Appendix E

Nonrecurring Cost Estimates

Proposed Amendments to the California Consumer Products Regulations

Date of Release: February 2, 2021
Date of Hearing: March 25, 2021

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Appendix E:
Nonrecurring Cost Estimates

In this Appendix, staff provides additional detail regarding derivation of non-recurring cost information utilized to determine Proposed Amendment compliance costs. Non-recurring costs are assumed to be costs incurred once to reformulate complying products, and are independent of, and in addition to, the costs of ingredients to produce a product (recurring costs).

CARB has utilized two complementary approaches to identify non-recurring costs for the Proposed Amendments. The first methodology has been utilized to estimate non-recurring cost per product formulation each time CARB has adopted or amended VOC standards over the past 30 years. This traditional approach has been reviewed, refined, and generally accepted by industry stakeholders, particularly over the past 15 years, and the reasons justifying its use have not changed. The second cost estimation methodology reflects manufacturer-derived costs based upon data from CARB surveys sent to product manufacturers in mid-2020. This more recent data is based upon a relatively small percentage of product manufacturers and has not faced the same level of scrutiny as the traditional cost methodology. But 2020 cost survey responses reflect a more recent snapshot of potential non-recurring costs, and CARB staff believe they are generally reasonable. Descriptions of these two approaches and how they are utilized to estimate non-recurring costs for the Proposed Amendments are provided below.

Traditional Nonrecurring Cost Methodology. Over the past thirty years, CARB amendments to the Consumer Product Regulation have utilized a set of reformulation costs for each phase of bringing a reformulated product to market, based upon identified 1991 product reformulation costs (CARB 2013). These product reformulation costs have been updated over the years in collaboration with industry stakeholders based upon a well-established method of adjusting costs based upon the rate of growth of the Chemical Engineering Plant Cost Index (Peters and Timmerhaus, 1980). This method and associated nonrecurring cost estimates were updated based upon new cost data and information during 2006 Consumer Product Regulation amendments, and have been generally accepted as reasonable by industry stakeholders during the most recent program rulemakings in 2006, 2008, 2009, 2010, and 2013. The Chemical Engineering Plant Cost Index method provides nonrecurring costs for the following phases of product development:

- Product Development: Given a set of new product requirements, a laboratory prototype for product evaluation and testing may be developed. This includes formulating the contents and specifying the packaging and raw materials. New packaging and chemical formula components may need to be sourced.

- Product Testing, including:

    - Stability Testing. Stability testing ensures that the newly formulated chemical composition and/or package are compatible with each other and

with product function for a reasonable period of time. Food and Drug Administration- (FDA) and U.S. Environmental Protection Agency- (U.S. EPA) regulated products require extra steps to ensure the stability of active ingredients and the kill claims of products such as disinfectants and insecticides.

  - Efficacy Testing. Efficacy testing seeks to ensure that the product maintains the ability to perform label claims and meet customer expectations. For U.S. EPA-registered products, such as crawling bug insecticide, this would require extensive testing by a specialized laboratory, most likely not the manufacturer's own laboratory. The testing must be documented with and meet the approval of U.S. EPA.

  - Safety Test. Safety testing costs include testing of the new product to ensure safety to manufacturing personnel during fabrication, logistics personnel during transit, and to the consumer during use and storage.

- Labeling Modifications: Cost assigned for labeling modifications are those required when product qualities or use instructions change.

- Registration Fees (if applicable): Registration expenses are incurred for products requiring U.S. EPA and California Department of Pesticide Regulation registration, such as "Crawling Bug Insecticide," whenever changes are made to the label or formula.

- Marketing: The costs for marketing consider focus group testing, conducting surveys, advertising, and design and publication of print and internet materials. Marketing includes literature costs incurred when new sales and marketing and/or technical literature needs to be developed and distributed in order to inform customers of the attributes of a new product.

- Manufacturing: The costs for manufacturing consider the technology and infrastructure required to mass produce a product. Manufacturing costs to comply with proposed standards can include "pilot plant" testing and/or retooling of production lines, or construction of completely new facilities.

- Other: Survey participants had the option to identify other costs that may not fit into the above categories.

The Low and High cost per product, utilizing the Chemical Engineering Plant Cost Index method, are provided in Table E-1:

Table E-1:
Total Nonrecurring Cost per Product Formulation
Based upon the Chemical Engineering Plant Cost Index Methodology[1]

	Low Cost	High Cost
Manual Aerosol Air Freshener	$18,159	$189,830
Hair Finishing Spray	$14,628	$133,335
Dry Shampoo	$14,628	$133,335
Hair Shine	$14,628	$133,335
Temporary Hair Color	$14,628	$133,335
Personal Fragrance Products	$14,628	$133,335
Aerosol Crawling Bug Insecticide	$19,334	$185,631

The low and high cost values identified in Table E-1 are adjusted to 2019 dollars, based upon a Chemical Engineering Plant Cost Index value of 607.5. More information regarding the Chemical Engineering Plant Cost Index method of determining non-recurring consumer product reformulation costs can be found in Appendix J of the *Initial Statement of Reasons: Proposed Amendments to the Antiperspirants and Deodorants Regulation, the Consumer Products Regulation, the Aerosol Coating Products Regulation, the Tables of MIR Values, Test Method 310, and Proposed Repeal of the Hairspray Credit Program* (CARB; 2013).

2020 Cost Survey. To supplement this traditional method of estimating nonrecurring costs, CARB conducted a cost survey of consumer product manufacturers (2020 Cost Survey) to inform staff's evaluation of nonrecurring compliance costs. In June 2020, CARB sent more than 820 cost surveys to manufacturers of products proposed for VOC standards as part of this rulemaking. These category-specific surveys asked manufacturers to estimate a range of costs to comply with each of the proposed VOC standards. Given the low manufacturer response rate to cost surveys conducted as part of Consumer Product Regulation Amendments in previous years, this survey was geared to encourage greater industry participation, with a relatively straightforward and brief multiple choice format.

CARB staff worked closely with public stakeholders, including the Household and Commercial Products Association, the Personal Care Products Council, and the

Fragrance Creators Association to ensure that product manufacturers were aware of this opportunity to provide compliance cost estimates to CARB.

The number of manufacturers contacted, responses received, and average estimated low and high costs provided by participating product manufacturers are identified in Table E-2.

Table E-2:
Responses to the 2020 Cost Surveys

Cost Survey Category Name	Number of Manufacturers Contacted	Number of Responses	Average of Estimated Low Cost per Formulation		Average of Estimated High Cost per Formulation	
Aerosol Crawling Bug Insecticide	19	3	$214,501		$476,000	
Dry Shampoo	158	7	Tier 1	Tier 2	Tier 1	Tier 2
			$76,121	$141,422	$169,082	$298,125
Hair Finishing Spray		10	$56,550		$139,478	
Hair Shine		7	$72,351		$176,976	
Temporary Hair Color		6	$38,922		$121,333	
Personal Fragrance Products	152	16*	Tier 1	Tier 2	Tier 1	Tier 2
			$48,586	$184,080	$125,761	$280,655
Manual Aerosol Air Freshener	21	3	Tier 1**	Tier 2**	Tier 1**	Tier 2**
			$308,890	$477,109	$308,890	$477,109

* Ten of the 16 survey respondents did not provide cost estimates.
** Respondents provided a single reformulation cost for both Tiers, including nonrecurring costs to transition to compressed gas propellants.

The 2020 Cost Survey requested manufacturers estimate compliance costs applicable to what were, at the time, more stringent proposed standards in six of the seven proposed categories. Many product manufacturers in multiple categories utilized comments sections within the survey to express opposition to these previous staff proposals. For example, at the time of the 2020 Cost Survey, CARB was proposing a Tier 1 Personal Fragrance Product standard of 68 percent VOC content, applicable to products with 10 percent or less fragrance. Ten of the 16 Personal Fragrance Product manufacturers responding to the 2020 Cost Survey expressed significant opposition to this proposal with identical language. Staff believes that cost estimates provided for previously proposed standards that many respondents indicated would be infeasible would be likely to skew higher (due to manufacturer feasibility concerns) than cost estimates for the more generally accepted current staff proposals.

This assessment is borne out by a comparison of the 2020 Cost Survey results with non-recurring cost estimates from previous Consumer Product Regulation amendments, identified previously in Table E-1(ToxEcology, 2014).[1] While 2020 Survey Costs are slightly higher in most Hair Care categories, they are orders of magnitude higher in other categories. Staff has been unable to identify a compelling reason why non-recurring compliance costs would increase so significantly from generally accepted cost estimates used in previous rulemakings.

Staff has therefore based non-recurring cost per product on a hybrid of the traditional methodology and the 2020 Cost Survey results.

Non-recurring Cost Methodology. Low and high non-recurring costs for most product categories and proposed VOC standards are based upon an average of the Chemical Engineering Plant Cost Index methodology and the results of the 2020 Cost Survey, identified in Tables E-1 and E-2, respectively. Staff believes this approach, informed by both data sets, is superior to either approach taken individually.

While staff believes this approach provides the most reasonable and technically justifiable cost estimates for the vast majority of categories and proposed standards, it has made two exceptions to this hybrid approach. First, staff is utilizing the Chemical Engineering Plant Cost Index methodology to estimate non-recurring cost per product for proposed Dry Shampoo Tier 2 VOC standards.[2] Dry Shampoo consists primarily of

[1] 2020 Cost Survey responses were also significantly higher than the $26,300 (Canadian) per product average reformulation costs identified by independent consultants in support of Canada's first ever consumer product rulemaking (ToxEcology Environmental Consulting Ltd; Technical and SocioEconomic Study on Certain Products Containing Volatile Organic Compounds; Final Report; K2AA1-12-0013; September 2, 2014). The subsequent Canadian VOC standards, proposed in 2019, largely mirror CARB's Consumer Product Regulation VOC standards.

[2] The 2020 Survey data indicated that nonrecurring cost to meet the proposed 55 percent VOC standard for Dry Shampoo in 2023 would be $76,778 to $169,082 per product and the nonrecurring cost to meet the 50 percent VOC standard for Dry Shampoo in 2029 would be $107,726 to $219,510 per product. However, staff found no compelling reason why cost to reformulate a product to comply with the second proposed standard (from 55 to 50 percent) would exceed the cost to reformulate from the typical existing 90 percent VOC product to the 55 percent VOC standard.

propellant, which must emit a starch into the hair for the purposes of absorbing oil. Discussions with Dry Shampoo manufacturers suggest that a significant portion of the product cost increase should derive from increased use of more costly Exempt propellant, which is considered to be a recurring rather than non-recurring cost. These higher recurring costs are reflected in 'Appendix D: Recurring Cost Estimates.' CARB discussions with industry stakeholders also indicate that some manufacturers intend to leverage research needed to comply with the 55 percent standard to also inform what would be needed to meet the 50 percent standard. Others have indicated an intention to only reformulate one time, to meet the 50 percent VOC standard by 2023. For these reasons, staff found 2020 Cost Survey estimates of non-recurring cost to meet the Dry Shampoo 50 percent VOC standard (in addition to the estimated cost to meet the 55 percent standard) to not be credible.

For Manual Aerosol Air Freshener, non-recurring cost estimates reflect the higher non-recurring costs that some manufacturers have indicated they would incur to transition from hydrocarbon propellant to compressed gas propellant manufacturing infrastructure. Low and high nonrecurring costs identified in Tables E-3 and E-4 are based upon staff's assessment that at least 80 percent of Manual Aerosol Air Freshener products are manufactured by companies that have either already transitioned to compressed gas propellant, or are not anticipated to make this transition due to low sales volumes. Manufacturers with sales volumes that do not justify the initial investment to transition to compressed gas propellant are assumed to either find a compliance pathway with traditional propellants or cease manufacting these products. The non-recurring per product cost for manufacturers that are not anticipated to incur new compressed gas technology investment costs is based upon the average of 2020 Cost Survey Responses and the Chemical Engineering Plant Cost Index methodology, while the per product cost of the compressed gas propellant transition is based entirely on 2020 Cost Survey data, as no prior estimates of these costs exist.

Two Percent Fragrance Exemption. CARB also sent surveys regarding the proposed sunset of the Two Percent Fragrance Exemption in May 2020 to the more than 1,300 consumer product manufacturers known to sell products in California. Survey respondents were asked to identify the cost of obtaining their fragrance VOC content from their fragrance suppliers, and if product reformulation would be necessary, the anticipated product reformulation cost. CARB received 41 responses to the Two Percent Fragrance Exemption Cost survey; however, 20 of the 41 respondents did not provide cost information. Nonrecurring cost estimates for sunset of the Two Percent Fragrance Exemption are illustrated in ISOR Chapter IX.

Total Nonrecurring Costs. Total amortized low cost estimates are calculated by multiplying the amortized low cost per product by the number of non-complying companies, while the total amortized high cost is calculated by multiplying the amortized high cost times the number of noncompliant products.[3] This approach

[3] For more information regarding how this method was applied in previous rulemakings, see the *2013 Consumer Product Regulation Amendments Initial Statement of Reasons.*

reflects the fact that new product development does not occur in isolation. Few companies have only one product line; for those that have more than one product line, the product lines can be very similar. Development and production tasks, from the initial concept through marketing, would proceed simultaneously on more than one product line, with a transfer of information, techniques and work-sharing between the products. For these companies, this "technology transfer" would substantially reduce the cost of developing and marketing a new product on a per-product basis.

The approach, where each company is assumed to incur a full product reformulation cost, is also likely conservative due to the presence of contract fillers. In this analysis and the subsequent analyses on per-unit cost increases, staff has assumed that all manufacturers will conduct their own research and development, purchase their own equipment, and make all other expenditures and efforts necessary to reformulate their products. Essentially, each manufacturer and marketer is assumed to "reinvent the same wheel," and to directly conduct all of their own reformulation and R&D efforts. However contract fillers, who usually conduct their own reformulation efforts in house, formulate and fill products for a large number of consumer product marketers, and are therefore able to avoid duplication of reformulation efforts by applying "technology transfer" between product lines of different companies. The full extent to which contract fillers make products for other companies under each proposed category is unknown. However, to the extent contract fillers are used by companies to make complying products, the actual cost to comply with the Proposed Amendments for the entire industry is likely to be less than predicted, resulting in more cost-effective emission reductions than indicated in this analysis.

Appendix E contains the methodology and costs staff used to assign nonrecurring costs for each category. Nonrecurring costs are those associated with research and development to reformulate complying products, and are independent of, and in addition to, the costs of ingredients to produce a product.

For the cost scenarios, the initial statement of development goals to final delivery of the new product/product line to the marketplace shelves was divided into eight phases. The phases are: product development, including reformulation and development of a new delivery system if necessary; stability testing; efficacy testing; safety testing; labeling modification; registration with regulatory agencies, if necessary; manufacturing changes; and marketing. For the consumer product categories proposed for VOC standards as part of these Proposed Amendments, staff estimated a low and a high cost scenario. These non-recurring costs are shown in Tables E-3 through E-12.

Table E-3
Manual Aerosol Air Freshener 10% VOC Standard Nonrecurring Costs

Sector	Low	High
Product Development Material Computer Support Personnel/Formulation Personnel/Delivery System Prototype Equipment	$29,933	$71,419
Testing Material Computer Support Personnel/Stability Test Personnel/Efficacy Test Personnel/Safety Test	$18,852	$32,213
Labeling Modification Material Technical Data Personnel	$3,032	$10,348
Registration Fees Personnel	$2,274	$7,761
Manufacturing Equipment Technical Data Computer Support Other Personnel	$58,250	$139,068
Marketing Studies Literature Inventory Computer Support Personnel	$23,490	$48,842
Total[1]	**$135,832**	**$309,650**
Amortized Cost[2]	**$17,590**	**$40,100**

1. Low and High cost have been sales-weighted to reflect potential manufacturer transition to compressed gas propellant, as described previously in 'Appendix E: Non-recurring Cost Methodology.'
2. The cost is amortized over a 10 year period at a 5% discount rate.

Table E-4
Manual Aerosol Air Freshener 5% VOC Standard Nonrecurring Costs

Sector	Low	High
Product Development Material Computer Support Personnel/Formulation Personnel/Delivery System Prototype Equipment	$29,933	$71,419
Testing Material Computer Support Personnel/Stability Test Personnel/Efficacy Test Personnel/Safety Test	$18,852	$32,213
Labeling Modification Material Technical Data Personnel	$3,032	$10,348
Registration Fees Personnel	$2,274	$7,761
Manufacturing Equipment Technical Data Computer Support Other Personnel	$58,250	$139,068
Marketing Studies Literature Inventory Computer Support Personnel	$23,490	$48,842
Compressed Gas Transition Already Complete By Product-Compressed Gas	$81,600	$110,400
Total[1]	**$135,832**	**$309,650**
Amortized Cost[2]	**$17,590**	**$40,100**

1. Low and High cost have been sales-weighted to reflect potential manufacturer transition to compressed gas propellant, as described previously in 'Appendix E: Non-recurring Cost Methodology.'
2. The cost is amortized over a 10 year period at a 5% discount rate.

Table E-5
Hair Finishing Spray 50% VOC Standard Nonrecurring Costs

Sector	Low	High
Product Development Material Computer Support Personnel/Formulation Personnel/Delivery System Prototype Equipment	$7,721	$26,025
Testing Material Computer Support Personnel/Stability Test Personnel/Efficacy Test Personnel/Safety Test	$7,210	$22,146
Labeling Modification Material Technical Data Personnel	$6,154	$16,430
Registration Fees Personnel	$505	$2,775
Manufacturing Equipment Technical Data Computer Support Other Personnel	$5,084	$42,248
Marketing Studies Literature Inventory Computer Support Personnel	$5,581	$16,783
Other Nonrecurring Costs	$3,334	$10,000
Total	**$35,589**	**$136,407**
Amortized Cost[1]	**$4,609**	**$17,665**

1. The cost is amortized over a 10 year period at a 5% discount rate.

Table E-6
Hair Shine 50% VOC Standard Nonrecurring Costs

Sector	Low	High
Product Development Material Computer Support Personnel/Formulation Personnel/Delivery System Prototype Equipment	$9,113	$28,354
Testing Material Computer Support Personnel/Stability Test Personnel/Efficacy Test Personnel/Safety Test	$5,471	$19,178
Labeling Modification Material Technical Data Personnel	$8,768	$22,866
Registration Fees Personnel	$504	$2,774
Manufacturing Equipment Technical Data Computer Support Other Personnel	$8,254	$50,355
Marketing Studies Literature Inventory Computer Support Personnel	$5,754	$17,879
Other Nonrecurring Costs	$5,626	$13,750
Total	**$43,490**	**$155,156**
Amortized Cost[1]	**$5,632**	**$20,093**

1. The cost is amortized over a 10 year period at a 5% discount rate.

Table E-7
Temporary Hair Color 50% VOC Standard Nonrecurring Costs

Sector	Low	High
Product Development Material Computer Support Personnel/Formulation Personnel/Delivery System Prototype Equipment	$6,779	$25,044
Testing Material Computer Support Personnel/Stability Test Personnel/Efficacy Test Personnel/Safety Test	$5,518	$19,916
Labeling Modification Material Technical Data Personnel	$4,173	$14,199
Registration Fees Personnel	$504	2,774
Manufacturing Equipment Technical Data Computer Support Other Personnel	$4,587	$42,688
Marketing Studies Literature Inventory Computer Support Personnel	$3,546	$15,212
Other Nonrecurring Costs	$1,667	$7,500
Total	**$26,774**	**$127,333**
Amortized Cost[1]	**$3,467**	**$16,490**

1. The cost is amortized over a 10 year period at a 5% discount rate.

Table E-8
Dry Shampoo 55% VOC Standard Nonrecurring Costs

Sector	Low	High
Product Development Material Computer Support Personnel/Formulation Personnel/Delivery System Prototype Equipment	$10,387	$31,736
Testing Material Computer Support Personnel/Stability Test Personnel/Efficacy Test Personnel/Safety Test	$8,501	$25,894
Labeling Modification Material Technical Data Personnel	$10,725	$23,368
Registration Fees Personnel	$504	$2,774
Manufacturing Equipment Technical Data Computer Support Other Personnel	$8,597	$49,623
Marketing Studies Literature Inventory Computer Support Personnel	$6,661	$17,814
Other Nonrecurring Costs	$0	$0
Total	**$45,375**	**$151,209**
Amortized Cost[1]	**$5,876**	**$19,582**

1. The cost is amortized over a 10 year period at a 5% discount rate.

Table E-9
Dry Shampoo 50% VOC Standard Nonrecurring Costs

Sector	Low	High
Product Development Material Computer Support Personnel/Formulation Personnel/Delivery System Prototype Equipment	$6,557	$29,088
Testing Material Computer Support Personnel/Stability Test Personnel/Efficacy Test Personnel/Safety Test	$4,035	$18,832
Labeling Modification Material Technical Data Personnel	$1,345	$7,398
Registration Fees Personnel	$0	$0
Manufacturing Equipment Technical Data Computer Support Other Personnel	$1,850	$67,592
Marketing Studies Literature Inventory Computer Support Personnel	$841	$10,425
Other Nonrecurring Costs	$0	$0
Total[1]	**$14,628**	**$133,335**
Amortized Cost[2]	**$1,894**	**$17,267**

1. Based upon the Chemical Engineering Plant Cost Index methodology, as described previously in 'Appendix E: Non-recurring Cost Methodology.'
2. The cost is amortized over a 10 year period at a 5% discount rate.

Table E-10
Personal Fragrance Products ≤7% Fragrance (Aerosol and Non-Aerosol)
70% VOC Standard Nonrecurring Costs

Sector	Low	High
Product Development Material Computer Support Personnel/Formulation Personnel/Delivery System Prototype Equipment	$15,165	$45,366
Testing Material Computer Support Personnel/Stability Test Personnel/Efficacy Test Personnel/Safety Test	$5,232	$18,201
Labeling Modification Material Technical Data Personnel	$2,280	$9,175
Registration Fees Personnel	$504	$2,774
Manufacturing Equipment Technical Data Computer Support Other Personnel	$2,183	$37,093
Marketing Studies Literature Inventory Computer Support Personnel	$5,349	$15,153
Other Nonrecurring Costs	$893	$1,786
Total	**$31,607**	**$129,548**
Amortized Cost[1]	**$4,093**	**$16,776**

1. The cost is amortized over a 10 year period at a 5% discount rate.

Table E-11
Personal Fragrance Products ≤10% Fragrance (Aerosol and Non-Aerosol)
50% VOC Standard Nonrecurring Costs

Sector	Low	High
Product Development Material Computer Support Personnel/Formulation Personnel/Delivery System Prototype Equipment	$39,886	$62,133
Testing Material Computer Support Personnel/Stability Test Personnel/Efficacy Test Personnel/Safety Test	$18,000	$49,505
Labeling Modification Material Technical Data Personnel	$2,935	$10,723
Registration Fees Personnel	$504	$2,774
Manufacturing Equipment Technical Data Computer Support Other Personnel	$32,519	$65,218
Marketing Studies Literature Inventory Computer Support Personnel	$4,617	$14,855
Other Nonrecurring Costs	$893	$1,786
Total	**$99,354**	**$206,995**
Amortized Cost[1]	**$12,866**	**$26,806**

1. The cost is amortized over a 10 year period at a 5% discount rate.

Table E-12
Aerosol Crawling Bug Insecticide 8% VOC Standard Nonrecurring Costs

Sector	Low	High
Product Development Material Computer Support Personnel/Formulation Personnel/Delivery System Prototype Equipment	$28,528	$78,439
Testing Material Computer Support Personnel/Stability Test Personnel/Efficacy Test Personnel/Safety Test	$49,362	$111,334
Labeling Modification Material Technical Data Personnel	$2,173	$6,775
Registration Fees Personnel	$6,093	$23,202
Manufacturing Equipment Technical Data Computer Support Other Personnel	$13,341	$62,630
Marketing Studies Literature Inventory Computer Support Personnel	$4,420	$20,624
Other Nonrecurring Costs	$13,000	$27,811
Total	**$116,917**	**$330,815**
Amortized Cost[1]	**$15,141**	**$42,841**

1. The cost is amortized over a 10 year period at a 5% discount rate.

References

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