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California Air Resources Board

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RE: STIHL Comments to the California Air Resources Board's *Notice of Public Availability of Modified Text and Availability of Additional Documents - Proposed Amendments to the Small Off-Road Engine Regulations: Transition to Zero Emissions ("15-Day Modifications)*

Dear Ms. Chang,
Dear Mr. Burford,
Dear Ms. Fibiger,
Dear Mr. Dilbeck,
Dear Ms. Singh,

As a leading manufacturer of outdoor power equipment, the worldwide STIHL Group ("STIHL") designs, manufactures and sells millions of battery, electric and combustion engine powered equipment each year. STIHL is committed to developing new technologies and innovations that support the transition to low emission technologies. As a technology front-runner, STIHL has a vital interest in moving its product portfolio to new technologies in order to fight climate change, support sustainability, foster biodiversity and respond to customers' expectations. Our core values for business strategies are leading the handheld equipment industry by innovations. Indeed, STIHL has invested more than 680 Mio USD to develop low emission products, most recently resulting in thirty-two (32) CARB certified emission families in California and fifty-seven (57) EPA-certified emission families.

STIHL Incorporated, the STIHL Group's U.S. headquarters and manufacturing facility manufactures over 75% of STIHL products sold in the United States, and employs almost 2,500 employees nationwide and distribute STIHL products to more than 10,000 US dealers. STIHL Inc. and Andreas STIHL AG & Co., KG (STIHL Inc.'s founding company and developer of STIHL products) are both active members of the Outdoor Power Equipment Institute ("OPEI"), the industry trade group responsible for advocating for the outdoor power equipment industry that represents more than 85% of the U.S. market for all outdoor power equipment categories. STIHL has signed on to the comments filed by OPEI, and respectfully submits the following supplemental comments to CARB's proposed 15-Day Modifications to the Original Proposal published on March 30th, 2022. (the "15-Day Modifications").

STIHL comments to the 15-Day Modifications to the Original Proposal

Comment 1: Modification to SORE Evaporative Emission Regulations for SORE ≤80 cc. (Attachment B)

CARB's 15-Day Modification to the original proposal in the ISOR adds language in section 2753 (c) and 2754(a)(1) to allow applicants to certify to the diurnal emission standards through model year 2023 for engines with displacement less than or equal to 80 cc. CARB staff justifies "*These proposed modification are necessary for manufacturer to be able to earn **more** evaporative emission credits than could occur under the proposed Amendments in the ISOR.*" It should be noted, however, that under the original proposed amendment in the ISOR it was impossible to generate and/or earn evaporative emission credits. The 15-day modification tries to enable manufacturers to earn evaporative emission credits but falls short. Earning evaporative emissions is not feasible for the following reasons:

a) Diurnal emission testing set forth in section 2754 (a)(1) means a completely new test procedure for engines with displacement less than or equal to 80 cc and replaces the current design standards set forth in section 2755 (permeation emission standards for fuel tank and fuel line). It is practically impossible to meet the new diurnal requirements with the proposed lead time of less than 1 year. This proposed diurnal testing requirements increase the necessary efforts significantly (test of each individual machine representative of an engine family and no clustering as before for the fuel tank and fuel line test for several engine families). For this purpose, significantly higher testing capacities have to be organized and corresponding equipment has to be purchased, which usually has long delivery times. The latter is even more uncertain given the current global supply chain issues.

   The diurnal emission testing itself takes more than 150 working days, without taking into account the preparation time in advance, availability of the measurement laboratories, evaluation of the test results and preparation of test reports. In addition, the CARB

Executive Officer needs another 120 days to issue an executive order. This does not take into account the additional lead time required by the new Mobile Source Certification and Compliance Fees Invoicing and Payment Process implemented from April 1st, 2022. In summary, it would take at least 270 days to complete the diurnal emission testing and certification for each of the 26 engine families approved by CARB.

b) If a diurnal emission testing set forth in section 2754 (a)(1) fails or if it turns out that technical or design changes have to be made to the engine / equipment, the remaining time is insufficient. This engine / equipment can therefore no longer be certified in accordance with diurnal emission testing.

c) The CARB feasibility study (DRAFT 2020 Emissions Model for Small Off-Road Engines - SORE2020) has clearly demonstrated that there is no compliance issue stemming from handheld equipment certified according to section 2755 (design based permeation emission standards) for Small off-road engines with displacements ≤ 80 cc when tested according to the diurnal emission set forth in section 2754 (a)(1). A variety of handheld equipment from different manufacturers (chainsaws, trimmers and blower with 2- and 4-stroke engines) were tested during CARB's feasibility study. Diurnal emission values from 0.390 to 0.593 g per test were obtained (see enclosure figure 1 and 2). STIHL evaporative emission measurements on chainsaws, backpack blowers and trimmers (see enclosure figure 3) likewise confirm the CARB results from the validation and compliance testing's published in the SORE2020 model final report from September 2020, tables 20 and 25. All values are well below the standard set forth in section 2754 (a)(1) (0.95 + 0.056 x nominal capacity [liters]).

d) A CARB feasibility study has not been provided for the 4-stroke 5 HP bin gasoline equipment category (backpack blowers) that fall under the current requirements for Small off-road engines with displacements ≤ 80 cc set forth in section 2755. This 4-stroke 5 HP bin gasoline equipment category in particular is characterized by the lowest exhaust emissions.

e) Trading of evaporative emission credits from ground-supported engines towards handheld engines would not be possible. Ground-supported engine manufacturers do not offer evaporative emission credits for trading.

The recent average, banking and trading (ABT) program allows manufacturers ***only*** to generate exhaust emission credits (5 years rule), but not to generate evaporative emission credits for small off-road engines with displacements ≤ 80 cc. The recent ABT program foresees several rules, inter alia a five year validity of the credits earned. As a responsible company as outlined above and reliable partner to the public, STIHL has significantly invested in the program over the last years. However, the proposed 15-Day Modification does not allow manufacturers to use up the previously earned exhaust emission credits. As demonstrated above, the remaining time through model year 2023 is far too short to collect any significant evaporative emission credits set forth in section 2753 (c) and 2754(a)(1). The majority of the earned exhaust emission credits will thus be forfeited. Past

and present efforts to improve engines and make engines / equipment available on the market that comply with much higher standards than legally required would be ignored, even penalized; trust and confidence in CARBs reliability would be weakened. Manufacturers and OPEI put forward many suggestions on how to improve the recent proposal in such a way that manufacturers could use up their existing exhaust emission credits. Thus far these proposals have not been seriously taken into account.

Therefore, STIHL believes that CARB's 15-Day Modifications to the original proposal in the ISOR needs to be extended by an optional provision that may allow manufacturer to convert exhaust emission credits earned through model year 2023 into evaporative emission credits in lieu of the hot soak plus diurnal emission standard set forth in sections 2754(a)(3) table 2.

STIHL proposes the following rather conservative credit calculation method to calculate "evaporative emissions over median life" based on diurnal emission standard (0.95 + 0.056 x nominal capacity [liters]) set forth in sections 2754(a)(1) table 1. With model year 2024 the hot soak plus diurnal emission standard set forth in sections 2754(a)(3) table 2 will be zero. Thus "evaporative emissions over median life" will be ***negative*** and can be offset by banked ***positive*** exhaust emission credits. In addition, an Uncertainty Factor UF of 1,5 is proposed as a safety factor including hot soak emissions, as no measurements are to be carried out for this.

For each evaporative family STIHL proposes, evaporative emission credits (negative) are to be calculated according to the following conservative equation and rounded to the nearest hundredth of gram. Consistent units with two significant digits are to be used throughout the equations.

Credits = -EFELD x production volume x ML x UF
(Credits = -(0.95 + 0.056 x nominal capacity [liters]) x production volume x ML x UF)

Where:

EFELD = Diurnal emission standard set forth in section 2754 (a)(1) – EMEL

EMEL = 0.00 gram

ML = Median Life [days]: 1095 days corresponds to 3 years (according enclosures figure 4: Table 16. Median Life (years) Lawn & Garden and Light Commercial Categories (SORE2020 Model))

UF = Uncertainty Factor of 1,5*

*) Consideration of hot soak emissions not included in section 2753 (c) and 2754(a)(1) table 1. Determination based on Table 20 of CARB 2020 Emissions Model for Small Off-Road Engines – SORE2020 final report.

STIHL is convinced that CARB could support such an approach for the following reasons:
An exhaust emission credit conversion towards evaporative emission credits does not negatively influence the emission reduction in the ISOR and will not change the expected emission reductions of NOx and ROG in the 2016 State SIP Strategy measure for SORE of 4 and 36 tons per day (tpd), respectively, in 2031, as compared to the Baseline Scenario emissions described in the ISOR.
On the contrary, the conversion of exhaust emission credits into evaporative emission credits within the handheld engines category prevents a trading towards ground-supported products (including high pressure washer >225cc and generators) which leads to a deterioration of the baseline scenario emissions described in the ISOR and will lead to an earlier fulfillment of the SIP.
The prerequisite for a credit conversion is that this may only be possible for equipment which is certified according to the Amended Evaporative Emission Regulation Order- Sections 2750 - 2774 (amended May 6, 2019) from model year 2020 through model year 2023.
This approach minimizes the hardship on manufacturers and consumers and eliminating unnecessary new certification work for CARB.
In principle, the proposed method for calculating the "evaporative emissions over median life" based on evaporative standard (0.95 + 0.056 x nominal capacity [liters]) and the uncertainty factor of 1.5 clearly exceeds the values from the CARB feasibility study (DRAFT 2020 Emissions Model for Small Off-Road Engines - SORE2020). However, it offers manufacturers the opportunity to avoid the time-consuming and costly diurnal emission testing set forth in sections 2753 (c) and 2754(a)(1) without a loophole to allow manufacturers the introduction of previously uncertified engines/equipment on the Californian market.

Comment 2: Harmonization of “handheld” definitions (Attachment A)
STIHL proposes to harmonize the "handheld" definition with federal 40 CFR Part 1054 language specified in section §1054.801. This change is necessary to avoid potential conflicts between federal and California definitions of “handheld” definitions.

Conclusion:

Sustainability is an integral part of a long tradition at STIHL, where continuity and long-term thinking have always been key elements of our business approach. We feel a special sense of obligation to our staff, the environment and society. Our sense of responsibility has evolved over a period of decades and is firmly rooted in our corporate culture, as reflected in STIHL’s significant investment in ZEE and other sustainable technologies.

The 15-Day Modifications only theoretically allow manufacturers to earn evaporative emission credits. Because the lead time for implementation of the new diurnal emissions test set forth in section 2754(a)(1) for Small off-road engines with displacements ≤ 80 cc, replacing the current design standards set forth in section 2755 (fuel tank and fuel line permeation emission standards), is too short to obtain significant evaporative emission credits in real terms. Therefore, STIHL proposes a conservative credit calculation method to calculate "average life evaporative emissions". With model year 2024, the "hot soak plus diurnal emission" standard set forth in Section 2754(a)(3), Table 2 will be zero. Thus, the calculated "average lifetime evaporative emissions" will be negative and can be offset by banked positive exhaust emission credits, if available. This significantly minimizes the burden on both manufacturers and CARB. Transferring exhaust emission credits into evaporative emission credits has no impact on the emission reductions in the ISOR and does not change the expected emission reductions in the 2016 State Implementation Plan, as these have already been priced in.

Against this backdrop, we are convinced that the above-mentioned measures would guarantee the 2016 State Implementation Plan and 2031 federal air-quality standards to be met.
To be clear and transparent, STIHL wholeheartedly supports the transition towards zero-emission equipment. In order to make the transition a success, the potential underlying regulatory framework needs to be technology-neutral and the feasibility of the transition must be adequately examined and prepared to ensure market acceptance and supply chain capabilities. The optional opportunity for manufacturer will support CARB's transition to Zero emission equipment for a very limited transfer period and limited number of clean handheld Small off-road engines with displacements ≤ 80 cc by allowing a short window of flexibility to customers like professional landscapers as well as to engine / equipment manufacturers.

STIHL would be grateful if CARB would consider the above-mentioned comments. STIHL is prepared to jointly develop a regulatory plan for a transition towards ZEE that effectively reduces emissions, responds to the needs and expectations of customers and small businesses, and allows innovative solutions to be developed and businesses to implement and adapt accordingly.

Additional Documents added to the STIHL record

1. CARB 2020 Emissions Model for Small Off-Road Engines – SORE2020 final report. Available at: https://ww2.arb.ca.gov/sites/default/files/2020-09/SORE2020_Technical_Documentation_2020_09_09_Final_Cleaned_ADA.pdf. Published: September 2020

2. US EPA Code of Federal Regulation, Title 40, Chapter I, Subpart U, Part 1054. Available at: https://www.ecfr.gov/current/title-40/chapter-I/subchapter-U/part-1054?toc=1. Last amended 4/6/2022

Yours sincerely,

ANDREAS STIHL AG & Co. KG
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Robert Olma
(Vice President Global Governmental Relations)

Enclosures
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Enclosures:

Table 20. Average Evaporative Emission Results (grams and g/day)

Technology	Equipment (Model Year > 2010)	HP Bin	Number of Tests	Evaporative Emissions Test Data*	
				Hot Soak (g)	24-hour Diurnal (g/day)
Gasoline 4-stroke	Blower	2	9	0.126	0.529
	Generator		3	0.847	12.366
	Trimmer		18	0.078	0.593
	Generator	5	15	1.387	2.747
	Lawn Mower		65	0.157	0.823
	Pressure Washer		10	0.136	0.608
	Trimmer		6	0.082	0.545
	Generator (49-state)		1	0.537	1.881
	Chipper/Stump Grinder		3	0.160	1.488
	Compressor	15	10	0.411	8.178
	Generator		36	0.831	2.922
	Lawn Mower		10	0.195	0.796
	Pressure Washer		10	0.164	1.171
	Riding Mower		6	0.135	0.965
	Tiller		14	0.107	0.839
	Chipper (49-state)		1	0.319	2.476
	Chipper/Stump Grinder		5	0.177	0.896
	Riding Mower	25	21	0.379	2.122
	Tractor		9	0.582	1.769
Gasoline 2-stroke	Blower	All	3	0.138	0.460
	Chainsaw		3	0.129	0.390
	Generator		1	1.031	1.931
	Tiller		1	0.724	2.624
	Trimmer		4	0.086	0.431

* Emissions test data for tests with E10 fuel are converted to E0 for use in the model

Figure 1: CARB 2020 Emissions Model for Small Off-Road Engines – SORE2020 final report

Table 25. Hot Soak and Diurnal Emission Factors (SORE2020)

Category	Equipment	Tech Type	HP	Evap Emission Factors	
				Hot Soak (g/start)	24-hr Diurnal (g/day)
Lawn & Garden	Chainsaws	G2-Carb	2	0.129	0.390
			5	0.129	0.390
	Chainsaws Preempt	G2-Carb	2	0.129	0.390
			5	0.129	0.390
	Chippers/Stump Grinders/Shredders	G4-Carb	2	0.160	1.488
			5	0.160	1.488
			15	0.177	0.896
	Lawn Mowers	G4-Carb	2	0.157	0.823
			5	0.157	0.823
			15	0.195	0.796
			25	0.195	0.796
	Leaf Blowers/Vacuums	G2-Carb	2	0.138	0.460
			5	0.138	0.460
		G4-Carb	2	0.126	0.529
			5	0.126	0.529
			15	0.378	3.278
			25	0.378	3.278
		G4-FI	25	0.378	3.278
	Other Lawn & Garden Equipment	G4-Carb	5	0.157	0.823
			15	0.195	0.796
			25	0.195	0.796
	Riding Mowers/Tractors	G4-Carb	5	0.135	0.965
			15	0.135	0.965
			25	0.480	1.945
		G4-FI	25	0.480	1.945
	Snow Blowers	G4-Carb	5	0.126	0.529
			15	0.378	3.278
			25	0.378	3.278
	Tillers	G2-Carb	2	0.724	2.624
		G4-Carb	2	0.157	0.823
			5	0.157	0.823
			15	0.195	0.796
	Trimmers/Edgers/Brush Cutters	G2-Carb	2	0.086	0.431
			5	0.086	0.431
		G4-Carb	2	0.078	0.593
			5	0.082	0.545
			15	0.378	3.278
	Wood Splitters	G4-Carb	2	0.160	1.488
			5	0.160	1.488
			15	0.177	0.896
			25	0.177	0.896

Figure 2: CARB 2020 Emissions Model for Small Off-Road Engines – SORE2020 final report

Technology	Equipment (Model Year > 2010)	HP Bin	Number of Test Data	Evaporative Emissions Test Data	
				Hot Soak (g)	24-hour Diurnal (g/day)
Gasoline 4-stroke	Blower	5	5	0,147	0,548
	Trimmer	2	5	0,037	0,480
Gasoline 2-stroke	Chainsaw	5	3	0,087	0,349
	Chainsaw	2	2	0,092	0,224

Figure 3: STIHL hot soak plus 24-hr diurnal evaporative emission test results

Table 16. Median Life for Lawn & Garden and Light Commercial Categories

Category	Gasoline Equipment	2018 Survey Median Life (years)		
		Residential	Business	Vendor
Lawn & Garden	Chainsaws	5	3	2
	Lawn Mowers	6	5	3
	Leaf Blowers	5	3	2
	Other Lawn & Garden	-	3	2
	Riding Mowers	8	-	5
	Trimmers	5	3	2
Light Commercial	Compressors	3	3	3
	Generator	7	5	4
	Pressure Washers	5	3	3
	Pumps	6	8	3
	Welders	10	5	4

Figure 4: Table 16 Median Life (yrs) Lawn & Garden and Light Commercial Categories (SORE2020 Model)