

## **Appendix C-2**

Summary and Response to Department of Finance  
Comments on the Standardized Regulatory Impact  
Assessment for Commercial Harbor Craft

Proposed Amendments to the  
Commercial Harbor Craft Regulation

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## **I. Summary and Response to Department of Finance (DOF) Comments on the Standardized Regulatory Impact Assessment (SRIA)**

### **A. DOF Comment #1**

Given that the timing of costs and benefits depends on the compliance scenario assumptions, underlying fitment factors, and uptake of extensions, the SRIA should disclose the feasible range of these parameters and discuss the sensitivity of the cost and benefit estimates to these parameters. For example, the compliance scenarios are based on the assumption that technological growth increases the feasibility of repowering over time, but it is not clear what that rate of technological advancement is, how it influences compliance timing, or how many businesses would fail to come into compliance if repower feasibility does not grow at the assumed rate. The SRIA should also clarify whether the same compliance scenario assumptions were used in the estimation of avoided adverse health outcomes as in the cost estimates.

#### **1. Response to DOF Comment #1**

Staff prepared cost estimates for high and low technology feasibility growth scenarios, which are described further below. However, staff would like to clarify that if repower and retrofit feasibility does not grow at the assumed rate, the Proposed Amendments provide a pathway for entities to apply for and receive compliance extensions rather than “fail to come into compliance” as DOF’s comment states. Failure to come into compliance and receiving a compliance extension do not represent the same circumstances because receiving a compliance extension would allow an entity to remain in compliance with the regulation even if repower and retrofit technology does not advance at the rate expected.

As DOF has pointed out, the presentation of costs and benefits (including health benefits) in the SRIA are based on compliance assumption scenarios including fitment factors for repowers and retrofits, vessel replacement, and the usage of low-use extensions or low-use exceptions. To address DOF’s comment on the feasible range of these parameters and the sensitivity of the cost and benefits associated with these assumptions, staff analyzed two alternative compliance assumption scenarios as further discussed below.

##### **a. Sensitivity Analysis of Compliance Assumption Scenarios**

As discussed in Chapter C of the SRIA (Appendix C-1 of the ISOR), staff made assumptions about the compliance rate for pre-Tier 1 and Tier 1 engines to repower to Tier 4 and also for pre-Tier 1 through Tier 4 engines to repower to Tier 4 plus a DPF (SRIA, Tables C-4 and C-5). These assumptions were based on the feasibility determinations made in the 2019 evaluation conducted by the California State

University Maritime Academy (CSU Maritime Academy or CMA)<sup>1</sup> and represent staff's best judgement to quantify a qualitative feasibility determination based on the current status of marine engine technology. To address the uncertainty of the marine engine technological advancement and how this would influence compliance timing and costs, staff analyzed two additional compliance assumption scenarios and compared the resulting costs with the SRIA scenario. The first compliance assumption scenario, Scenario B, considered a more advanced technology scenario whereby the majority of vessels would be able to repower and retrofit to meet the initial compliance deadline and the use of extensions would be non-existent. For the second compliance assumption scenario, Scenario C, staff analyzed a less advanced technology scenario whereby fewer vessels would be able to repower and retrofit by their initial compliance date due to limitations on meeting the required technology requirements. For purposes of this analysis, the SRIA compliance assumption scenario is considered Scenario A.

#### **b. Compliance Assumption Scenario B**

Under this scenario, staff assumes that 95 percent of vessels (with the exception of short-run ferries) would comply with the Proposed Amendments by repowering and retrofitting by the initial compliance date. Staff assumes that short-run ferries would continue to comply with Zero Emission and Advanced Technology (ZEAT) requirements under this scenario because the technology already exists.

Table C-2-1 lists the compliance assumptions for Scenario B for vessels with pre-Tier 1 and Tier 1 engines repowering to Tier 4 engines. Table C-2-2 lists the percentage of vessels that would repower and retrofit to Tier 4 plus a DPF (for engines >448 kW). Under this scenario, technology would advance to the point where existing vessels could accommodate repowers, therefore vessel owners would not need to apply for and receive compliance extensions or replace vessels. Therefore, because the majority of vessel owners (95 percent) would be able to repower and retrofit their engines by the initial compliance date, vessel replacements are assumed to cover the remaining vessels (5 percent) and no extensions would be necessary as shown in Tables 1 and 2 below. The costs associated with this scenario would decrease compared with Scenario A. The non-amortized costs would decrease from \$2.11 billion to \$1.67 billion and the amortized costs would decrease from \$1.82 billion to \$1.71 billion. Under Scenario B, staff assumed that fewer vessels would need to be replaced, and instead would be repowered, which has a lower unit cost (\$/hp) than vessel replacement. These factors in combination with other factors such as vessel useful life, engine useful life, and interest accrued would result in lower costs than Scenario A. Table C-2-3 lists the amortized and non-amortized compliance costs associated with these scenarios under Scenario B for the analysis period, 2023 through 2038.

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<sup>1</sup> CSU Maritime Academy, Evaluation of the Feasibility and Costs of Installing Tier 4 Engines and Retrofit Exhaust Aftertreatment on In-Use Commercial Harbor Craft, 2019, <https://ww2.arb.ca.gov/sites/default/files/2019-10/cmafeasibilityreport09302019.pdf>.

**Table C-2-1. Compliance Assumption Scenario B for pre-Tier 1 and Tier 1 to Tier 4 Repowers  
(Engines >600 HP/448 kW)**

Vessel Category	% Vessel Repowers/ Retrofits by Initial Compliance Date	% Vessel Replacements by Initial Compliance Date	% Vessel Repowers/ Retrofits after 1 <sup>st</sup> Extension	% Vessel Replacements after 1 <sup>st</sup> Extension	% Vessel Repowers/ Retrofits after 2 <sup>nd</sup> Extension	% Vessel Replacements after 2 <sup>nd</sup> Extension
Ferry, Catamaran	95%	5%	0%	0%	0%	0%
Ferry, Monohull	95%	5%	0%	0%	0%	0%
Ferry, Short Run	100%	0%	0%	0%	0%	0%
Pilot Boat	95%	5%	0%	0%	0%	0%
Push/Tow Tug	95%	5%	0%	0%	0%	0%
Escort/Ship Assist Tug	95%	5%	0%	0%	0%	0%
ATB Tug	95%	5%	0%	0%	0%	0%
Research Vessel	95%	5%	0%	0%	0%	0%
Commercial Passenger Fishing	95%	5%	0%	0%	0%	0%
Excursion	95%	5%	0%	0%	0%	0%
Dredge	95%	5%	0%	0%	0%	0%
ATB Barge	95%	5%	0%	0%	0%	0%
Bunker Barge	95%	5%	0%	0%	0%	0%
Other Barge	95%	5%	0%	0%	0%	0%
Towed Petrochemical Barge	95%	5%	0%	0%	0%	0%
Crew Supply	95%	5%	0%	0%	0%	0%
Workboat	95%	5%	0%	0%	0%	0%

**Table C-2-2. Compliance Assumption Scenario B for Percentage of CHC Repowering and Retrofit to Tier 4+DPF (Engines >600 HP/448 kW)**

Vessel Category	% Vessel Repowers/ Retrofits by Initial Compliance Date	% Vessel Replacements by Initial Compliance Date	% Vessel Repowers/ Retrofits after 1 <sup>st</sup> Extension Period	% Vessel Replacements after 1 <sup>st</sup> Extension Period	% Vessel Repowers/ Retrofits after 2 <sup>nd</sup> Extension	% Vessel Replacements after 2 <sup>nd</sup> Extension
Ferry, Catamaran	95%	5%	0%	0%	0%	0%
Ferry, Monohull	95%	5%	0%	0%	0%	0%
Ferry, Short Run	100%	0%	0%	0%	0%	0%
Pilot Boat	95%	5%	0%	0%	0%	0%
Push/Tow Tug	95%	5%	0%	0%	0%	0%
Escort/Ship Assist Tug	95%	5%	0%	0%	0%	0%
ATB Tug	95%	5%	0%	0%	0%	0%

Vessel Category	% Vessel Repowers/Retrofits by Initial Compliance Date	% Vessel Replacements by Initial Compliance Date	% Vessel Repowers/Retrofits after 1 <sup>st</sup> Extension Period	% Vessel Replacements after 1 <sup>st</sup> Extension Period	% Vessel Repowers/Retrofits after 2 <sup>nd</sup> Extension	% Vessel Replacements after 2 <sup>nd</sup> Extension
Research Vessel	95%	5%	0%	0%	0%	0%
Commercial Passenger Fishing	95%	5%	0%	0%	0%	0%
Excursion	95%	5%	0%	0%	0%	0%
Dredge	95%	5%	0%	0%	0%	0%
ATB Barge	95%	5%	0%	0%	0%	0%
Bunker Barge	95%	5%	0%	0%	0%	0%
Other Barge	95%	5%	0%	0%	0%	0%
Towed Petrochemical Barge	95%	5%	0%	0%	0%	0%
Crew Supply Workboat	95%	5%	0%	0%	0%	0%

**Table C-2-3. Compliance Costs for Compliance Assumption Scenario B (2023-2038)**

Year	Amortized Costs	Non-Amortized Costs
2023	\$31,932,135	\$177,694,598
2024	\$51,134,835	\$387,842,716
2025	\$70,051,884	\$268,828,568
2026	\$87,357,951	\$205,255,841
2027	\$99,025,126	\$142,907,325
2028	\$109,618,599	\$132,207,827
2029	\$114,468,404	\$72,713,389
2030	\$123,537,826	\$138,471,733
2031	\$125,547,128	\$52,439,961
2032	\$127,427,962	\$49,876,399
2033	\$127,895,976	\$8,051,689
2034	\$127,420,340	\$7,576,027
2035	\$127,414,520	\$7,570,179
2036	\$127,407,450	\$7,563,081
2037	\$127,404,040	\$7,559,642
2038	\$127,873,567	\$8,029,140
Total	\$1,705,517,744	\$1,674,588,115

**c. Compliance Assumption Scenario C**

Under Scenario C, staff assumes that only half of the original vessel re-powers and retrofits assumed in the SRIA would be able to occur by the initial compliance date due to decreased marine engine technological advancement. As assumed in all compliance assumption scenarios presented, staff assumes that short-run ferries would continue to comply with ZEAT requirements under this scenario.

Table C-2-4 lists the compliance assumptions for Scenario C for vessels with pre-Tier 1 and Tier 1 engines repowering to Tier 4 engines. Table C-2-5 lists the percentage of vessels that would repower and retrofit to Tier 4 plus a DPF (for engines >448 kW).

Under this scenario, only 50 percent of vessels in each individual CHC vessel category (Table C-4 in the SRIA) are assumed to be able to repower and retrofit by the initial compliance date. The initial percentages of repowers and retrofits for each vessel category in the SRIA rely on feasibility determinations from the CMA report. The percentages assigned to each category are staff assumptions based on the expectation that technology improvement and increased product offerings over time will lead to increased feasibility of repowering and retrofitting vessels. Under this scenario, fewer vessels would be able to repower or retrofit by the initial compliance date due to insufficient marine engine technological advancements. Therefore, vessel owners would need to seek extensions to remain in compliance until the required technology was made available, or replace their vessels. Both the amortized and non-amortized costs to vessel owners associated with this scenario would increase due to the higher rate of vessel replacements that would be required if extensions were not applied for and granted. The non-amortized costs would increase from \$2.11 billion to \$3.02 billion and the amortized costs would increase from \$1.82 billion to \$2.30 billion. Table C-2-6 lists the amortized and non-amortized compliance costs associated with these scenarios under Assumption C for the analysis period 2023 through 2038.

**Table C-2-4. Compliance Assumption Scenario C for Tier 0 and Tier 1 to Tier 4 Repowers (Engines >600HP/448kW)**

Vessel Category	% Vessel Repowers/Retrofits by Initial Compliance Date	% Vessel Replacements by Initial Compliance Date	% Vessel Repowers/Retrofits after 1 <sup>st</sup> Extension	% Vessel Replacements after 1 <sup>st</sup> Extension	% Vessel Repowers/Retrofits after 2 <sup>nd</sup> Extension	% Vessel Replacements after 2 <sup>nd</sup> Extension
Ferry, Catamaran	38%	5%	14.4%	14.4%	14.4%	14.4%
Ferry, Monohull	45%	5%	12.5%	12.5%	12.5%	12.5%
Ferry, Short Run	100%	0%	0.0%	0.0%	0.0%	0.0%
Pilot Boat	38%	5%	14.4%	14.4%	14.4%	14.4%
Push/Tow Tug	45%	5%	12.5%	12.5%	12.5%	12.5%
Escort/Ship Assist Tug	48%	5%	11.9%	11.9%	11.9%	11.9%
ATB Tug	48%	5%	11.9%	11.9%	11.9%	11.9%
Research Vessel	38%	5%	14.4%	14.4%	14.4%	14.4%
Commercial Passenger Fishing	25%	5%	17.5%	17.5%	17.5%	17.5%
Excursion	48%	5%	11.9%	11.9%	11.9%	11.9%
Dredge	45%	5%	12.5%	12.5%	12.5%	12.5%
ATB Barge	48%	5%	11.9%	11.9%	11.9%	11.9%
Bunker Barge	48%	5%	11.9%	11.9%	11.9%	11.9%
Other Barge	45%	5%	12.5%	12.5%	12.5%	12.5%
Towed Petrochemical Barge	45%	5%	12.5%	12.5%	12.5%	12.5%
Crew Supply Workboat	38%	5%	14.4%	14.4%	14.4%	14.4%



**Table C-2-5. Compliance Assumption Scenario C for Percentage of CHC Repowering and Retrofit to Tier 4+DPF (Engines >600HP/448kW)**

Vessel Category	% Vessel Repowers/Retrofits by Initial Compliance Date	% Vessel Replacements by Initial Compliance Date	% Vessel Repowers/Retrofits after 1 <sup>st</sup> Extension Period	% Vessel Replacements after 1 <sup>st</sup> Extension Period	% Vessel Repowers/Retrofits after 2 <sup>nd</sup> Extension	% Vessel Replacements after 2 <sup>nd</sup> Extension
Ferry, Catamaran	16%	5%	19.8%	19.8%	19.8%	19.8%
Ferry, Monohull	21%	5%	18.4%	18.4%	18.4%	18.4%
Ferry, Short Run	100%	0%	0.0%	0.0%	0.0%	0.0%
Pilot Boat	25%	5%	17.5%	17.5%	17.5%	17.5%
Push/Tow Tug	40%	5%	13.8%	13.8%	13.8%	13.8%
Escort/Ship Assist Tug	45%	5%	12.5%	12.5%	12.5%	12.5%
ATB Tug	45%	5%	12.5%	12.5%	12.5%	12.5%
Research Vessel	25%	5%	17.5%	17.5%	17.5%	17.5%
Commercial Passenger Fishing	1%	5%	0.0%	47.3%	0.0%	47.3%
Excursion	45%	5%	12.5%	12.5%	12.5%	12.5%
Dredge	40%	5%	13.8%	13.8%	13.8%	13.8%
ATB Barge	45%	5%	12.5%	12.5%	12.5%	12.5%
Bunker Barge	45%	5%	12.5%	12.5%	12.5%	12.5%
Other Barge	40%	5%	13.8%	13.8%	13.8%	13.8%
Towed Petrochemical Barge	40%	5%	13.8%	13.8%	13.8%	13.8%
Crew Supply	25%	5%	17.5%	17.5%	17.5%	17.5%
Workboat	25%	5%	17.5%	17.5%	17.5%	17.5%

**Table C-2-6. Compliance Costs for Compliance Assumption Scenario C (2023-2038)**

Year	Amortized Costs	Non-Amortized Costs
2023	\$62,154,099	\$239,283,036
2024	\$66,714,234	\$318,080,646
2025	\$77,511,626	\$272,129,368
2026	\$88,577,665	\$163,833,833
2027	\$103,977,820	\$220,514,429
2028	\$116,647,594	\$192,811,764
2029	\$122,869,225	\$208,133,862
2030	\$143,718,454	\$323,814,759
2031	\$159,236,717	\$263,526,759
2032	\$169,982,483	\$186,600,124
2033	\$187,883,914	\$265,239,608
2034	\$198,070,263	\$180,760,163
2035	\$196,913,237	\$85,718,516
2036	\$201,981,610	\$88,090,638
2037	\$201,978,199	\$7,960,877
2038	\$202,447,727	\$8,430,375
Total	\$2,300,664,866	\$3,024,928,759

Table C-2-7 summarizes the compliance costs for the assumptions used in the SRIA (Scenario A) and compares them to those costs under compliance assumption Scenarios B and C. The amortized costs from 2023 to 2038 ranged from \$1.71 billion to \$2.30 billion and the non-amortized costs ranged from \$1. billion to \$3.02 billion under these three assumptions.

**Table C-2-7. Comparison of Compliance Costs of 3 Compliance Assumption Scenarios (2023-2038)**

Compliance Costs	Scenario A (SRIA)	Scenario B (Faster Growth of Technology Feasibility)	Scenario C (Slower Growth of Technology Feasibility)
Amortized Costs	\$1,816,616,000	\$1,705,518,000	\$2,300,665,000
Non-Amortized Costs	\$2,110,531,000	\$1,674,608,000	\$3,024,948,000

The valuation of health benefits for the Proposed Amendments is estimated at \$4.95 billion for the evaluation period of 2023 through 2038 (SRIA Table B-4). Under compliance assumption Scenario B, staff assumed that technology would advance at a faster rate than what was assumed in the SRIA. Since more vessels would be able to meet the proposed performance standard under this scenario, increased health benefits would be expected to occur sooner and the overall health benefits would be greater than those under Scenario A. Under compliance assumption Scenario C, if technology advances slower than the rate staff assumes in the SRIA, fewer vessels would be able to meet the proposed performance standard initially. There would be less health benefits in the early years of the assessment but by 2038, Scenario A and C would have the same annual benefits.

Staff did not quantify changes to the valuation of health benefits that would result from compliance assumption scenarios B and C. However, staff expects that changes to the health benefits would be small because the health benefit calculation is less sensitive than the cost calculation to the changes to compliance assumptions made for scenarios B and C. This is because faster technology advancement would result in more engine repowers and fewer vessel replacements, and costs for vessel replacements are much higher than costs for repowers, but the emission reductions of repowering versus vessel replacement is identical. However, because the timing of introducing cleaner engines would change in Scenarios B and C relative to Scenario A, the cumulative emission benefits over the evaluation period of 2023 through 2038 would also change. There would be an increase in total health benefits in Scenario B and a decrease in health benefits in Scenario C, relative to Scenario A. Because emission benefits would shift earlier or later within the evaluation period by the same number of years as costs, the relative differences between overall monetized benefits and regulatory costs would not change substantially. Staff highlights that the changes in cost are primarily the result of a different cost between repowering and replacing vessels to comply with the Proposed Amendments. The amortized and non-amortized costs from 2023 to 2038 under all scenarios would still be less than the estimated health benefit cost savings of \$4.95 billion.

## B. DOF Comment #2

The SRIA should report costs and benefits separately from any offsetting benefits or costs, and annual fiscal impacts should be disclosed clearly. While the SRIA reports a lot of detailed information that helps communicate the nuances of the proposed regulations, the SRIA can gain transparency by adding a summary table that indicates the total costs (without netting savings), total benefits, and fiscal impacts in an aggregated annual table.

### 1. Response to DOF Comment #2

Aggregated summary tables are provided below.

**Table C-2-8. Total Amortized Costs and Benefits (Amortized Cost Savings and Health Benefits of the Proposed Amendments (2023-2038))**

Year	Total Amortized Costs (Table C-2-C-25 of SRIA)	Total Benefits (Amortized Cost Savings and Health Benefits)
2023	\$41,876,173	\$66,074,886
2024	\$56,869,507	\$107,446,193
2025	\$75,319,470	\$148,924,033
2026	\$90,849,040	\$195,269,710
2027	\$105,106,674	\$227,501,079
2028	\$116,004,269	\$254,742,380
2029	\$121,304,421	\$284,012,050
2030	\$137,735,184	\$330,123,719
2031	\$145,567,485	\$375,886,628
2032	\$152,869,984	\$411,379,980
2033	\$162,281,543	\$442,250,426
2034	\$167,548,476	\$453,145,610
2035	\$165,988,777	\$466,394,114
2036	\$168,626,895	\$471,539,439
2037	\$168,626,337	\$472,603,291
2038	\$169,099,435	\$471,682,863
Total	\$2,045,673,665	\$5,178,976,401

**Table C-2-9. Local and State Government Fiscal Impacts of Proposed Amendments (2023-2038)**

<b>Year</b>	<b>Local Govt Costs</b>	<b>Local Govt Benefits</b>	<b>State Govt Costs</b>	<b>State Govt Benefits</b>
2023	\$4,461,598	\$2,743,319	\$3,146,537	\$4,858,656
2024	\$6,981,519	\$6,070,704	\$4,179,230	\$7,585,005
2025	\$4,766,851	\$4,718,811	\$3,702,626	\$6,449,369
2026	\$3,288,984	\$3,260,838	\$3,132,269	\$5,165,802
2027	\$3,316,216	\$2,687,601	\$3,145,424	\$4,593,231
2028	\$2,819,784	\$2,094,346	\$2,954,436	\$4,139,439
2029	\$2,645,330	\$1,577,654	\$2,884,537	\$3,635,172
2030	\$4,354,221	\$3,080,761	\$3,561,577	\$4,822,514
2031	\$2,717,103	\$1,946,413	\$2,922,920	\$3,976,356
2032	\$2,588,673	\$1,860,190	\$2,874,387	\$3,880,021
2033	\$2,572,330	\$1,488,482	\$2,871,191	\$3,501,519
2034	\$1,992,631	\$1,110,070	\$2,644,791	\$3,240,842
2035	\$1,073,908	\$529,792	\$2,285,972	\$2,847,912
2036	\$1,205,821	\$569,489	\$2,338,314	\$2,870,432
2037	\$599,209	\$241,688	\$2,100,988	\$2,642,136
2038	\$606,995	\$241,664	\$2,104,088	\$2,642,172
<b>Total</b>	<b>\$45,991,173</b>	<b>\$34,221,821</b>	<b>\$46,849,287</b>	<b>\$66,850,578</b>