance, and greater tensile strength.

Staff investigated the types of technology to meet a standard of 5.0 g/m^2/day at 40°C for marine hoses. Currently, fuel hoses used for automobiles and small off-road applications meet or exceed this standard. According to a major marine hose manufacturer, it is possible to get permeation rates below 5.0 g/m^2/day at 40°C using THV or HNBR as a barrier material. Fuel hose manufacturers have informed ARB staff that although it is possible to develop a 5 g/m^2/day at 40°C fuel marine hose, the California market may not be sufficient to support the costs of retooling and development of such a product. Fuel hose manufacturers have stated that a 10 g/m^2/day at 23°C marine fuel hose is commercially available in multiple sizes. Fuel hose manufacturers have also stated that although a 5 g/m^2/day at 40°C fuel hose is technically feasible, it is cost-prohibitive.

In an effort to achieve additional future fuel hose permeation reductions, staff proposes to set an initial 10 g/m^2/day at 23°C fuel hose standard in MY 2018. Staff will then perform an investigation in 2020 to determine the commercial availability of the 5 g/m^2/day at 40°C fuel hose. Beginning in 2020, if the Executive Officer finds that a 5 g/m^2/day at 40°C is commercially available in common sizes, then staff proposes that the new lowered standard be implemented two years after the finding.

e. Diurnal Leakage Emissions Control Technology and Availability

Leakage emissions can contribute to overall diurnal emissions if clamps are not properly secured or fitted.

Emissions from leaks can be controlled by using better clamps than the standard worm gear type clamp commonly used by industry. Worm gear clamps can pinch fuel hoses, release tension over time, and distribute pressure unevenly around a fuel hose. This can lead to increased leakage emissions. Manufacturers of on-road vehicles currently use quick-connect locking fittings and constant tension clamps to meet the current low emissions vehicle evaporative requirements.

Quick-connect fittings and constant tension clamps greatly reduce leakage emissions and are widely available.

4. Test Results for SIMW Retrofitted with Control Technology

ARB staff performed testing to evaluate the effect of various evaporative emissions control technologies on SIMW. SIMW testing involved performing 1-day, 3-day, and 7-day diurnals on uncontrolled and controlled SIMW to evaluate evaporative emissions.

a. Marine Watercraft Diurnal Emissions Results

ARB staff conducted diurnal emissions testing on uncontrolled SIMW with OB engines, inboard engines, PWC, SD/I engines, and jet drive engines to determine evaporative emissions rates. One OB was used to test the effectiveness of evaporative emissions controls. It was first tested in an OEM configuration with a Honda 90 HP outboard carbureted engine in a SHED (Figure II-15). The OB was then incrementally fitted with low permeation hoses, a low permeation fuel tank, a 1.5-liter Delphi carbon canister with marine grade carbon, and a Honda 90 HP fuel injected engine. The results from the controlled testing and the estimated U.S. EPA controlled emissions are compared in Table II-5 and Figure II-16, respectively. Appendix G summarizes all test results. The testing showed that diurnal emissions are significant and reductions are feasible. ARB controlled testing results were obtained from the first day of a 7-day diurnal test performed with California commercial pump fuel containing 6 percent ethanol (E6). Due to resource constraints, repeat testing was not performed. However, additional controlled 7-day diurnal tests were performed with California certification fuel (E0) and with fuel containing 10 percent ethanol (E10). Table II-5 compares the ARB controlled testing to the estimated U.S. EPA controlled emissions for a 2006 Crestliner Sport Angler 1750.

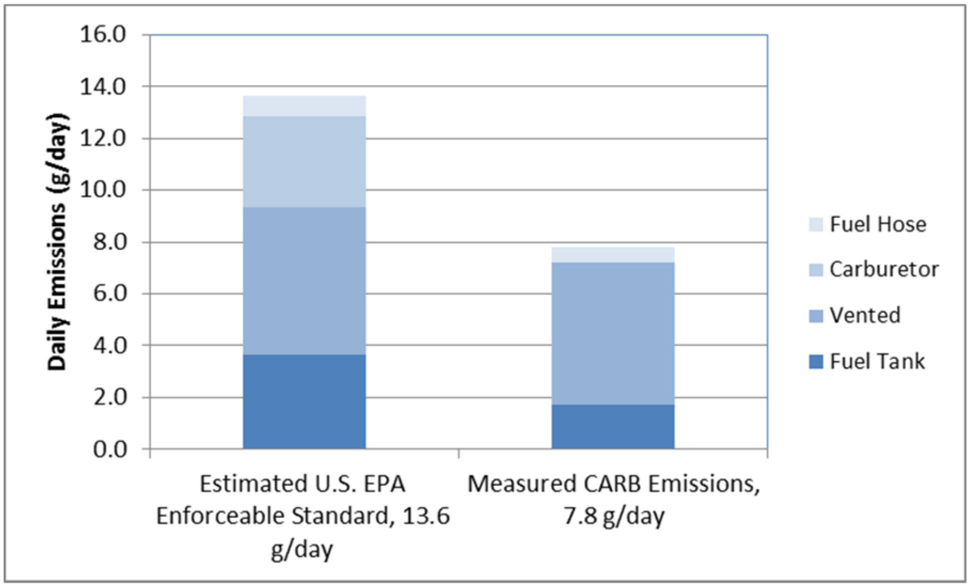
Figure II-15: Outboard Tested in a SHED

Table II-5: Diurnal Emissions for a 1-Day Diurnal for U.S. EPA Controlled and ARB Controlled (Using E6 as a test fuel)

Marine Watercraft	U.S. EPA Estimated Controlled (g/day)	ARB Testing Controlled (g/day)	ARB Controlled Difference (g/day)
2006 Crestliner SportAngler 1750 (33 gallon fuel tank)	13.6	7.8	5.8

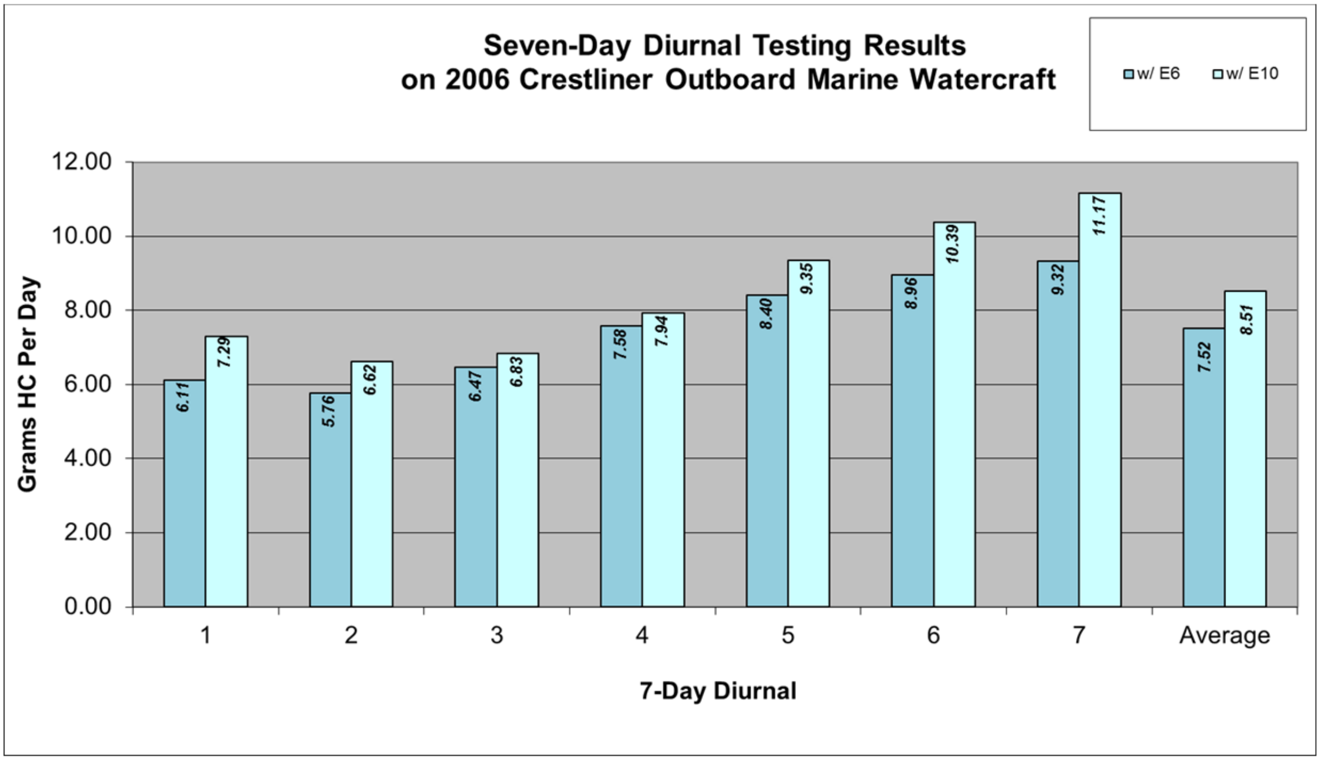
Since measured results for a U.S. EPA controlled evaporative system were not available, staff estimated the evaporative emissions by component using the U.S. EPA standards. A calculation for each component was estimated using the U.S. EPA standards, applying the 2006 Crestliner SportAngler parameters (fuel tank size, fuel hose size, etc.), and then summing all the component emissions to determine the total daily emissions. A breakdown of the diurnal emissions by emissions sources is shown in Figure II-16.

Figure II-16: Breakdown of Diurnal Emissions - Estimated U.S. EPA versus Measured ARB Controlled Emissions (Using E6 as a test fuel)



Staff also performed 7-day diurnal tests to analyze the evaporative emissions over an extended period of time. Since most marine watercraft are stored for long periods of time (Appendix H), staff evaluated the effectiveness of control technology over extended storage periods. The results of the 7-day diurnal tests are shown in Figure II-17. This extended storage period better represents the evaporative emissions of marine watercraft. Figure II-17 also compares results from controlled testing with E6 and E10 fuel. Testing indicates that evaporative emissions are higher with E10 compared to E6 as expected based on a study that evaluated the effect of fuels containing ethanol on evaporative emissions (Haskew, 2010). The average increase in evaporative emissions over the 7-day test period was 13 percent. The increase in evaporative emissions on the fourth and subsequent days is mainly attributable to the decrease in carbon canister capture efficiency when not actively purged. Carbon canisters that are not actively purged only have a long term capture efficiency that ranges between 50 and 65 percent depending on the design. The increase in evaporative emissions is also attributable to the increased permeation through fuel system components with fuel containing ethanol.

Figure II-17: Evaporative Emissions over a 7-Day Diurnal for ARB Controlled Marine Watercraft with E6 and E10



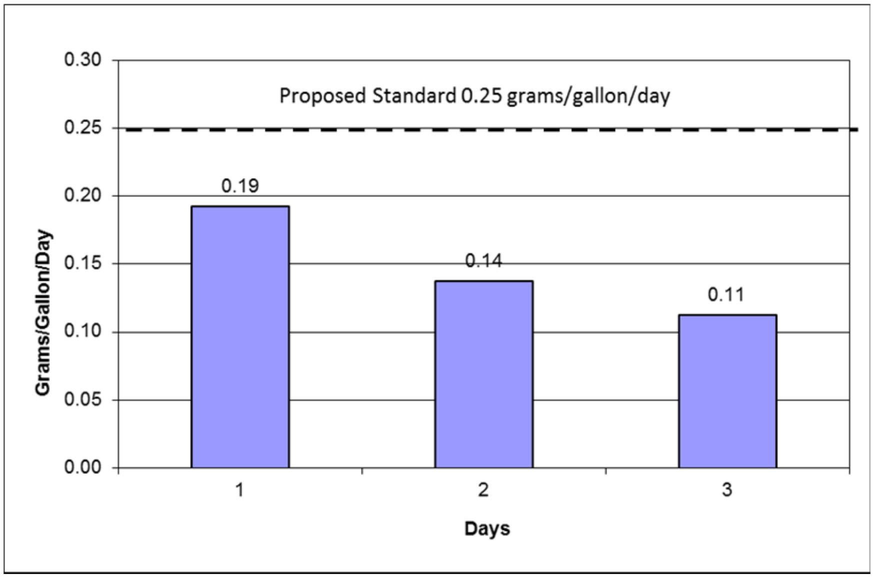
b. Diurnal Venting Test Results

In an effort to harmonize with U.S. EPA test procedures, staff conducted diurnal testing using the U.S. EPA tank venting test procedure (TP) in 40 CFR 1060.525. This SHED-based testing method measures the efficiency of venting control technology on a fuel tank. It is performed over three days with a stabilization period allowed for the carbon canisters. Staff performed the U.S. EPA diurnal venting test with two control technologies, a carbon canister, and a pressure relief valve.

For all diurnal venting tests, staff evaluated evaporative emissions control using California E10 certification fuel (E10 CERT) with a 7 psi RVP. Staff did not use U.S. EPA certification fuel with 9 psi RVP because it does not represent fuel used in California during the peak ozone season. For tests using carbon canister technology as a method of control, a 1.5-liter (L) carbon canister with marine grade carbon was attached to the vent hose of a 33-gallon marine fuel tank.

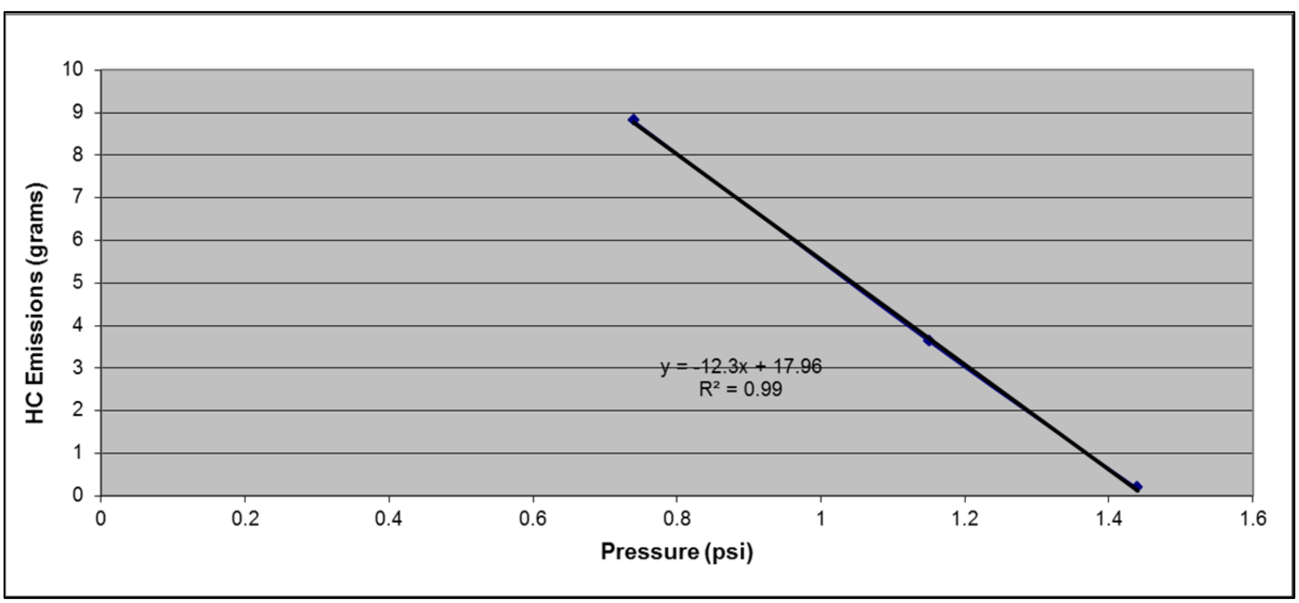
The U.S. EPA diurnal venting TP requires that the highest result of the three days be compared to the standard. For this test, the highest value obtained was 0.19 g/gal/day and shows that the proposed standard of 0.25 g/gal/day is achievable. The test results are shown in Figure II-18.

Figure II-18: Carbon Canister Diurnal Venting Test Results



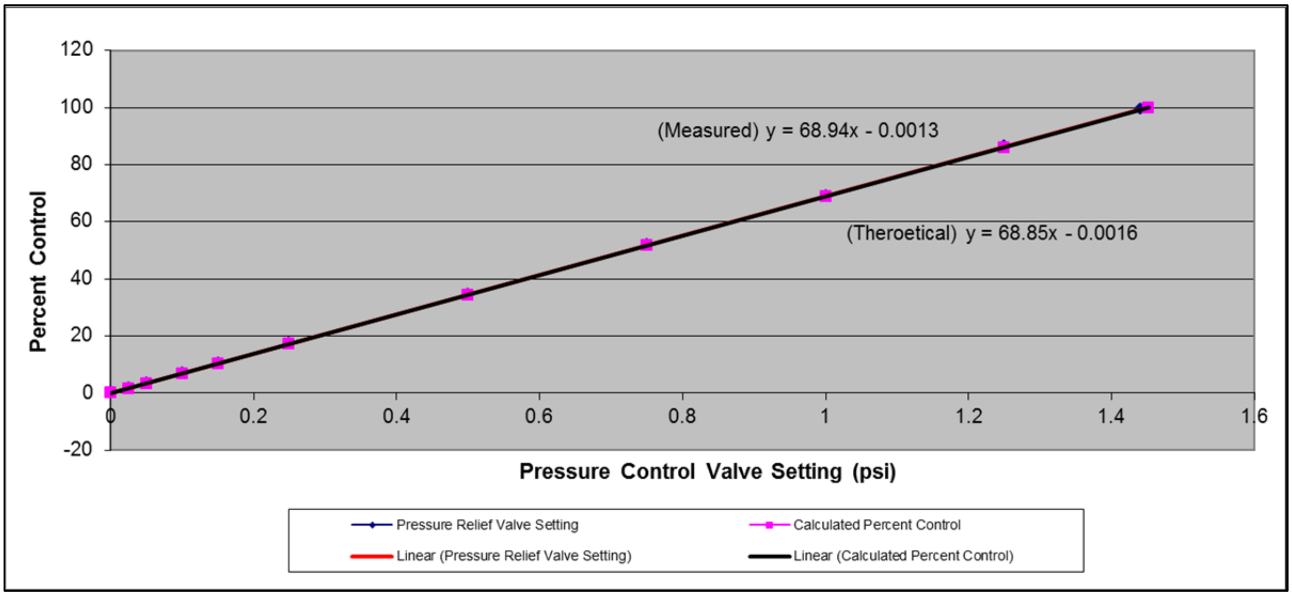
Staff also performed diurnal venting tests using pressure relief valves as an alternate control technology. A 30-gallon metal fuel tank was configured with a variable pressure relief valve and tested at various settings to measure different levels of control efficiency. Figures II-19 and II-20 show the reduction in vented HC emissions for increasing pressure settings. The testing shows that the increase in control is linear with the valve pressure settings.

Figure II-19: Pressure Relief Valve Diurnal Venting Test Results



The testing results shown in Figure II-19 demonstrate the level of emission control as the pressure relief valve setting is adjusted. An increase in the pressure relief valve setting results in more effective control of diurnal vented emissions. Figure II-20 shows the percent control based on the pressure relief valve setting. The figure shows that the values measured in a SHED correlate very well with theoretical calculations using the Reddy equation (Reddy, 2004).

Figure II-20: Theoretical Versus Measured Pressure Relief Valve Control

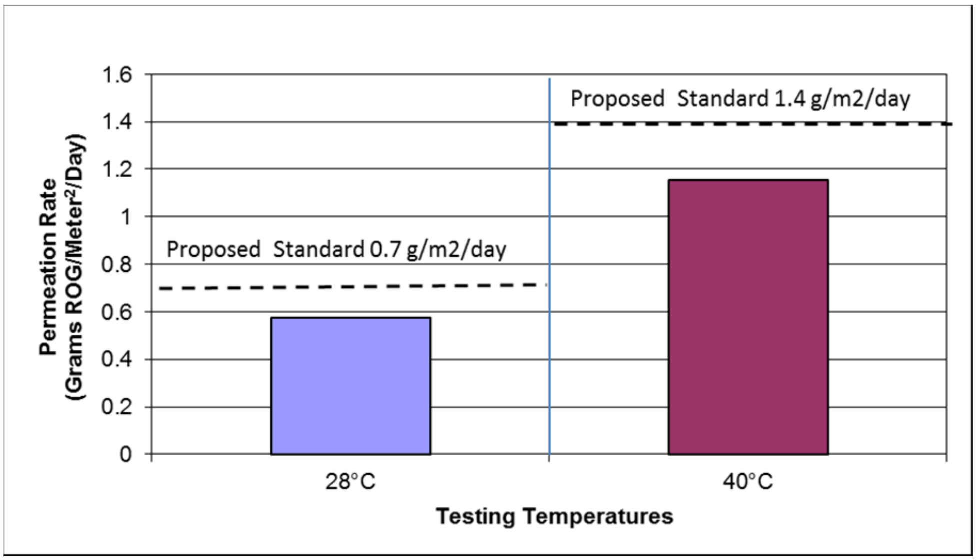


Staff determined that a carbon canister stabilizes at approximately 65 percent control after a period of 4 days during the U.S. EPA diurnal venting test. However, pressure relief valves effectively maintain the same level of control every day. The amount of control can be adjusted according to the setting of the pressure relief valve. Since the U.S. EPA diurnal venting test requires the highest emitting day be compared to the standard for compliance, the overall efficiency is not known because the carbon canister is completely saturated with fuel vapors before the testing begins (as required by the test). Even though the canister will reach 65 percent efficiency, the test does not accurately represent the control over the 3-day period of testing. In the case of a pressure relief valve with a set point of 1 psi, the same level of control is maintained throughout the testing over multiple days. However, this raises concerns due to the potential for tank expansion in confined spaces as a result of the higher continuous pressures. Conceivably, fuel tanks could be redesigned to withstand greater continuous pressures. There are considerable costs associated with redesigning fuel tanks and/or developing new tank molds. Therefore, staff proposes to set a 65 percent control standard for non-canister systems. This ensures that the level of control for venting is equivalent for all types of venting control technologies.

c. Permeation Testing Results

Staff performed a series of permeation tests using a 33-gallon controlled marine fuel tank. The controlled fuel tank was manufactured using a rotational molding process with XLPE and a low permeating material as inner barrier. The permeation test was performed using the U.S. EPA permeation test procedure 40 CFR 1060.520. This is a 14-day permeation test that is performed gravimetrically after the permeation rate has stabilized. For the controlled fuel tank, the preconditioning period was 120 days. In Figure II-21, the daily permeation rates of the 14-day test are presented at different constant temperatures. The average permeation rate for the controlled fuel tank at 40°C was nearly 1.20 $g/m^2/day$. The average permeation rate for the controlled fuel tank at 28°C was approximately 0.60 $g/m^2/day$. Data from this testing show that a standard of 0.70 $g/m^2/day$ at 28°C and 1.4 $g/m^2/day$ at 40°C is achievable for marine fuel tank technology.

Figure II-21: ARB Fuel Tank Permeation Testing

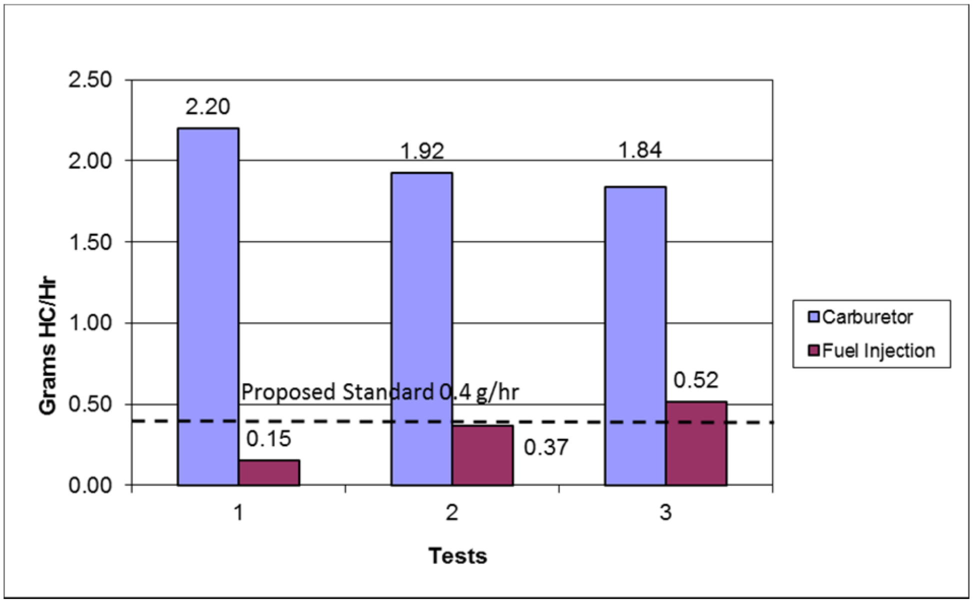


d. Fuel Injection Performance Testing Results

Initially, staff considered a prescriptive requirement for fuel injection. However, in an effort to not exclude carbureted systems with emissions comparable to fuel injection, staff investigated setting a fuel injection performance standard. Staff performed background hot soak tests of a complete engine with the fuel tank and hoses disconnected. Staff conducted three hot soak tests each on a carbureted engine and fuel injected engine. The permeation emissions from background tests were subtracted from the overall result to obtain the hot soak evaporative emissions from both engines.

Figure II-22 compares carbureted and fuel injected 90 horsepower OBs. Test results show that fuel injection reduced carburetor related HC emissions by 82 percent. The average of the 3 test results (0.35 grams HC/hour) supports the proposed standard (0.4 grams HC/hour).

Figure II-22: ARB Fuel Injection Performance Testing



III. SUMMARY OF PROPOSED ACTION

A. SUMMARY OF PROPOSAL

This section discusses staff's proposed requirements for SIMW. The proposed regulation applies to new SIMW with permanently installed fuel tanks manufactured for sale or use in California. It proposes to harmonize requirements with existing U.S. EPA evaporative requirements for SIMW with permanently installed fuel tanks that are less than or equal to 30 kW. The proposed regulation sets more stringent design-based standards for marine watercraft with engines greater than 30 kW to control evaporative emissions from fuel system components. The proposal also sets an optional performance standard for certification. The proposed regulation excludes diesel- and propane-fueled marine engines. As discussed previously, existing technology is currently available to control evaporative emissions from fuel system components.

B. DESIGN REQUIREMENTS FOR EVAPORATIVE EMISSIONS COMPONENTS

Staff is proposing design-based evaporative standards for fuel hoses, fuel tanks, fuel injection and diurnal venting emissions as well as test procedures for determining compliance. Design-based requirements are specific performance levels and/or standards for evaporative emissions control components. Design-based evaporative standards provide manufacturers with the flexibility to comply by installing ARB approved evaporative emissions control components without performing a SHED test. The component approval process is discussed in subsection E. Compliance with design-based standards is determined by measuring emissions following an applicable test procedure.

1. DESIGN STANDARDS (ENGINES ≤ 30 KW)

Staff investigated evaporative emissions control components for all SIMW, including those with engines less than or equal to 30 kW. Staff determined that most SIMW with engines less than or equal to 30 kW are primarily OBs configured with OMTs. Staff decided not to pursue more stringent evaporative standards for this sub category because the Board adopted regulations in September 2008 that control evaporative emissions from OMTs. Staff initially considered more stringent controls for SIMW using engines less than or equal to 30 kW with permanently installed fuel tanks, that included a requirement for fuel injection. However, based on comments received from industry and the National Marine Manufacturers Association (NMMA) costs were found to be prohibitive (Appendix K). As a result, staff is proposing to harmonize with the U.S. EPA standards shown in Table III-1.

Table III-1: Evaporative Emissions Standards for Marine Watercraft with Engines ≤ 30 kW

MY Effective Date	Fuel Hose Permeation (g/m^2/day ROG)	Fuel Tank Permeation (g/m^2/day ROG)	Diurnal Requirement (g/gallon/day HC)
2018 and later	15.0	1.5	0.4
Test Procedure	40 CFR 1060.515	40 CFR 1060.520	40 CFR 1060.525

2. DESIGN STANDARDS (ENGINES > 30 KW)

Staff is proposing more stringent standards for fuel hose and fuel tank permeation, and diurnal tank venting than those adopted by U.S. EPA in 2008 for SIMW with engines greater than 30 kW. In addition, staff is also proposing fuel injection or equivalent requirements. The proposed standards for trailerable marine watercraft using engines greater than 30 kW are shown in Tables III-2 and III-3. The proposed standards for nontrailerable marine watercraft using engines greater than 30 kW are shown in Tables III-4 and III-5.

Table III-2: Evaporative Emissions Standards for Trailerable Marine Watercraft with Engines > 30 kW

Model Year Effective Date	Fuel Hose Permeation[1] (grams/m^2/ day ROG[2a])	Fuel Tank Permeation (grams/m^2/ day ROG[2a])	Meets Fuel Injection Definition or Equivalent Performance Standard (grams HC[2b]/hour)
2018 and 2019	10.0[3]	0.70	0.4
2020 and Later	5.0[3,4]	0.70	0.4
Test Procedure	TP-1504[5] or SAE J1737[5]	TP-1504[5]	TP-1502[6]

Notes

[1] The following fuel hose standards also apply to auxiliary engines on watercraft using > 30 kW spark-ignition marine engines. The fuel hose permeation standards do not apply to under the cowl fuel lines. As an alternative to 40 CFR 1060.515, evaporative emissions control component manufacturers can test following SAE J1737, Test Procedure to Determine the Hydrocarbon Losses from Fuel Tubes, Hoses, Fittings, and Fuel Line Assemblies by Recirculation (Revision: November 2004).

[2a] Reactive Organic Gas (ROG).

[2b] Hydrocarbon (HC).

[3] Starting with MY 2018 and thereafter, if the Executive Officer determines that all of the following criteria are met:

1. That a 5.0 g/m^2/day fuel hose has been certified, and
2. That a certified 5.0 g/m^2/day fuel hose is commercially available in common sizes,

then the fuel hose permeation standard will change to 5.0 g/m^2/day, effective no earlier than MY 2020 or two years after the finding.

[4] Using a test temperature of 40°C. As an alternative to 40 CFR 1060.515, evaporative emissions control component manufacturers can test following SAE J1737, Test Procedure to Determine the Hydrocarbon Losses from Fuel Tubes, Hoses, Fittings, and Fuel Line Assemblies by Recirculation (Revision: November 2004).

[5] Using a test fuel of either E10 CERT or CE 10. As an alternative for fuel tank testing, evaporative emissions control component manufacturers can certify at 1.4 grams/m^2/day at 40^oC.

[6] Using E10 CERT fuel.

Table III-3: Evaporative Emissions Diurnal Requirements for Trailerable > 30 kW

Model Year Effective Date	Diurnal Requirement				
	Canister			Non-Canister[2]	
	Performance (grams/gallon /day HC[1])	Design (Minimum Working Capacity)		General	Pressure Relief Valve (kPa)
		Canister (g/gal)[3]	Carbon (g/l)[4]		Minimum
2018 and later	0.25	3.8	94	65 percent reduction from uncontrolled HC emissions	7.35
Test Procedure	TP-1503[5]	TP-902[6] Attachment 1	ASTM D5228-92[7]	TP-1503[5]	TP-1505

Notes

1 Hydrocarbon (HC).

2 For non-canister vented systems, a venting control efficiency standard of 65 percent must be met. To determine the venting control efficiency, a venting control test must be performed following 40 CFR 1060.525 (or TP-1503, if applicable) with E10 CERT fuel and then compared against an identical uncontrolled venting test. Alternatively, an estimated uncontrolled venting value can be calculated using the fuel tank vapor generation equation (6) in SAE Technical Paper 892089, Prediction of Fuel Vapor Generation From a Vehicle Fuel Tank as a Function of Fuel RVP and Temperature (Reddy, 2004). A marine watercraft using a sealed evaporative control system to a positive pressure of at least 7.35kPa (1.05PSI) will be deemed compliant with the 65 percent HC reduction requirement. The pressure relief valve must also be tested and pass TP-1505 durability requirements.

3 Grams of vapor storage capacity per gallon of nominal fuel tank capacity.

4 Grams per liter of carbon working capacity with minimum carbon volume of 0.040 liters per gallon of nominal fuel tank capacity. The carbon canister must have a minimum effective length-to-diameter ratio of 3.5 and the vapor flow must be directed with the intent of using the whole carbon bed.

5 Using E10 CERT fuel.

6 ARB, 2004.

7 ASTM D5228-92(2010), Standard Test Method for Determination of Butane Working Capacity of Activated Carbon, ASTM International, West Conshohocken, PA, 2010.

Table III-4: Evaporative Emissions Standards for Nontrailerable Marine Watercraft with Engines > 30 kW

Model Year Effective Date	Fuel Hose Permeation[1] (grams/m^2/ day ROG[2a])	Fuel Tank Permeation (grams/m^2/ day ROG[2a])	Meets Fuel Injection Definition or Equivalent Performance Standard (grams HC[2b]/hour)
2018 and 2019	10.0[3]	0.70	0.4
2020 and Later	5.0[3,4]	0.70	0.4
Test Procedure	TP-1504[5] or SAE J1737[5]	TP-1504[5]	TP-1502[6]

Notes

[1] The following fuel hose standards also apply to auxiliary engines on watercraft using > 30 kW spark-ignition marine engines. The fuel hose permeation standards do not apply to under the cowl fuel lines. As an alternative to 40 CFR 1060.515, evaporative emissions control component manufacturers can test following SAE J1737, Test Procedure to Determine the Hydrocarbon Losses from Fuel Tubes, Hoses, Fittings, and Fuel Line Assemblies by Recirculation (Revision: November 2004).

[2a] Reactive Organic Gas (ROG).

[2b] Hydrocarbon (HC).

[3] Starting with MY 2018 and thereafter, if the Executive Officer determines that all of the following criteria are met:

1. That a 5.0 g/m^2/day fuel hose has been certified, and
2. That a certified 5.0 g/m^2/day fuel hose is commercially available in common sizes,

then the fuel hose permeation standard will change to 5.0 g/m^2/day, effective no earlier than MY 2020 or two years after the finding.

[4] Using a test temperature of 40°C. As an alternative to 40 CFR 1060.515, evaporative emissions control component manufacturers can test following SAE J1737, Test Procedure to Determine the Hydrocarbon Losses from Fuel Tubes, Hoses, Fittings, and Fuel Line Assemblies by Recirculation (Revision: November 2004).

[5] Using a test fuel of either E10 CERT or CE 10. As an alternative for fuel tank testing, evaporative emissions control component manufacturers can certify at 1.4 grams/m^2/day at 40^0 C.

[6] Using E10 CERT fuel.

Table III-5: Evaporative Emissions Diurnal Requirements for Nontrailerable with Engines > 30 kW

Model Year Effective Date	Diurnal Requirement				
	Canister			Non-Canister[2]	
	Performance (grams/gallon /day HC[1])	Design (Minimum Working Capacity)		General	Pressure Relief Valve (kPa)
		Canister (g/gal)[3]	Carbon (g/l)[4]		Minimum
2018 and later	0.16	1.5	94	65 percent reduction from uncontrolled HC emissions	7.35
Test Procedure	TP-1503[5]	TP-902[6] Attachment 1	ASTM D5228-92[7]	TP-1503[8]	TP-1505

Notes

1 Hydrocarbon (HC).

2 For non-canister vented systems, a venting control efficiency standard of 65 percent must be met. To determine the venting control efficiency, a venting control test must be performed following 40 CFR 1060.525 (or TP-1503, if applicable) with E10 CERT fuel and then compared against an identical uncontrolled venting test. Alternatively, an estimated uncontrolled venting value can be calculated using the fuel tank vapor generation equation (6) in SAE Technical Paper 892089, Prediction of Fuel Vapor Generation From a Vehicle Fuel Tank as a Function of Fuel RVP and Temperature (Reddy, 1989). A marine watercraft using a sealed evaporative control system to a positive pressure of at least 7.35kPa (1.05PSI) will be deemed compliant with the 65 percent HC reduction requirement. The pressure relief valve must also be tested and pass TP-1505 durability requirements.

3 Grams of vapor storage capacity per gallon of nominal fuel tank capacity.

4 Grams per liter of carbon working capacity with minimum carbon volume of 0.016 liters per gallon of nominal fuel tank capacity. The carbon canister must have a minimum effective length-to-diameter ratio of 3.5 and the vapor flow must be directed with the intent of using the whole carbon bed.

5 Using U.S. EPA certification gasoline with 9 RVP.

6 ARB, 2004.

7 ASTM D5228-92(2010), Standard Test Method for Determination of Butane Working Capacity of Activated Carbon, ASTM International, West Conshohocken, PA, 2010.

8 Using E10 CERT fuel.

3. DESIGN REQUIREMENTS – TEST PROCEDURES

SIMW manufacturers certifying to the proposed design-based standards will be required to use the test procedures noted in this section. Evaporative emissions control components used on MY 2018 and later SIMW that use engines less than or equal to 30 kW must be tested using the U.S. EPA test procedures as specified in 40 CFR Part 1060. For MY 2018 and later, SIMW that use engines greater than 30 kW, emissions from fuel system components must be measured with the applicable test procedures in subsections a through e.

a. Fuel Injection Equivalent Performance

Marine engine evaporative hot soak performance must be measured according to ARB TP-1502, *Test Procedure for Determining Hot Soak Evaporative Emissions from Spark-Ignition Marine Engines*, which is included in Appendix C.

b. Diurnal Requirement

Vented evaporative emissions must be measured according to ARB TP-1503, *Test Procedure for Determining Diurnal Vented Emissions from Installed Marine Fuel Tanks*, which is included in Appendix D.

c. Fuel Hose Permeation

Fuel hose permeation must be measured according to SAE J1737 or ARB TP-1504, *Test Procedure for Determining Permeation Emissions from Installed Marine Fuel Tanks, Marine Fuel Hoses and Marine Fuel Caps*, which is included in Appendix E. SAE J1737 is an option because it allows very low permeation rates to be accurately measured.

d. Fuel Tank Permeation

Fuel tank permeation must be measured according to ARB TP-1504, *Test Procedure for Determining Permeation Emissions from Installed Marine Fuel Tanks*, Marine Fuel Hoses and Marine Fuel Caps, which is included in Appendix E.

e. Pressure Relief Valve Performance

Pressure relief valves must be tested according to ARB TP-1505, *Test Procedure for Determining Pressure Relief Valve Performance*, which is included in Appendix F.

C. ALTERNATIVE PERFORMANCE REQUIREMENTS

Manufacturers of SIMW can elect to certify to a performance standard as an alternative to the design-based certification. Performance-based certification requires that a complete SIMW, or SIMW fuel system, be tested in a SHED for one 24-hour diurnal period following a California summer temperature profile (65ºF – 105ºF – 65ºF). The result of the one day test will be compared to the corresponding performance standard based on fuel tank volume.

1. ALTERNATIVE PERFORMANCE STANDARD

The diurnal emissions performance standard is shown in Table III-6.

Table III-6: Alternative Evaporative Emissions Performance Standard for Marine Watercraft with Engines > 30 kW

Marine Watercraft Type	MY Effective Date	Diurnal Standard (grams HC/day)
All Marine Watercraft With Engines > 30 kW	2018	0.048 * Tank Volume (liters) + 0.97
	Test Procedure	TP-1501[1]

[1] Using E10 CERT fuel.

2. ALTERNATIVE PERFORMANCE REQUIREMENTS - TEST PROCEDURE

All SIMW manufacturers certifying to the proposed performance standard will be required to use TP-1501, Test Procedure for Determining Diurnal Evaporative Emissions from Spark-ignition Marine Watercraft. ARB TP-1501 is included in Appendix B.

D. COMPARISON OF ARB AND U.S. EPA STANDARDS

On October 8, 2008, U.S. EPA adopted Part 1060 – Control of Evaporative Emissions from New and In-use Nonroad and Stationary Equipment in title 40 of the Code of Federal Regulations. The federal rule controls evaporative emissions from SIMW by setting emissions standards for specific fuel system components. Consequently, SIMW manufacturers must install low permeation fuel hoses and fuel tanks, and meet a venting loss control standard to reduce evaporative emissions from SIMW fuel systems.

Based on SIMW test data generated by ARB, staff has determined that further emissions reductions than those obtained from U.S. EPA controls are achievable at a cost-effective level as discussed in Section VII.C. The proposed ARB regulation sets more stringent standards for marine watercraft with engines greater than 30 kW that will effectively reduce ROG emissions. The proposed regulation will rely on component certification to ensure that fuel hoses, fuel tanks, and venting controls meet the design standards. However, for nontrailerable marine watercraft, the diurnal requirement and test fuel will be harmonized with the U.S. EPA regulation. The ARB regulation also sets an optional performance-based standard whereby the entire fuel system, or SIMW, can be tested and certified. In addition to the more stringent component standards, the ARB regulation requires that SIMW designed to use engines greater than 30 kW meet a fuel injection requirement or an engine hot soak performance standard. Table III-7 compares the U.S. EPA adopted standards and the ARB proposed standards.

Table III-7: U.S. EPA Adopted Rule versus ARB Proposed Regulation for Trailerable and Nontrailerable Standards for Marine Watercraft with Engines > 30 kW

Standard	U.S. EPA Adopted Rule		ARB Proposed Regulation	
	Trailerable	Nontrailerable	Trailerable	Nontrailerable
Fuel Hose Standard	15 $g/m^2/day$ at 23°C		10 $g/m^2/day$ at 23°C (MY 2018)[1] 5 $g/m^2/day$ at 40°C (MY 2020)[1,2]	
Fuel Tank Standard	1.5 $g/m^2/day$ at 28°C or 2.5 $g/m^2/day$ at 40°C		0.70 $g/m^2/day$ at 28°C[2]	
Diurnal Standard	0.4 g/gal/day[3]	0.16 g/gal/day[3]	0.25 g/gal/day[4]	0.16 g/gal/day[3]
Fuel Injection Definition or Equivalent Engine Performance Standard	None		0.4 g/hr[4]	
Alternate Performance Standard	None		0.048 * Tank Volume (liters) + 0.97[4]	

[1] Using California E10 certification fuel with 7 RVP (E10 CERT) or ASTM Fuel C with 10 percent ethanol (CE10).

[2] Starting MY 2018 and thereafter, if the Executive Officer finds that all of the following criteria are met:

1. 5.0 $g/m^2/day$ fuel hose has been certified.
2. A certified 5.0 $g/m^2/day$ fuel hose is commercially available in common sizes,

then the fuel hose permeation standard will change to 5.0 $g/m^2/day$, effective no earlier than MY 2018 or two years after the finding. The 5.0 $g/m^2/day$ standard will not apply to high performance marine watercraft using a fuel hose with an inside diameter of larger than 0.5 inch, which are the common sizes found on spark-ignition marine watercraft.

[3] Using U.S. EPA gasoline with 9 RVP.

[4] Using E10 CERT fuel.

In general, staff's proposal sets more stringent standards and requires fuel injection on marine engines greater than 30 kW. Low emitting fuel systems with the evaporative emissions characteristics are allowed as an alternative certification option. Staff also proposes to lower the fuel hose permeation standard to 5.0 $g/m^2/day$ at 40°C, effective no earlier than MY 2020, if the Executive Officer makes a finding of commercial availability.

E. GENERAL EVAPORATIVE EMISSIONS CERTIFICATION REQUIREMENTS

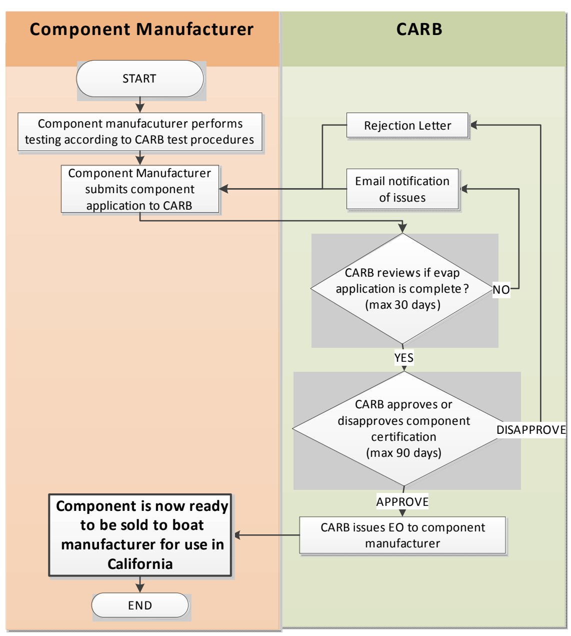
This section describes the process for certification of evaporative emissions control components and SIMW.

1. EVAPORATIVE EMISSIONS CONTROL COMPONENT CERTIFICATION

Manufacturers of evaporative emissions control components can obtain a Component Executive Order of Certification by having ARB certify their evaporative emissions control component. ARB has successfully implemented a similar evaporative emissions control component certification program for small off-road engines (SORE). Many evaporative emissions control component manufacturers are already familiar with ARB's component certification programs.

In order to certify an evaporative emissions control component a manufacturer must demonstrate by testing that it meets the applicable design standard. The evaporative emissions control component application must be submitted to the Monitoring and Laboratory Division of ARB for review. If approved, the Executive Officer will issue a Component Executive Order of Certification number for the evaporative emissions control component. The Component Executive Order of Certification number can then be referenced in an Executive Order of Certification application for a SIMW as described in the next subsection. The evaporative emissions component certification process is shown in Figure III-1.

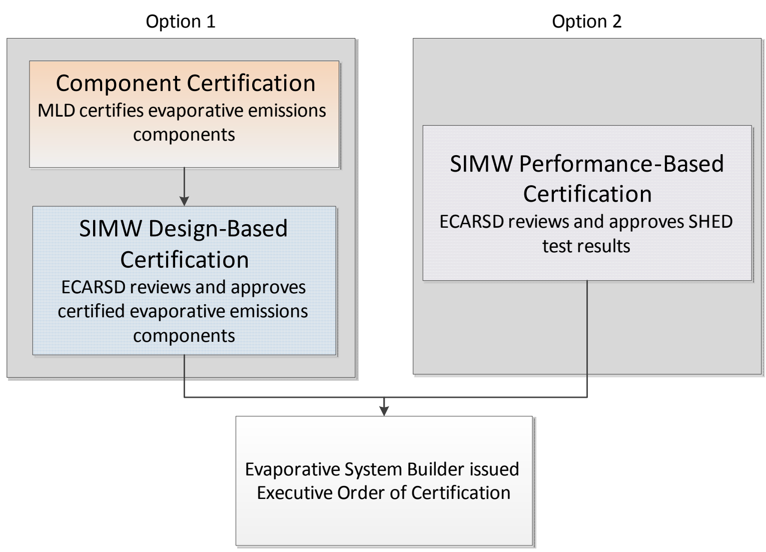
Figure III-1: ARB Evaporative Emissions Component Certification Process



2. SIMW CERTIFICATION

Beginning with MY 2018, the proposed regulation requires that evaporative emissions control systems on SIMW be certified and issued an Executive Order of Certification prior to the marine watercraft being offered for sale or sold in California. Evaporative system builders (SIMW manufacturers, boat builders, dealers, fuel system manufacturers, etc.) have two options for SIMW certification. Evaporative system builders can certify to a design-based option or alternatively, using a performance-based option (Figure III-2). Under option one, the process begins with ARB making available lists of approved evaporative emissions components. An evaporative system builder then references the approved components in their design-based certification application. Under option two, an evaporative system builder conducts testing to verify compliance with the applicable performance standard and supplies ARB with the test results in their certification application. The two options are described in the next two subsections.

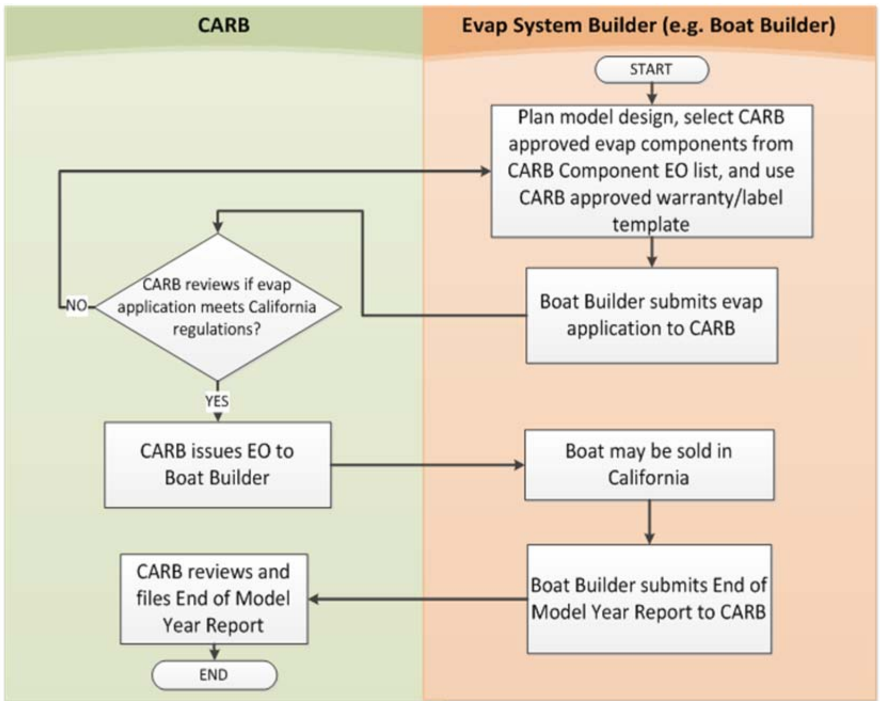
Figure III-2: Simplified SIMW Evaporative Emissions Certification Flowchart



a. Design-Based Certification Option

The design-based certification option entails an evaporative system builder applying for an Executive Order of Certification using the Component Executive Order numbers for ARB-approved evaporative emissions control components for fuel hose permeation, fuel tank permeation, and diurnal venting control. This option does not require testing the SIMW in a SHED, which is expensive and can't be performed for large SIMW. Staff expects that design-based certification will be the preferred option for evaporative system builders. An authorized SIMW representative must submit a certification application that includes all the approved Component Executive Order of Certification numbers and other relevant boat specifications for each evaporative family to the Emissions Compliance, Automotive Regulations and Science Division (ECARS) for review. If the application is deemed complete, the application will be approved or disapproved by the Executive Officer within 90 days. If approved, the Executive Officer will issue an Executive Order of Certification making the evaporative system legal for sale and use in California. The flowchart for the SIMW design-based certification process is shown in Figure III-3.

Figure III-3: Streamlined Design-Based SIMW Evaporative Emissions Certification Process

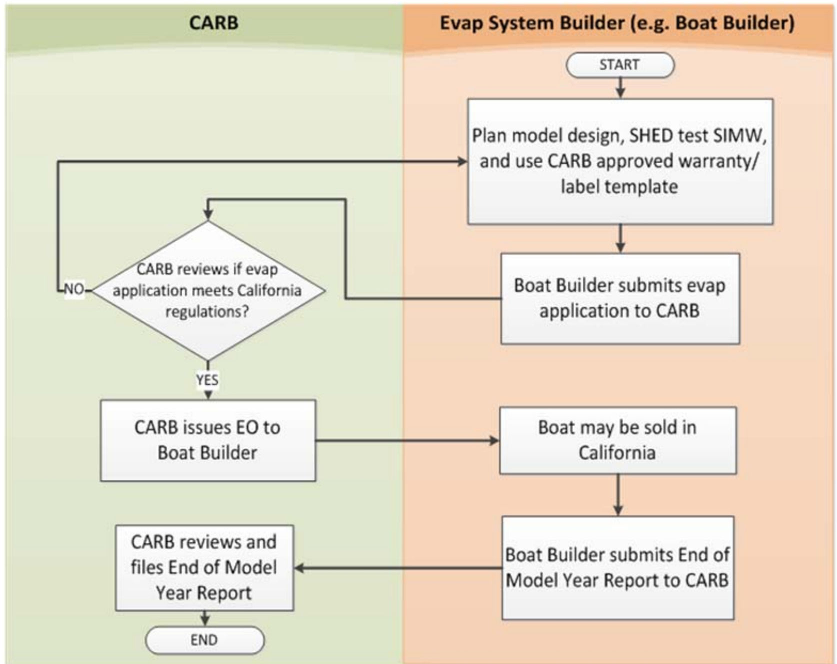


b. Performance-Based Certification Option

The performance-based certification option entails an evaporative system builder applying for an Executive Order of Certification (EO) using the data from a SHED test that measures compliance with proposed diurnal evaporative emissions performance standard.

Evaporative system builders certifying to the alternative performance standard must submit a certification application to ECARS Division that includes the test results showing compliance and other relevant boat specifications. If the application is deemed complete, the application will be approved or disapproved by the Executive Officer within 90 days. If approved, the Executive Officer will issue an EO. The flowchart for the SIMW performance-based certification process is shown in Figure III-4.

Figure III-4: Streamlined Performance-Based SIMW Evaporative Emissions Certification Process



F. EVALUATION OF PROGRAM EFFECTIVENESS

An important aspect for a successful emissions reduction program is to evaluate its effectiveness after implementation. To ensure overall emissions reductions and SIP goals are met, ARB will evaluate the SIMW evaporative program effectiveness. The evaluation will measure diurnal evaporative emissions on MY 2018 and later SIMW that have been certified to meet California's design and performance requirements. The testing will quantify the actual diurnal evaporative emissions from representative SIMW in a SHED. In addition to measuring diurnal evaporative emissions on SIMW, ARB will also test new randomly selected certified evaporative emissions system components for compliance with the design-based standards. The measurement results will help to determine if regulatory amendments are needed.

G. EMISSIONS RELATED DEFECTS REPORTING AND RECALL

Staff proposes a requirement that manufacturers must report to ARB the emission-related defects affecting a given class or category of SIMW. A manufacturer must file a defect information report whenever the manufacturer determines an emissions performance defect exists as defined in section 2861 of the proposed regulation (Appendix A). A manufacturer must report the defect if it exists in 10 percent of production, or 20 or more SIMW (whichever is less) of a given family covered by the same EO. This requirement only applies to the evaporative emissions components specified in the proposed regulation.

H. AFTERMARKET RETROFIT DETERRENCE

Staff proposes that the sale or installation of any aftermarket evaporative emissions parts which alters or modifies the original design or performance of the certified evaporative system be prohibited. The proposed requirements pertaining to aftermarket parts can be found in Appendix A.

I. EXHAUST APPLICABILITY UPDATE

Staff proposes to update the date of applicability for the revised Voluntary Standards in California Code of Regulations, title 13, section2442 (d) such that the proposed changes correspond only to future model year engine families beginning with MY 2015 (Appendix A1). This is necessary to prevent the possibility of a retroactive interpretation of requirements regarding prior model year engine families.

Staff proposes to modify California Code of Regulations, title 13, section 2442 (d)(1) in order to clarify that engine manufacturers are solely responsible for certifying engines to the voluntary five-star standards, which include compliance with permeation and diurnal control requirements. This is not a change to the existing provision and is consistent with requirements for manufacturers certifying to the mandatory four-star standards.

Staff proposes the addition of three additional footnotes to "Table 3 - Voluntary Standards," in California Code of Regulations, title 13, section 2442, to narrow the applicability of specific evaporative emission control requirements. As currently written, Table 3 requires all spark-ignition marine engines to meet canister-based evaporative emission control requirements in order to be certified to the voluntary five-star standard, even though the mandatory three- and four-star requirements require canisters only on SIMW equipped with high-performance engines. When this provision was originally adopted, staff believed that canister-based evaporative emissions controls would be implemented statewide on virtually all SIMW prior to any manufacturer attempting to certify to the voluntary five-star standard. Therefore, the requirements for certifying to the five-star standard were inherently associated with using canister-based evaporative emissions controls because staff wanted only the cleanest SIMW, with respect to both exhaust and evaporative emissions, to be labeled as five-star compliant. However, the unexpected delay in implementing canister-based evaporative emissions controls resulted in at least one manufacturer not being granted a five-star certification. Even though the manufacturer met the necessary exhaust requirements, the manufacturer couldn't guarantee that their standard performance sterndrive/inboard engines would be installed in SIMW equipped with canister-based evaporative emissions controls.

Consequently, staff proposes new footnotes 5 and 6 to relax the requirement for canister-based evaporative emission controls from all but those SIMW installed with high-performance engines, and to restrict the requirement for low-permeation fuel lines to standard- and high-performance sterndrive/inboard engines only. In doing so, engine manufacturers will no longer be required to ensure that their five-star engines are installed in SIMW over which they do not have direct or indirect control. Additionally, footnote 7 is proposed to harmonize future evaporative emission control requirements between SIME and SIMW manufacturers should the provisions of Article 4, chapter 15, division 3, title 13, California Code of Regulations, be approved by the Board as recommended by staff in this rulemaking.

IV. AIR QUALITY BENEFITS

A. ROG EMISSIONS REDUCTIONS AND ENFORCEMENT

The primary air quality benefit associated with the regulatory proposal is the reduction in ambient ozone concentrations achieved by reducing emissions of ROG from SIMW. Quantification of these benefits is supported by extensive emissions inventory modeling (Appendix J). The modeling reflects an updated population and vehicle life of SIMW based on DMV registration data (DMV, 2013), updated activity factors derived from a California-based SIMW user survey (Appendix H), revised growth assumptions based on projected housing starts from the UCLA Economic Forecast (UCLA, 2014), technology trends such as the shift from carburetor to fuel injection delivery systems, and empirical evaporative emissions factors adjusted for a variety of influences, such as spatial allocation.

The ROG emissions reductions achieved through this proposal will help fulfill commitments associated with the 2007 SIP. They are necessary to meet the 8-hour ozone standard in California's two extreme non-attainment areas, namely the South Coast and the San Joaquin Valley Air Basins.

Enforcement is crucial to realize the benefits of the federal and proposed State evaporative emissions standards. Adoption of the proposal allows ARB to enforce federal and State emissions standards. In 2037, ARB enforcement of the U.S. EPA marine rule, combined with enforcement of the more stringent ARB standards, will reduce evaporative emissions by 1.31 tons per day (TPD) in SJVAPCD and 1.89 TPD in SCAQMD. ROG emissions reductions associated with the proposed regulation are necessary, in whole or in part, for attainment of the 8-hour federal ozone standard for Ventura, Sacramento, and other areas downwind of major urban centers.

B. CLIMATE CHANGE CONSIDERATIONS

Although the focus of the proposed SIMW evaporative emissions regulations is a reduction in ambient concentrations of ground level ozone, they will also help to reduce emissions of climate change pollutants in California.

1. GREENHOUSE GAS REDUCTIONS

Greenhouse gas emissions reductions could result from improved engine efficiency and reduced in-use fuel consumption associated with the wider use of fuel injection technology. Manufacturers are expected to comply with the proposed regulation by shifting from carburetor to fuel injection technology. Since fuel injection engines tend to be substantially more fuel-efficient, the shift away from carburetor technology could yield substantial benefits in terms of reduced fuel consumption, and therefore, emissions of carbon dioxide.

2. INDIRECT WARMING IMPACTS

This regulatory proposal is also expected to exert small, indirect climate change impacts through its effects on climate forcing pollutants in the atmosphere. Since ROG emitted into the atmosphere is oxidized within a relatively short timeframe, it exerts substantial climate impacts through its effects on atmospheric chemistry (Collins et al., pp.453-476). These indirect impacts are mediated through changes in the concentrations of tropospheric ozone and methane. For example, curtailment of tropospheric ozone associated with ROG emissions reductions is a climate benefit, because tropospheric ozone is currently associated with radiative forcing of approximately 0.39 Watts per square meter, W/m^2 (Shindell et al., 2005). Similarly, ROG perturbs atmospheric chemistry such that methane has a longer atmospheric lifetime. Since methane is the second most important of the relatively long-lived greenhouse gases tabulated by the Intergovernmental Panel on Climate Change (Section 2.3.2) in terms of radiative forcing, averting ROG emissions and the associated impacts on methane's atmospheric lifetime constitute a climate benefit.

C. REDUCTION OF EXPOSURE TO TOXIC EMISSIONS

One of the expected co-benefits of the proposed regulation is reduced exposure to toxic air pollutants, specifically benzene, which makes up about one percent of current blends of gasoline. More than 80 percent of the evaporative emissions from the current fleet of SIMW in California are emitted during diurnal processes, when SIMW are stored. Oftentimes, SIMW are stored for periods of a week or more (Appendix H). SIMW equipped with evaporative emissions controls compliant with the proposed emissions standards will reduce not only ROG emissions, but also benzene emissions.

V. ENVIRONMENTAL ANALYSIS

A. INTRODUCTION

This chapter provides the basis for ARB's determination that the proposed regulation is exempt from the requirements of CEQA. A brief explanation of this determination is provided in subsection B. ARB's regulatory program, which involves the adoption, approval, amendment, or repeal of standards, rules, regulations, or plans for the protection and enhancement of the State's ambient air quality, has been certified by the California Secretary for Natural Resources under Public Resources Code section 21080.5 of the California Environmental Quality Act (CEQA) (Cal. Code Regs., tit. 14, § 15251(d)). Public agencies with certified regulatory programs are exempt from certain CEQA requirements, including but not limited to, performing initial studies, and preparing environmental impact reports and negative declarations. ARB, as a lead agency, prepares a substitute environmental document (referred to as an "Environmental Analysis" or "EA") as part of the Staff Report prepared for a proposed action to comply with CEQA (Cal. Code Regs., tit. 17, §§ 60000-60008). If the regulation is finalized, a Notice of Exemption will be filed with the Office of the Secretary for the Natural Resources Agency and the State Clearinghouse for public inspection.

B. ANALYSIS

ARB has determined that the proposed regulation is categorically exempt from CEQA under the "Class 8" exemption (Cal. Code Regs., tit. 14, § 15308) because it is an action taken by a regulatory agency for the protection of the environment. The proposed regulation will harmonize with existing U.S. EPA evaporative emissions requirements for SIMWs with permanently installed fuel tanks that are less than 30 kW. The proposed regulation will set more stringent design-based standards for SIMW with engines greater than or equal to 30 kW to control evaporative emissions from fuel system components. The proposal also sets an optional performance standard for certification. All of the proposed standards are easily met by incorporating currently available technologies during marine watercraft construction. These standards are designed to improve air quality as discussed in Section IV. The proposed action is designed to protect the environment, and ARB has determined there is no substantial evidence indicating the proposal could adversely affect air quality or any other environmental resource area, or that any of the exceptions to the exemption applies (Cal. Code Regs., tit. 14, §15300.2); therefore, this activity is exempt from CEQA.

VI. ENVIRONMENTAL JUSTICE

California Government Code section 65040.12(e) defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation and enforcement of environmental laws, regulations, and policies. ARB is committed to supporting the achievement of environmental justice. In 2001, the Board adopted a framework for incorporating environmental justice into ARB's programs consistent with the directives of State law (ARB, 2001). Although ARB's environmental justice policies apply to all communities in California, they recognize that environmental justice issues have been raised more often in the context of low-income and minority communities.

As a result of ARB's work with the public, the business sector, local government, and air districts, California's ambient air is the cleanest since air quality measurements have been recorded (ARB, 2013). However, large numbers of Californians live in areas that continue to experience episodes of unhealthy concentrations of ground level ozone.

The proposed rulemaking is designed to achieve ROG emissions reductions in support of attainment of the federal 8-hour ozone standard. In particular, the proposed rulemaking supports attainment in the only two areas nationwide whose nonattainment status has been classified as "extreme," namely the South Coast and the San Joaquin Valley Air

Basins. Both areas have strong environmental justice groups that have lobbied ARB to take aggressive action in pursuit of ozone attainment to ease air quality-related health burdens on their communities. The air quality impacts of this regulatory proposal promote environmental justice by improving California's air quality in areas that are simultaneously the most adversely affected with respect to ground level ozone and home to many minority and low-income groups.

VII. ECONOMIC IMPACTS

In this section, staff assesses the economic impacts from the proposed regulation on SIMW and engine manufacturers, evaporative emissions control component manufacturers, distributors, dealers, and California consumers. Staff evaluated cost information supplied by evaporative emissions control component manufacturers, SIMW manufacturers, and U.S. EPA to determine the economic impact of the proposed regulation.

The SIMW manufacturing industry as a whole (inclusive of parts and material manufacturers, dealers, and distributors) has contracted due to the national economic recession. Industry representatives report that in 2009 new SIMW sales dropped from 2008 levels by 33 percent nationally and by 52 percent in California (NMMA, 2009). Combined data from the 2008 and 2009 DMV Registration Database (DMV, 2009) confirmed this drop in new SIMW sales in California for 2009. However, recent industry reports indicate that SIMW sales are slowly on the rise and have hit a five-year high since 2008 for traditional powerboats in 2013 (NMMA, 2013).

The proposed regulation is not expected to impose an unreasonable cost burden on SIMW manufacturers. With the U.S. EPA rule fully implemented in 2012, the SIMW industry has already retooled to meet U.S. EPA evaporative emissions standards. Therefore, staff expects no additional retooling to meet the ARB proposed standards and anticipates that the performance of the economy and consumer preferences, not the increased cost of evaporative emissions control for this regulation, will be the primary factor affecting new SIMW sales.

For the cost analysis of evaporative emissions controls, staff estimated the incremental retail price increase due to the cost of proposed ARB evaporative emissions controls relative to the current cost for U.S. EPA controls. The cost-effectiveness of the proposed regulation was then calculated by estimating the retail price increase over the life of the regulation and comparing these values to the proposed regulation's emissions benefits (beyond those achieved by the U.S. EPA regulations) over the same period.

The total average estimated retail price increase for ARB evaporative emissions controls is $39 per marine watercraft (Table VII-1). The total lifetime cost of the proposed regulation is expected to be about $8.3 million (Table VII-4). The cost of the proposed regulation is expected to be passed on to consumers, resulting in a

0.2 percent average retail price increase for purchasing a new SIMW with an engine greater than 30 kW beginning in MY 2018 (Table VII-5).

Also in this section, staff evaluates the proposed regulation's potential economic impact on the economy of the State and affected businesses. Economic impacts are quantified to the extent feasible, but some projections are qualitative, based on facts known about the industry or on industry reports. Staff expects the proposed regulations to impose no significant adverse impacts on California competitiveness, employment, and business status.

A. LEGAL REQUIREMENTS

Section 11346.3 of the Government Code requires State agencies to assess the potential for adverse economic impacts on California business enterprises and individuals when proposing to adopt or amend any administrative regulations. The assessment must include a consideration of the impact of the proposed regulations on California jobs, business expansion, elimination or creation of businesses, and the ability of California business to compete.

Also, section 11346.5 of the Government Code requires State agencies to estimate the cost or savings to any State, local agency and school district in accordance with instructions adopted by the Department of Finance. The estimate must include any non-discretionary costs or savings to local agencies and the costs or savings in federal funding to the State.

B. COST ESTIMATES TO REDUCE EMISSIONS

Staff conducted an analysis of industry-wide cost survey responses. The responses were used to determine the increased cost to implement ARB evaporative standards over U.S. EPA standards. As described in the methodology to determine economic impacts in Appendix K, a representative marine watercraft for each spark-ignition marine category was evaluated to determine the total retail price increase. Staff performed an industry-wide survey of component manufacturers to determine the increased cost to produce a ARB-compliant evaporative component. Equipment cost increases attributable to the difference between ARB and U.S. EPA compliance standards were then increased to account for normal profit from component manufacturers, marine watercraft manufacturers, and dealers. Staff applied a markup of 20 percent for three levels of industry (evaporative component manufacturer, SIMW manufacturer, and dealer) to estimate the total retail price increase to marine watercraft consumers.

For MY 2018 and later, SIMW with engines less than 30 kW, all evaporative emissions standards including fuel cap, fitting and carbon canister requirements, and test procedures will be harmonized with U.S. EPA standards. Therefore, no additional compliance costs are associated with these MYs. For MY 2018 and later SIMW with engines greater than 30 kW, ARB proposes to set a more stringent fuel hose permeation standard, more stringent fuel tank permeation standard, more stringent venting standard, and a fuel injection requirement.

In order to meet ARB's proposed MY 2018 requirements, the average estimated retail price increase per marine watercraft ranges from $28 to $45. The average retail cost for these marine watercraft ranges from $12,217 to $61,076 (NMMA, 2013). The total retail price increase for each marine watercraft category is shown in Table VII-1 and is calculated by summing the estimated average component cost increases and applying the increased markup value as discussed previously. The detailed cost estimates for the evaporative emissions control components are shown in Appendix K.

Table VII-1: Evaporative Emissions Total Estimated Retail Price Increase for MY 2018 Standards (2013 Dollars)

	Marine Watercraft Category	Total Retail Cost Increase			Average Marine Watercraft Retail Cost[2]
		Low Estimate	High Estimate	Average[1]	
MY 2018 Standards	PWC	$19	$41	$28	$12,217
	Outboard[3]	$21	$68	$44	$21,964
	SD/I[4]	$23	$81	$45	$61,076
	Average of All Categories			**$39**	**$31,752**

[1] Average based on the range of cost data received from industry.
[2] NMMA 2012 Recreational Boating Statistical Abstract (NMMA, 2013) in 2013 dollars.
[3] Outboard category includes both carbureted and fuel injected models.
[4] SD/I category includes jet drive, inboard, and sterndrive marine watercraft from NMMA 2013 Recreational Boating Statistical Abstract (NMMA, 2013).

C. COST-EFFECTIVENESS OF PROPOSED REGULATIONS

This section presents the methodology used to calculate the cost-effectiveness of the proposed regulation to reduce evaporative ROG emissions from SIMW. Cost-effectiveness is a measure of the incremental increased retail cost of compliance per lifetime mass reduction of ROG emitted per unit. Staff calculated the cost-effectiveness for each year of the regulation over the lifetime of the marine watercraft based on a comparison of the total increased average retail cost and the emissions reduction benefits.

Staff evaluated regulatory cost-effectiveness using levelized costs over all the estimated compliant SIMW (See also Appendix K). Regulatory cost-effectiveness, (Table VII-3), is calculated in dollars per pound by dividing levelized annual compliance equipment cost plus annual regulatory reporting cost by average annual emission reductions. Table VII-2 provides the present values of the total cost of compliance equipment for all three marine watercraft categories, as well as total regulatory reporting costs.

Table VII-2: Total Cost of Regulatory Compliance

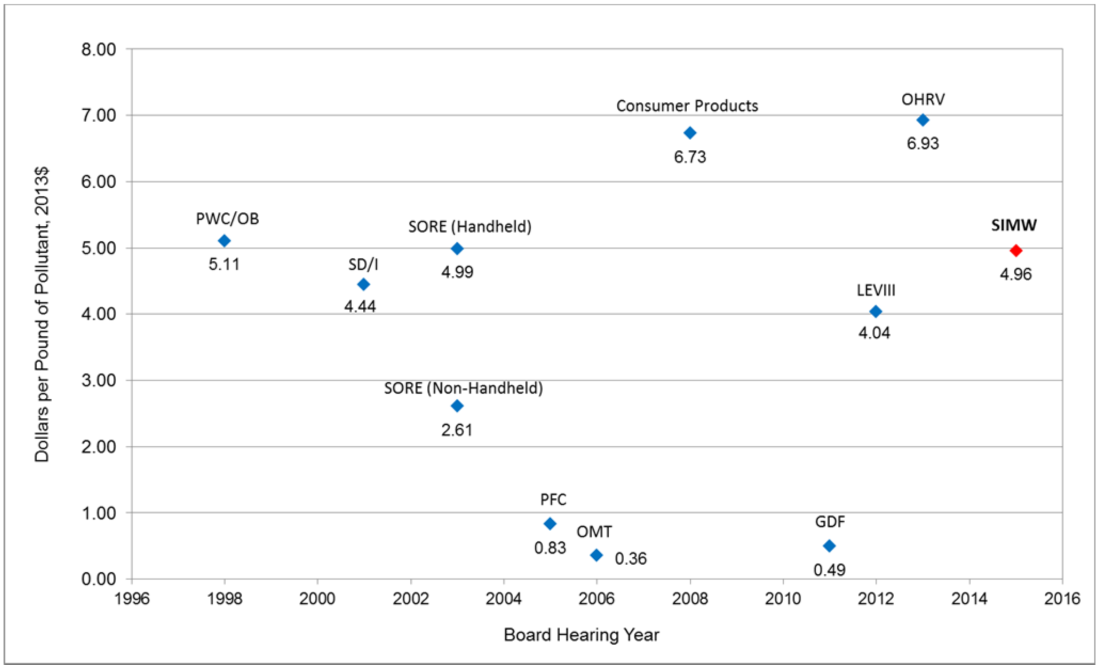
Marine SIMW Category	Projected 2037 Population	Present Value of Total Cost of Regulatory Compliance
PWC	99,943	$1,242,000
OB	102,985	$2,024,000
SD/I	160,792	$3,232,000
	Reporting Cost:	$1,781,000
	Total Statewide Dollar Cost:	**$8,279,000**

Table VII-3: Regulatory Cost-Effectiveness

	Total
Total Levelized Equipment Cost ($)	**$521,400**
Annual Reporting Cost ($)	**$136,100**
Average Annual Emissions Reductions (lbs.)	**132,600**
Levelized Cost-Effectiveness ($/lb.)	**$4.96**

The proposed regulation is cost-effective compared to the cost-effectiveness of previous rulemakings, as shown in Figure VII-1. Past cost-effectiveness values are adjusted to 2013 dollars from the year of adoption.

Figure VII-1: Historical Cost-effectiveness for ARB Evaporative Regulations



Abbreviation Key:

- GDF – Gasoline Dispensing Facility
- LEVIII – Low Emission Vehicle
- LSI – Large Spark-Ignition (Average)
- OB - Outboard
- OHRV – Off-Highway Recreational Vehicles
- OMT – Outboard Marine Tanks
- PFC - Portable Fuel Container
- PWC – Personal Watercraft
- SIMW – Spark-Ignition Marine Watercraft
- SD/I – Sterndrive/Inboard
- SORE – Small Off-Road Engines

In Appendix K, staff calculated the increased retail costs to meet ARB proposed evaporative standards over the current U.S. EPA standards. This was performed for three representative categories: PWC, OB, and SD/I. Staff used these cost data, based on an assumed regulation lifetime of 20 years to calculate the total annualized costs by model year. The detailed annualized costs are shown in Appendix K.

D. IMPACT ON THE STATE ECONOMY

The proposed regulation will require more stringent evaporative emissions controls for SIMW with engines greater than 30 kW than those required by U.S. EPA. However, the proposal is not expected to impose a significant cost burden on evaporative emissions control component, SIMW, or engine manufacturers because the industry has already changed their manufacturing processes to meet the U.S. EPA standards. For PWC, staff estimates an average retail price increase of $28 per unit. Staff estimates the average retail price will be $44 per unit higher for SIMW with installed OB engines. For SIMW with SD/I engines, staff estimates an average retail price increase of $45 per unit. This section annualizes these costs and estimates cost impacts for each category in order to assess influences on the California economy as a whole.

Most SIMW manufacturers are located outside of California. However, there are some small manufacturers located within the State. Based on the cost data available, the levelized annual equipment cost of the proposed regulation is estimated to be approximately $521,000 (Table VII-3). Levelization of the present value of total compliance equipment costs provides an annual average cost for purposes of cost-effectiveness calculation. Staff anticipates that the increased costs for evaporative emissions controls will be passed on by the manufacturers to the consumers, resulting in an average increase of 0.2 percent, or about $39, to SIMW retail prices. The total increased retail costs were calculated in Appendix K.

Due to the wide range of estimated evaporative emissions control system component and SIMW lifetimes, staff used a compliance lifetime of 20 years for all SIMW categories. A 5 percent capital recovery factor was applied to annualize compliance costs over the lifetime of the equipment. Annualization permits compliance costs to be recognized over the same period and at the same rate that regulatory compliance benefits (emission reductions) are achieved. Annualized future compliance costs were discounted at a 5 percent rate to calculate their present value, and then summed to calculate total compliance cost over the 20-year lifetime of the regulation. Levelization of the present value of total compliance equipment costs provides an annual average equipment cost for the purposes of the cost-effectiveness calculation.

Appendix K provides estimates of the total annualized costs of the SIMW regulation from 2018 to 2037. The annualized compliance equipment cost is expected to increase over time as additional SIMW are sold. For example, the annualized cost of 2020 reflects the annualized costs of model years 2018, 2019, and 2020. Therefore, the annualized costs for each year show the cumulative effect of new SIMW sold since 2018. Based on amortized payments over a 20-year marine watercraft lifetime, and assuming a 5 percent discounted rate, the present value of the total cost of regulatory compliance equipment (Table VII-4) is expected to be $6.5 million (2013 dollars). Reporting costs for California SIMW manufacturers are estimated in section VII of Appendix K. Total reporting costs for California SIMW manufacturers are expected to be $136,000 per year, with a present value of $1.8 million over rule’s lifetime. Table VII-2, above, summarizes the total impact of the proposed regulation on California’s economy.

Table VII-4: Total Statewide Compliance Equipment Cost 2018-2037 (2013 Dollars)

Marine Watercraft Category	Projected 2037 Population	Average Statewide Dollar Cost for Fleet Turnover
PWC	99,943	$1,242,000
OB	102,985	$2,024,000
SD/I	160,792	$3,232,000
Total Statewide Dollar Cost Estimate		**$6,498,000**

Using ARB's cost increase for evaporative emissions controls and retail data from industry reports (NMMA, 2013), staff estimated the percent increase in retail prices for each category type (Table VII-5). Staff anticipates manufacturers will pass on all the added costs of evaporative emissions controls to the consumers resulting in a retail price increase of 0.2 percent for PWC, 0.2 percent for OB marine watercraft, and less than 0.1 percent for SD/I spark-ignition marine watercraft.

Table VII-5: Estimated Average Retail Price Increase (2013 Dollars)

Marine Watercraft Category	Average Price Increase	Approximate Retail Cost[1]	Estimated Retail Price Increase (Percent)
PWC	$28	$12,217	0.2 %
OB	$44	$21,964	0.2 %
SD/I[2]	$45	$61,076	0.1 %
		Average of All Categories	**0.2 %**

[1] NMMA 2013 Recreational Boating Statistical Abstract (NMMA, 2013) in 2013 Dollars.
[2] SD/I category includes jet drive, inboard, and sterndrive watercraft from NMMA 2013 Recreational Boating Statistical Abstract (NMMA, 2013).

Based on the previous assumptions, staff expects the proposed regulation to impose no adverse impact on California competitiveness and employment. The following sections fulfill ARB's legal requirements related to economic analysis and economic impact for stakeholders affected by the proposed regulation.

E. BUSINESSES AFFECTED

Any business involved in the manufacturing of SIMW and SIME sold in California will potentially be affected by the proposed regulation. Additionally, potentially affected are businesses that supply parts to these manufacturers, as well as those businesses that buy and sell SIME and SIMW in California. The focus of this analysis, however, will be on the SIME and SIMW manufacturers because these businesses would be most directly affected by the proposed regulation.

1. ENGINE MANUFACTURERS

Based on the 2014 SIME certification database records, there are 18 SIME manufacturers that market certified engines in California. There are 2 outboard engine manufacturers who only produce marine engines that are less than or equal to 30 kW, and there are 10 engine manufacturers who produce marine engines greater than 30 kW for use in such applications as OBs, SD/Is, jet drives and PWCs. An additional 6 manufacturers produce engines of all sizes to be used in all types of SIMW. None of the major SIME manufacturers are located inside California, although some may have small repair and distribution operations within California.

2. SPARK-IGNITION MARINE WATERCRAFT MANUFACTURERS

The SIMW manufacturing industry is primarily comprised of small businesses that are not required to publicly disclose financial and other information. Based on information obtained from the 2012 U.S. Economic Census, there are 871 SIMW manufacturing businesses located nationally with approximately 53 marine watercraft manufacturers located in California. Two large companies control about 30 percent of the national industry revenue (IBIS, 2010), and industry has indicated that there are no major SIMW manufacturers located in California.

SIMW manufacturing businesses located in California represent about 4 percent of the $7 billion in sales volume done nationally (NMMA, 2013). Of those California businesses, approximately 96 percent have less than 100 employees and are defined as Small Businesses in California (Cal. Code Regs., tit. 2, §1896). Self-employed businesses are not included in U.S. Census reports or the IBISWorld reports.

Due to the fragmented nature of the SIMW manufacturing industry, and because there are no reporting requirements for the self-employed businesses, the actual number of SIMW manufacturers located in California cannot be determined. Stakeholders have commented that over the years, many of the SIMW manufacturers have moved out of California and that no major manufacturers remain.

F. IMPACT ON SMALL BUSINESSES

Staff assumes that the SIMW manufacturers located in California are primarily self-employed businesses or small businesses with less than 100 employees. In MY 2018 when permeation and diurnal venting standards are lowered, and additional requirements are implemented, the proposed regulation will have some impact on small businesses that manufacture SIMW and/or dealers that assemble their own evaporative emissions systems for SIMW. Annual ongoing costs are estimated to range as high as $2,568 per year (Appendix K: $2,568 estimated certification costs) should a small business opt to build and certify evaporative systems and not pass on the added control costs to consumers. Businesses located outside of California may stop selling in California, but will not necessarily go out of business because California is only 4 percent of the national SIMW market.

G. POTENTIAL IMPACT ON DEALERS AND DISTRIBUTORS

Most SIMW and SIME manufacturers sell their products through distributors and dealers, some of which are owned by manufacturers while others are independent. Most independently owned dealers are small businesses, and some low-volume manufacturers also deal directly with their customers. Based on 2012 U.S. Census data, there are 257 boat dealer establishments in California. This designation, NAICS Code 441222, encompasses businesses primarily engaged in retailing new and/or used marine watercraft separately, or in conjunction with other activities, such as repair services, and selling replacement parts and accessories.

Staff found that many businesses that sell new and used marine watercraft also perform SIMW repairs. Due to the poor economy, some dealers have shifted their focus towards repairs until the economy improves and the demand for new marine watercraft increases. Because of the fragmented nature of the SIMW industry and the significant impact of the economic recession, it is difficult to determine the number of SIMW dealers and distributors that would potentially be affected by the proposed regulation. However, the average estimated increase of 0.2 percent in the retail price of a SIMW is not expected to adversely affect the sales of new SIMW.

H. POTENTIAL IMPACT ON BUSINESS COMPETITIVENESS

The proposed regulation would have no significant impact on the ability of California SIMW and SIME manufacturers to compete with manufacturers of similar products in other states. The reason for this is because all manufacturers that produce SIMW and SIME for sale in California are subject to the proposed regulation regardless of their location. Furthermore, all of the SIME manufacturers, and most of the SIMW manufacturers, are located outside of California.

I. POTENTIAL IMPACT ON EMPLOYMENT

The proposed regulation is not expected to affect California employment because the retail price increases attributable to the regulation are too small to significantly impact new marine watercraft sales. California accounts for only 53 of the 882 manufacturers of marine watercraft nationally. An average estimated increase in 0.2 percent in the retail price of a SIMW is not expected to significantly affect sales of SIMW and businesses, which is not likely to affect employment.

J. BUSINESS CREATION, ELIMINATION, OR EXPANSION

The proposed regulation is not expected to have a noticeable impact on California SIMW manufacturers. On average, the retail cost increase for evaporative emissions control is about 0.2 percent of the average retail price for new SIMW. No business creation or expansion is expected as a result of this regulation.

K. POTENTIAL IMPACT ON LOCAL AND STATE AGENCIES

Local, State, and federal agencies would be affected by a price increase in the cost of new SIMW bought in California. The number of SIMW purchased by these agencies is unknown, but is expected to be small (Appendix K). However, additional costs will be incurred by State agencies enforcing this regulation. This is mainly due to the costs of certifying evaporative emissions control components, certifying SIMW, inspecting evaporative emissions control components and SIMW, and emissions testing SIMW in-use for evaporative emissions compliance. Additional cost information relevant to the impact on State agencies is presented in Appendix K.

L. ALTERNATIVES CONSIDERED

Health and Safety Code section 57005 requires ARB to perform an economic impact analysis of submitted alternatives to a proposed regulation before adopting any major regulation. A major regulation is defined as a regulation that will have a potential cost to California business enterprises in an amount exceeding 10 million dollars in any single year. This regulation does not exceed this threshold.

In accordance with Government Code section 11346.5, subdivision (a)(13), ARB must determine that no reasonable alternative it considered or that has otherwise been identified and brought to ARB's attention would be more effective in carrying out the purpose of the proposed regulation, or would be as effective and less burdensome to affected private persons then the proposed regulation.

The following alternatives were considered by staff.

1. NO ACTION

The first alternative evaluated was to take no action. Under this alternative, ARB would harmonize with the U.S. EPA rule as stated in 40 CFR Part 1060 to enforce the U.S. EPA evaporative emissions standards in California. As discussed earlier in this report, the U.S. EPA rule alone does not obtain the emissions reductions California needs to address its air quality challenges. Therefore, staff rejected this alternative.

2. PROPOSE MORE STRINGENT EVAPORATIVE EMISSIONS STANDARDS

Requiring fuel injection for SIMW less than 30 kW engines was considered by ARB staff. SIME less than 30 kW are generally OB marine engines. Introducing the technology to equip these OB engines with fuel injection would be costly and not cost-effective (Appendix K). Therefore, staff rejected proposing more stringent standards for marine watercraft with engines less than 30 kW.

Both alternatives considered by the agency would not be more effective, or less burdensome, than the proposed regulation.

VIII. SUMMARY AND RATIONALE FOR EACH REGULATORY PROVISION

This section discusses the requirements and rationale for each provision of the proposed regulation.

Section 2850. Purpose.

Summary of section 2850.

This section states the purpose of the proposed regulation. Specifically, pursuant to various Health and Safety Code provisions and to fulfill ARB's public health mandate, staff is proposing to reduce evaporative emissions from SIMW and SIME.

Rationale for section 2850.

This section is needed to advise the public, including those regulated, that the regulation is intended to reduce evaporative emissions from SIMW and SIME.

Section 2851. Applicability.

Summary of section 2851(a).

This subsection of the proposed regulation states that the regulation will apply to SIMW manufacturers, evaporative emissions control component manufacturers, and all businesses and individuals offering SIMW and SIME for sale in California.

Rationale for section 2851(a).

This subsection is necessary to identify the specific entities to which regulatory obligations would apply.

Summary of section 2851(b).

This subsection of the proposed regulation states that the regulation will not apply to the specified entities stated in this subsection.

Rationale for section 2851(b).

This subsection is necessary to identify the entities to which this regulation would not apply.

Section 2852. Prohibitions.

Summary of section 2852(a).

This subsection of the proposed regulation states that no entity can place an uncertified or noncompliant marine watercraft or an evaporative emissions control component into the California chain of commerce.

Rationale for section 2852(a).

This subsection is necessary to clarify that all standards and conditions are to be met before a marine watercraft is sold in California.

Summary of section 2852(a)(1).

This subsection of the proposed regulation states that a marine watercraft must be certified according to section 2856 to enter the chain of commerce in California.

Rationale for section 2852(a)(1).

This subsection is necessary to ensure that a marine watercraft and evaporative emissions control components sold in California meet California evaporative emissions control standards.

Summary of section 2852(a)(2).

This subsection of the proposed regulation states that a marine watercraft or evaporative emissions control component must be certified and must comply with the applicable standards.

Rationale for section 2852(a)(2).

This subsection is necessary to ensure that certified marine watercraft meet all applicable standards.

Summary of section 2852(b).

This subsection of the proposed regulation states that any marine watercraft or evaporative emissions control component cannot be sold in California if it does not have an Executive Order of Certification or Component Executive Order of Certification.

Rationale for section 2852(b).

This subsection is necessary to ensure that marine watercraft and evaporative emissions control components are covered by an Executive Order of Certification or Component Executive Order of Certification before being sold in California.

Section 2853. Definitions.

Summary of section 2853.

This section proposes definitions to the terms used in this proposed regulation.

Rationale for section 2853.

It is necessary for ARB to define its terms as they apply to the proposed SIMW regulation. Most of these terms are used in other Articles and titles in the California Code of Regulations, Government Code sections, or Health and Safety Code statutes. It is necessary for ARB to be consistent with existing definitions to the extent that they apply to this proposed regulation. Also, ARB definitions shall supersede U.S. EPA definitions.

Section 2854. Spark-Ignition Marine Watercraft Standards for ≤ 30 kW SIME.

Summary of section 2854.

This section states that beginning with MY 2018, marine watercraft with less than or equal to 30 kW engines meet the listed standards and test procedures to be in compliance with this regulation. Also, this category of marine watercraft must be compatible with commercial California fuels and all evaporative emissions control components must be properly installed before being offered for sale in California.

Rationale for section 2854.

This section is necessary to require marine watercraft with SIME less than or equal to 30 kW to meet California standards that are harmonized with U.S. EPA requirements while ensuring ARB can independently enforce those requirements. The evaporative emissions control system and evaporative emissions control components must be compatible with commercial California fuels and all evaporative emissions control components must be properly installed on SIMW before use in California.

Section 2855. Spark-Ignition Marine Watercraft Standards for > 30 kW SIME.

Summary of section 2855(a).

This subsection states that beginning with MY 2018, trailerable and nontrailerable marine watercraft with greater than 30 kW SIME must meet the design evaporative emissions standards, or performance standards and test procedures, to be in compliance with this proposed regulation. Also, marine watercraft must be compatible with commercial California fuels and all evaporative emissions control components must be properly installed on SIMW before use in California.

Rationale for section 2855(a).

This subsection is necessary to reduce evaporative emissions from marine watercraft with greater than 30 kW SIME. Fuel hose permeation, fuel tank permeation, and diurnal requirements are needed to reduce evaporative emissions and achieve the maximum ROG reductions.

Summary of section 2855(a)(1).

This subsection of the proposed regulation requires that all marine watercraft have a deck fill plate compatible with Phase II vapor recovery gasoline dispensing nozzles.

Rationale for section 2855(a)(1).

This subsection is necessary to control refueling emissions from SIMW being refilled at gas stations configured with Phase II vapor recovery nozzles.

Summary of section 2855(a)(2).

This subsection of the proposed regulation requires that all marine watercraft be compatible with commercial California fuels.

Rationale for section 2855(a)(2).

This subsection is required to ensure that marine watercraft manufactured for California be compatible with the commercial California fuels that they will use to operate the SIME.

Summary of sections 2855(a)(3) – (a)(5).

These subsections of the proposed regulation require that all fuel caps, vents, carbon canisters, fuel hose fittings, and refueling requirements meet the design requirements as regulated by U.S. EPA.

Rationale for sections 2855(a)(3) – (a)(5).

These subsections are necessary to ensure that evaporative system builders and/or evaporative emissions control component manufacturers meet the applicable federal design requirements when certifying in California. This minimizes the need for separate California requirements.

Summary of section 2855(b).

This subsection of the proposed regulation states that if a fuel hose is commercially available beginning MY 2018, that the fuel hose standard listed in Tables 1 and 2 of section 2855 shall be changed to the more stringent fuel hose standard in Tables 1 and 2 of section 2855. Subsections 2855(b)(1)(A)-(b)(1)(H) lists the requirements for a fuel hose to be considered commercially available. One requirement is that the fuel hose must pass the USCG fire test. In addition, the hose must comply with the American Boat and Yacht Council (ABYC) H24 fuel system standards, be of common size for marine systems, be flexible, meet ultraviolet (UV) resistance requirements, be resistant to kinks, remain intact during operation, and properly seal without leaks when attached to common barbs and fittings.

Rationale for section 2855(b).

This subsection was requested by industry since no 5 g/m^2/day fuel hose was commercially available in common sizes at the time of the rulemaking. When the fuel hose is commercially available in common sizes (defined in subsections (b)(1)(A) – (b)(1)(H)), then the standard will be lowered from 10 g/m^2/day at 23°C to 5 g/m^2/day at 40°C. The subsection is required to establish a list for the Executive Officer to determine the commercial availability of a fuel hose. ARB agrees that this industry-presented list ensures that a hose is commercially available.

Section 2856. Certification Requirements.

Summary of section 2856(a).

This subsection of the proposed regulation describes the process for evaporative emissions control component certification. It contains evaporative emissions control component testing and certification requirements for all marine watercraft. It also requires that evaporative emissions control components be approved by ARB and have a Component Executive Order of Certification to be used on a SIMW evaporative emissions control system certified to the design standards. This section sets the requirements for the testing of evaporative emissions control components for certification.

Rationale for section 2856(a).

This subsection summarizes the evaporative emissions control component certification process. It ensures that SIMW evaporative emissions control components are compliant with ARB standards. ARB must certify the evaporative emissions control components before they are installed on a marine watercraft. The subsection directs evaporative emissions control component manufacturers to the applicable standards and test procedures, including requirements for test fuels and design requirements.

Summary of section 2856(b).

This subsection of the proposed regulation details the general requirements for evaporative system builders who certify their marine watercraft to the design-based standards.

Rationale for section 2856(b).

This subsection is necessary to specify the design-based certification process.

Summary of section 2856(c).

This subsection of the proposed regulation details the testing and certification requirements for evaporative system builders who elect to certify to the performance standard.

Rationale for section 2856(c).

This subsection is required to specify the process for performance-based certification.

Summary of section 2856(d).

This subsection of the proposed regulation details the necessary steps that evaporative system builders and/or evaporative emissions control component manufacturers must follow after they have submitted their certification information.

Rationale for section 2856(d).

This subsection is required to clarify the necessary steps that evaporative system builders and/or evaporative emissions control component manufacturers must follow after they have submitted their certification information.

Summary of section 2856(e).

This subsection of the proposed regulation prohibits tampering of the evaporative emissions control system and requires evaporative system builders and/or evaporative emissions control component manufacturers to design products to resist tampering and/or removal.

Rationale for section 2856(e).

Prohibiting tampering of the evaporative emissions control system on marine watercraft is necessary to ensure the control effectiveness throughout the SIMW's useful life.

Section 2857. Spark-Ignition Marine Watercraft Registration.

Summary of section 2857.

This section of the proposed regulation states that all SIMW must meet California evaporative emissions control requirements before they can be registered in California.

Rationale for section 2857.

This section is necessary to deter anyone from bringing noncompliant marine watercraft into California and attempting to register them or offer them for sale. It also formalizes the mechanism by which DMV screens out-of-state marine watercraft for compliance with California's SIMW emissions requirements.

Section 2858. Aftermarket Parts.

Summary of section 2858.

This section of the proposed regulation prohibits the use of non-ARB approved aftermarket parts that may affect the evaporative emissions control system.

Rationale for section 2858.

This section is necessary to deter people from selling or installing non-approved aftermarket parts that affect the evaporative emissions control system.

Section 2859. Evaporative Emissions Control Component Labeling.

Summary of section 2859.

This section of the proposed regulation requires that all evaporative emissions control components be labeled. Additionally, this section details enforcement and the requirements for applying labels to SIMW evaporative emissions control components.

Rationale for section 2859.

This section is necessary to ensure that evaporative emissions control components are properly labeled and to identify which evaporative emissions control components meet the applicable standards for enforcement purposes.

Section 2860. Spark-Ignition Marine Watercraft Labeling.

Summary of section 2860.

This section of the proposed regulation states that all SIMW must be properly labeled. Additionally, this section details the requirements for applying labels to marine watercraft.

Rationale for section 2860.

This section is necessary to ensure that SIMW be properly labeled to identify which marine watercraft meet the applicable standards.

Section 2861. Defects Warranty Requirements for Spark-Ignition Marine Watercraft.

Summary of section 2861.

This section of the proposed regulation sets the requirements and instructions for a SIMW warranty. Offering a warranty is the responsibility of the EO Holder. The SIMW evaporative emissions control system must be free from defects, conform to all applicable regulations, and warranted for a period of five years.

Rationale for section 2861.

This section is necessary to describe what warranty requirements must be met for an evaporative system builder who designs an evaporative emissions control system or an evaporative emissions control component manufacturer who designs an evaporative emissions control component. Warranty coverage helps to ensure SIMW evaporative emissions control system effectiveness throughout the warranty period.

Section 2862. Evaporative Emissions Control Warranty Statement.

Summary of section 2862.

This section of the proposed regulation states that the warranty statement language must be supplied with the evaporative emissions control component, SIMW or SIME.

Rationale for section 2862.

This section is necessary to describe the warranty and the owner's responsibilities when a defect exists within the warranty period. It is necessary to ensure that owners can obtain warranty coverage for defective parts.

Section 2863. Emission-Related Defect Reporting Requirements.

Summary of section 2863(a).

This subsection of the proposed regulation establishes the applicability of the responsible party for filing a defect report.

Rationale for section 2863(a).

This subsection is necessary to describe when an evaporative system builder or evaporative emissions control component manufacturer must file a defect report.

Summary of section 2863(b).

This subsection of the proposed regulation requires that an evaporative system builder or evaporative emissions control component manufacturer file a defect report within 2 years of manufacture of the evaporative emissions control component or SIMW if it is determined that a defect exists in 10 percent of production or 20 marine watercraft (whichever is less) for a given SIMW evaporative family.

Rationale for section 2863(b).

This subsection is necessary to ensure that a copy of the procedures to identify defects is in the certification application and, therefore ready for use (if necessary) as soon as production begins. Defect reporting ensures that evaporative system builders and evaporative emissions control component manufacturers are keeping track of emissions-related defects, leading to more timely correction.

Summary of sections 2863(c) and (d).

These subsections of the proposed regulation establish that no report needs to be filed if the defect has been corrected prior to sale. However, if a defect is found and has not been corrected, then a defect report must be filed within 15 days of finding of the defect.

Rationale for sections 2863(c) and (d).

These subsections are necessary to encourage evaporative system builders and evaporative emissions control component manufacturers to remedy a defect found prior to sale and sets timing requirements for reporting a defect.

Summary of section 2863(e).

This subsection of the proposed regulation specifies the required information for defect reports.

Rationale for section 2863(e).

This subsection is necessary to ensure that ARB has sufficient information to evaluate the severity and implications of the defect reported.

Section 2864. New Evaporative Emissions Control Component Compliance Testing.

Summary of section 2864(a).

This subsection of the proposed regulation establishes that the Executive Officer may require an evaporative emissions control component manufacturer to provide 5 evaporative emissions control components for inspection or compliance testing. Additionally, this subsection ensures ARB has access to manufacturing facilities for inspections. Five evaporative emissions control components must be chosen randomly from production and tested following the applicable test procedure. The evaporative emissions control component manufacturer must be notified according to subsection 2864(b) of any failures or noncompliance with labeling procedures. The evaporative emissions control component will be deemed in compliance if all testing results are equal to or below the standard, or if the upper 95 percent confidence limit of the 5 samples is equal to or less than 110 percent of the applicable performance standards.

Rationale for section 2864(a).

This subsection is necessary to confirm that evaporative emissions control components certified with the SIMW design-based requirements continue to comply after production begins.

Summary of section 2864(b).

This subsection of the proposed regulation requires the Executive Officer to notify the EO Holder if their ARB certified SIMW evaporative emissions control component has failed a compliance test. Additionally, the Executive Officer may revoke or suspend the Component Executive Order of Certification. The SIMW evaporative emissions control component will be deemed in compliance, if the upper 95 percent confidence limit of the 5 samples is equal to or less than 110 percent of the applicable performance standards.

Rationale for section 2864(b).

This subsection is necessary to ensure that an evaporative emissions control component manufacturer is notified of a failed compliance test. It also grants the Executive Officer the authority to revoke a Component Executive Order of Certification if an evaporative emissions control component has failed a compliance test. This ensures timely detection and correction of failures that may cause excess evaporative emissions.

Summary of section 2864(c).

This subsection of the proposed regulation establishes that the Executive Officer may not revoke or suspend a Component Executive Order of Certification without considering certification information provided by the Component EO Holder. If failure has occurred at one plant, the Executive Officer may suspend production at that specific plant. The Executive Officer may suspend an Executive Order if the Component EO Holder refuses to comply with requirements of this section, submits false information, renders inaccurate data, denies authorized activities, or if ARB personnel have been denied the right of entry. After a Component Executive Order of Certification has been revoked or suspended, the Component EO Holder must submit a written report of the remedy of the noncompliance and demonstrate compliance by providing five evaporative emissions test results for the component following the applicable test procedure. A Component EO Holder may request to conditionally reinstate a Component Executive Order of Certification.

Rationale for section 2864(c).

This subsection is necessary to allow certain information to be considered before revoking or suspending a Component Executive Order of Certification. This section is also necessary to describe the requirements for suspension of a Component Executive Order of Certification and the process for reinstating a revoked or suspended Component Executive Order of Certification.

Summary of section 2864(d).

This subsection of the proposed regulation establishes that the Executive Officer may inspect any facility to ensure compliance with these regulations. Failure to allow inspection of a facility shall be grounds for suspension and/or revocation of a Component Executive Order of Certification.

Rationale for section 2864(d).

This subsection is necessary to allow ARB to inspect facilities that may be producing evaporative emissions control components or marine watercraft that do not comply with these regulations.

Section 2865. New Spark-Ignition Marine Watercraft Compliance Testing.

Summary of section 2865(a).

This subsection of the proposed regulation establishes that the Executive Officer, at any time with respect to a new design-based certified SIMW, may require an evaporative system builder to provide a marine watercraft or SIMW evaporative emissions control system for inspection and/or component compliance testing. Additionally, ARB must be granted access to manufacturing facilities. Compliance requirements for evaporative emissions control components are specified in section 2864.

Rationale for section 2865(a).

This subsection is necessary to confirm that marine watercraft in production are actually complying with SIMW evaporative emissions standards through design-based certification.

Summary of section 2865(b).

This subsection of the proposed regulation establishes that the Executive Officer, at any time with respect to a new performance-based certified SIMW, may require an evaporative system builder to provide a marine watercraft or SIMW evaporative emissions control system for inspection and/or compliance testing. Additionally, ARB must be granted access to manufacturing facilities. One marine watercraft or SIMW evaporative emissions control system will be chosen from random from one SIMW evaporative family and tested following the applicable test procedure or procedures.

The evaporative system builder must be notified according to subsection 2865(b) of any failures or noncompliance with labeling requirements.

Rationale for section 2865(b).

This subsection is necessary to confirm that marine watercraft in production are actually complying with SIMW evaporative emissions standards through performance-based testing.

Summary of section 2865(c).

This subsection of the proposed regulation requires the Executive Officer to notify the EO Holder if they have failed a compliance test. Additionally, the Executive Officer may revoke or suspend the Executive Order of Certification if the evaporative emissions control components do not meet the compliance testing standards.

Rationale for section 2865(c).

This subsection is necessary to provide notice to the evaporative system builder of a compliance failure and to provide an opportunity for a response, and grants the Executive Officer authority to revoke an Executive Order of Certification if a SIMW has failed a compliance test.

Summary of section 2865(d).

This subsection of the proposed regulation establishes that the Executive Officer may not revoke or suspend an Executive Order of Certification without considering certification information provided by the EO Holder. If a failure has occurred at one facility, the Executive Officer may suspend production at that location. The Executive Officer may suspend an Executive Order of Certification if the EO Holder refuses to comply with requirements of this subsection, submits false information, renders inaccurate data, denies authorized activities, or have been denied the right of entry. After an Executive Order of Certification has been revoked or suspended, the EO Holder must submit a written report of the remedy of the noncompliance and demonstrate compliance with five evaporative emissions tests. An EO Holder may request to conditionally reinstate an Executive Order of Certification.

Rationale for section 2865(d).

This subsection is necessary to allow certain information to be considered before revoking or suspending an Executive Order of Certification. This subsection is also necessary to describe the requirements for suspension of an Executive Order of Certification and the process for reinstating a revoked or suspended Executive Order of Certification.

Summary of section 2865(e).

This subsection of the proposed regulation allows the Executive Officer to inspect any facility to ensure compliance with these regulations. Failure to allow inspection of a facility shall be grounds for suspension and/or revocation of an Executive Order of Certification.

Rationale for section 2865(e).

Like subsection 2865(c), this subsection is necessary to ensure that ARB may inspect facilities that may be producing evaporative emissions control components or marine watercraft that do not comply with these regulations.

Section 2866. Exemptions.

Summary of section 2866.

This section of the proposed regulation establishes an evaporative emissions control component certification exemption for metal tanks that meet criteria for low permeating fuel tanks.

Rationale for section 2866.

This section is necessary to ensure that evaporative system builders and/or evaporative emissions control component manufacturers do not need to certify low permeating materials and metal tanks as established by U.S. EPA.

Section 2867. Variances.

Summary of section 2867.

This section of the proposed regulation establishes a variance process for any evaporative system builder and/or evaporative emissions control component manufacturer who cannot meet the requirements of the regulation due to extraordinary reasons beyond the manufacturer's control. The Executive Officer must hold a public hearing where members of the public will have an opportunity to testify. A final date of the variance must be set and the conditions of the variance must be met. The Executive Officer may approve, modify, or revoke a variance for good cause.

Rationale for section 2867.

This section is required to ensure that evaporative system builders and/or evaporative emissions control component manufacturers have the ability to apply for a variance of the regulations if they cannot meet the applicable standards due to reasons beyond their control. This section is also required to set requirements for a variance to be accepted or denied and grant the authority to the Executive Officer to revoke a variance.

Section 2868. Denial, Suspension, or Revocation of Certification.

Summary of section 2868.

This section of the proposed regulation establishes that the Executive Officer may deny, suspend, or revoke an Executive Order of Certification if the Executive Office finds just cause. Just cause may refer to falsifying certification information, using a non-ARB approved label, and not allowing inspection of a facility.

Rationale for section 2868.

This section is necessary to specify the Executive Officer's powers to deny, suspend, or revoke an Executive Order of Certification if an evaporative system builder does not comply with the regulations.

Section 2869. Appeals.

Summary of section 2869.

This section of the proposed regulation establishes an appeal process for evaporative system builders with regard to an Executive Order of Certification that has been denied, revoked, or suspended. The appeal can be done by a hearing or written submission.

Rationale for section 2869.

This section is necessary to specify an evaporative system builders administrative process rights to appeal a denial, suspension, or revocation of an Executive Order of Certification.

Section 2870. Penalties.

Summary of section 2870.

This section of the proposed regulation explains that in addition to suspension and revocation of certification, the Executive Officer may seek civil and/or administrative penalties for violation of the regulations.

Rationale for section 2870.

This section is necessary to inform the public about penalties for noncompliance and to direct the public to the appropriate statutes to determine the penalties.

Section 2871. Severability.

Summary of section 2871.

This section of the proposed regulation ensures that if one provision of the regulation is declared invalid by a court or other authority, the remaining provisions will remain in full force and effect.

Rationale for section 2871.

This section is required to ensure that if ARB has enacted a provision in the proposed regulatory article that is found illegal or unconstitutional, the remaining regulatory provisions shall remain intact.

IX. PUBLIC PROCESS FOR DEVELOPMENT OF PROPOSED ACTION

A. PUBLIC PROCESS

ARB staff made a considerable effort to inform, involve, and update the public and stakeholders of its progress during development of the SIMW regulations. ARB held stakeholder meetings and conducted public workshops to discuss issues and seek comment. This section presents a list of these efforts, meetings, and teleconferences and also describes the major issues raised during ARB's outreach efforts along with staff's responses.

Throughout the rulemaking process, access to ARB information was made available on the internet at http://www.arb.ca.gov/msprog/offroad/recmarine/recmarine.htm. Interested parties could browse the SIMW web page and find the latest test plan, draft test procedure(s), draft regulations, workshop presentations and contact information. Staff posted draft materials for review and comment during regulation development.

Beyond meetings and workshops, further outreach was conducted to identify and involve stakeholders, evaporative emissions control component manufacturers, and marine watercraft manufacturers in the development of a cost estimate for ARB SIMW evaporative emissions control components and systems. Staff participated in SIMW manufacturer conferences by presenting draft proposals and discussing the details with boat builders. For this rulemaking, staff completed 6 cost surveys, and sent out over 1,200 requests to determine the increased costs associated with ARB staff's proposed control measures above the cost for complying with the current U.S. EPA controls. Several hundred additional contacts by telephone, email, and facsimile were made to manufacturers of fuel tanks and fuel hoses, and boat builders to follow up on the cost surveys. A cost survey summary is presented in Appendix K.

B. MEETINGS

As listed in Table IX-1, ARB staff held numerous meetings and teleconferences with the following manufacturers and organizations throughout the rulemaking process. Staff reached out to over 40 boat builders that sold in California to inform and solicit information regarding the proposal and certification. Staff also participated in the International Boatbuilders Exhibition and Conference (IBEX) in 2013 and 2014 where information was shared with boat builders and many stakeholders interacted with staff.

Table IX-1: Pre-hearing Meetings and Teleconferences

Participants[1]	Date
Attwood Marine	9/1/2010, 5/23/2014
California Air Pollution Control Officers Association	4/21/2010
MeadWestvaco	7/15/2009, 12/16/2009
NMMA - Harold Haskew	2/17/2009
NMMA and Marine Manufacturers	9/3/2009, 12/16/2009, 9/2/2010, 3/3/2010, 8/13/2013, 1/28/2014
NMMA – John McKnight	4/29/2009, 6/2/2009, 7/23/2009, 9/23/2009, 11/4/2009, 11/17/2009, 12/16/2009, 3/15/2010, 8/19/2010, 2/19/2013, 7/29/2014
NMMA and Statistical Surveys, Inc.	4/6/2010,8/1/2013
NMMA/ABYC Working Group	2/6/2014, 2/27/2014, 4/2/2014, 4/11/2014, 4/29/2014
Small Volume Boatbuilders	7/30/2013[2], 8/28/2013
Testing Services Group	9/1/2010, 10/8/2013, 8/20/2014
The ITB Group, Ltd.	12/9/2009
USCG – Phil Cappel	3/11/2010, 7/28/2010
U.S. EPA - Glenn Passavant	2/23/2009, 2/20/2013,10/2/2013, 4/10/2014, 4/28/2014, 8/19/2014, 9/26/14
USCG and ABYC	11/19/2009

[1] See page vi for full title of acronyms.

[2] Staff contacted 20 boat builders to discuss the proposed certification application. No boat builders called to participate in the teleconference.

C. WORKSHOPS

Staff conducted public workshops on April 12, 2006; June 27, 2007; February 25, 2009; April 28, 2010; May 28, 2014; and June 4, 2014, to seek comment and responses on the proposed regulations. Workshop notices were sent to more than 1,000 affected stakeholders comprised of SIMW manufacturers, evaporative emissions control component manufacturers, environmental organizations, and trade associations, as well as other interested parties. Staff considered all oral and written comments received. As a result of the comments received throughout the regulatory development process, staff made significant changes to the proposed regulation, which are reflected in the final proposal.

D. MAJOR ISSUES

1. ISSUES RESOLVED

Table IX-2 lists the major issues brought up by the marine industry and stakeholders during the course of regulatory development that have been resolved prior to presenting the regulation to the Board.

Table IX-2: Major Issues Raised by the Marine Industry and Stakeholders

Issue	Staff Resolution
Marine industry adversely affected by economic recession.	In order to allow the marine industry time to recover from the economic recession, staff proposes to harmonize with the current U.S. EPA SIMW standards until MY 2018 when the more stringent California standards would be implemented.
Harmonize with U.S. EPA for spark-ignition marine engines.	Staff proposes to harmonize with U.S. EPA regarding design standards for SIME less than or equal to 30 kW and set more stringent standards for marine watercraft with SIME greater than 30 kW.
On-Board Refueling Vapor Recovery (ORVR) requirements present an extreme cost burden on manufacturers.	After an extensive feasibility analysis, staff is in agreement with industry that requiring ORVR would place an extreme cost burden on manufacturers and would be cost prohibitive. Therefore, staff proposes no ORVR requirements.
A 5 g/m^2/day fuel hose is not commercially available.	Staff agrees that a 5 g/m^2/day at 40°C fuel hose is not commercially available at this time. Staff proposes to set a less stringent standard of 10 g/m^2/day at 23°C and delay setting a 5 g/m^2/day at 40°C fuel hose requirement until it is commercially available in common sizes.
Harmonize with U.S. EPA test procedures to reduce duplicative testing.	Staff agrees and has proposed harmonization with most U.S. EPA test procedures.

2. ISSUES UNRESOLVED

An issue raised by NMMA involves the proposed requirement that SIMW evaporative system builders must obtain ARB certification and be issued an ARB Executive Order of Certification in order to legally sell SIMW evaporative systems into California. Specifically, NMMA wants no certification requirement placed on boat builders and instead wants ARB to align with U. S. EPA's certification approach. Currently, U.S. EPA only requires certification for SIMW evaporative emissions control components, but not for the complete evaporative system/marine watercraft. SIMW certification is important for realizing the benefits of the SIMW regulation because an Executive Order clearly identifies what is legal for sale and who is responsible. This certification requirement is consistent with other ARB mobile source emission control regulations. It would be unprecedented if SIMW certification and issuance of a ARB Executive Order of

Certification were not required. Certification provides identification of a responsible party, and the basic description of the watercraft, evaporative system and components (i.e. fuel tank, fuel hose, and carbon canister). During the certification process, ARB staff reviews this information to ensure that the SIMW meets the applicable evaporative requirements, including insuring proper pairing of evaporative components. For example, correct canister sizing is critically important for diurnal evaporative emissions control. If a SIMW manufacturer does not properly plan an evaporative system design and equips the watercraft with an incorrectly sized canister relative to the fuel tank volume, canister breakthrough would result in substantially higher evaporative emissions. Therefore, evaluation of the selected evaporative components upfront through certification is essential for ensuring appropriate pairing of components and is a central part of the strategy for controlling emissions. Moreover, enforcement staff would be able to use labeling, component numbers, and other technical information described in the certification application during visits to boat builders and dealers. In addition, retroactive actions such as recalls or penalties would also be less effective without a watercraft certification process.

Since this requirement is of paramount importance, ARB staff worked exhaustively with the marine industry, NMMA, and other stakeholders to solicit feedback regarding SIMW evaporative certification, including ARB public workshops, teleconferences, and meetings. ARB staff also visited several boat builders at their facilities in California to learn about the boat building industry's practices, and to get direct feedback on the proposed certification process. To address some of the certification issues raised at the workshops and meetings, a workgroup comprised of ARB, NMMA, and ABYC representatives was set up in early 2014. Over a period of several months this workgroup met multiple times to discuss the relevant certification issues and to help ARB staff understand the NMMA Safety Certification Program. The workgroup meetings also allowed ARB the opportunity to explain the proposed ARB certification program to NMMA and ABYC staff. The workgroup focused on coordination between the ARB certification program and the NMMA Safety Certification Program, and as a result was able to develop a cohesive and efficient process that a NMMA boat builder could use. One such example would be that NMMA will review the boat builder applications before they are submitted to ARB which would greatly reduce application errors and improve certification turnaround times. Furthermore, to assist boat builders in meeting California's certification requirements, NMMA and ARB worked together to develop pre-approved label and warranty templates for boat builders to use instead of having to create their own. The templates may be used by both NMMA members and non-members.

NMMA expressed concern that some boat builders may have to delay sales in California while waiting for an Executive Order to be issued. Thus NMMA proposed an alternate SIMW certification process wherein boat builders would be able to sell in California before receiving an Executive Order, as long as the boat model was NMMA inspected and NMMA certified. Specifically, as part of its certification, NMMA indicated that it plans to check compliance with California SIMW requirements. As a result, NMMA believes its safety certification should provide adequate confidence for ARB to allow sale of boats before receiving a ARB Executive Order. After reviewing the timelines and steps involved in the NMMA safety certification process, staff believes that in most cases the boat builder would have received the Executive Order of Certification earlier than NMMA certification. Since NMMA members do not sell until a SIMW is NMMA certified, sales are not likely to be delayed by ARB. Staff also pointed out to NMMA that ARB cannot delegate certification authority to an industry group or allow sales of a product before an Executive Order is issued. Moreover, allowing sales of a product before an Executive Order is issued may result in noncompliant product being introduced into the California marketplace, which would then require costly recalls or enforcement action.

Based on input from NMMA, ABYC, the marine industry, boat builders, and other stakeholders, ARB staff proposed a streamlined certification process that reduces the time and information needed for certification, taking into account the unique manufacturing aspects of the SIMW industry. Staff presented the process at a major marine watercraft manufacturer show (IBEX) in Louisville, Kentucky in September 2013 and at a more recent IBEX show in Tampa, Florida in October 2014, and in ARB SIMW regulatory workshops in 2014. However, in spite of these efforts, industry continues to oppose a SIMW certification.

E. MINOR ISSUES

Table IX-3 lists the minor issues brought up by the marine industry and stakeholders during the course of regulatory development that have been resolved prior to presenting the regulation to the Board.

Table IX-3: Listing of Issues Raised By Industry

Issue Number	Issue Raised by Marine Industry	ARB Response
1	Marine industry adversely affected by economic recession.	In order to allow the marine industry time to recover from the economic recession, staff proposes to harmonize with the current U.S. EPA SIMW standards until 2014 when the more stringent California standards would be implemented.
2	Harmonize with U.S. EPA for spark-ignition marine engines.	Staff proposes to harmonize with U.S. EPA for design standards for spark-ignition marine engines less than or equal to 30 kW and set more stringent standards for SIMW with engines greater than 30 kW.
3	On-Board Refueling Vapor Recovery (ORVR) requirements present an extreme cost burden on manufacturers.	After an extensive feasibility analysis, staff is in agreement with industry that requiring ORVR would place an extreme cost burden on manufacturers and would be cost prohibitive. Therefore, staff proposes no ORVR requirements.
4	A 5 $g/m^2/day$ fuel hose is not commercially available.	Staff agrees that a 5 $g/m^2/day$ @ 40°C fuel hose is not commercially available. Staff proposes to set a less stringent standard of 10 $g/m^2/day$ at 23°C and delay setting a 5 $g/m^2/day$ @ 40°C fuel hose requirement until it is commercially available.
5	Information required for certification is too burdensome.	Staff agrees and proposes reducing information required for certification.
6	Harmonize with U.S. EPA test procedures to reduce duplicative testing.	Staff agrees and proposes standards based on U.S. EPA test procedures.
7	ARB should combine labeling requirements with USCG and U.S. EPA.	ARB requires specific label requirements, however alternative labels are allowed to be submitted for approval.
8	Fuel tanks should be filled to 20% during testing in order to save on fuel costs.	ARB will continue to harmonize with U.S. EPA test procedures, however ARB has the authority to approve alternate test procedures.
9	ARB should harmonize with the U.S. EPA carbon specifications for carbon canisters.	ARB has agreed with this request.
10	ARB should harmonize under cowl fuel line standards with the current U.S. EPA standards.	ARB has agreed with this request.

Table IX-4: Listing of Issues Raised By Industry (cont.)

Issue Number	Issue Raised by Marine Industry	ARB Response
11	The fuel injection definition should be generalized to include all forms of fuel injection.	ARB has agreed with this request.
12	Harmonize with U.S. EPA test procedures to reduce duplicative testing.	Staff agrees and proposes standards based on U.S. EPA test procedures.
13	ARB should harmonize with the U.S. EPA rule of reporting defective emissions related problems to 20 or more SIMW/SIME.	ARB has agreed with this request.
14	It would be difficult to SHED test large boats.	ARB will allow testing of complete fuel systems in lieu of complete spark-ignition marine watercraft testing.
15	Consider using less expensive test fuel, such as CE10.	ARB will allow the use of CE10 fuel for permeation testing only.
16	Use ICOMIA profile for fuel injection efficiency.	ARB has agreed with this request.
17	Applicability of any aftermarket part too broad.	ARB will specify aftermarket parts that will affect the evaporative system.
18	The fuels compatibility definition is too broad, it should relate only to fuels that are usable by SIMW.	ARB has agreed with this request.
19	ARB should drop compatible fuel deck plate requirements for nontrailerable SIMW.	ARB has agreed with this request.
20	ARB should consider industry approved durability specifications.	ARB will incorporate industry approved durability specifications into TP-1503.
21	ARB should address the need for relief to evaporative system builders when required evaporative components are not available.	The variance section of the regulation addresses the evaporative system builders need for relief.

X. CONCLUSIONS AND RECOMMENDATIONS

In developing the proposed regulation for SIMW, staff's goal has been to achieve the greatest possible ROG emissions reductions in a technologically feasible and cost-effective manner. The proposed design and performance standards for SIMW are achievable using existing technologies and manufacturing processes. The ROG emissions reductions are cost-effective when compared to recent control measures adopted by the Board. The proposed regulations are necessary to meet ARB's air quality emissions reduction goals and to achieve health-based ambient air quality standards.

No alternatives considered by the Board would be more effective in achieving the purpose for which the regulations are proposed or would be as effective or less burdensome to affected private persons than the proposed regulations.

The staff recommends that the Board adopt sections 2850 to 2871, title 13, California Code of Regulations provided in Appendix A. Staff also recommends the Board adopt test procedures TP-1501, TP-1502, TP-1503, TP-1504, and TP-1505 incorporated by reference therein, as provided in Appendices B - F of this Staff Report.

XI. REFERENCES, TECHNICAL, THEORETICAL, AND/OR EMPIRICAL STUDIES, REPORTS, OR DOCUMENTS RELIED UPON

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XII. APPENDICES

A. PROPOSED REGULATION ORDER FOR SPARK-IGNITION MARINE WATERCRAFT

A.1 PROPOSED REGULATION ORDER FOR MARINE EXHAUST REVISIONS

B. PROPOSED TP-1501, TEST PROCEDURE FOR DETERMINING DIURNAL EVAPORATIVE EMISSIONS FROM SPARK-IGNITION MARINE WATERCRAFT

C. PROPOSED TP-1502, TEST PROCEDURE FOR DETERMINING HOT SOAK EVAPORATIVE EMISSIONS FROM SPARK-IGNITION MARINE ENGINES

D. PROPOSED TP-1503, TEST PROCEDURE FOR DETERMINING DIURNAL VENTED EMISSIONS FROM INSTALLED MARINE FUEL TANKS

E. PROPOSED TP-1504, TEST PROCEDURE FOR DETERMINING PERMEATION EMISSIONS FROM INSTALLED MARINE FUEL TANKS, MARINE FUEL HOSES AND MARINE FUEL CAPS

F. PROPOSED TP-1505, TEST PROCEDURE FOR DETERMINING PRESSURE RELIEF VALVE PERFORMANCE

G. ARB SUMMARIZED DATA

H. FINAL ANALYSIS OF THE 2009 CALIFORNIA SURVEY OF REGISTERED SPARK-IGNITION MARINE VESSEL OWNERS: USAGE AND STORAGE – INSTITUTE OF SOCIAL RESEARCH AT CALIFORNIA STATE UNIVERSITY, SACRAMENTO

I. COLLECTION OF EVAPORATIVE EMISSIONS DATA FROM OFF-ROAD EQUIPMENT, AUTOMOTIVE TESTING LABORATORY (2003)

J. SPARK-IGNITION MARINE WATERCRAFT EMISSIONS INVENTORY METHODOLOGY

K. ECONOMIC ANALYSIS METHODOLOGY FOR SPARK-IGNITION MARINE WATERCRAFT