APPENDIX H

Estimated Costs for Alternatives

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– Appendix H –

Estimated Costs for Alternatives

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(July 27, 2018)

This appendix provides information, calculation methods, and assumptions for assessing costs for four alternatives to the proposed regulatory amendments for nozzle dimensions specifications. All references, tables, and figures cited in the text are provided at the end of the appendix. Chapter VIII provides the economic impacts assessment for the proposed regulatory amendments. Chapter IX provides the alternatives analysis.

ALTERNATIVE 1: DO NOT CHANGE EXISTING NOZZLE DIMENSION SPECIFICATIONS

Staff considered not adopting any new dimension specifications for EVR and ECO nozzles (i.e., the "no action alternative"). This alternative would permit future nozzle manufacturers to design and sell nozzles with dimensions known to form a poor latch with some vehicles' fill pipes at gasoline dispensing facilities (GDF) with vacuum-assist vapor recovery systems. In addition, this alternative would not support vehicle manufacturer efforts to effectively design compatible fill pipes.

Even without the proposed amendments, GDFs with assist systems are likely to replace their old assist nozzles with an improved version, and obtain any associated economic benefit with the reduction in ISD overpressure alarms and service calls, because currently only one version—the Healy Model 900 nozzle with improved EOR spout assembly—is CARB-certified for use in California. However, the proposed amendments serve the purpose of codifying dimensions that ensure compatibility with vehicle fill pipes in case manufacturers consider developing additional assist nozzles in the future. Without the proposed amendments, manufacturers can request and obtain CARB certification for nozzles that may form a poor latch with vehicle fill pipes and ultimately result in increased ISD overpressure alarms and ROG and benzene emissions. Consequently, it is too speculative for CARB staff to estimate potential emission reductions, costs and cost-savings that might be associated with this alternative.

ALTERNATIVE 2: REQUIRE INSTALLATION OF IMPROVED ASSIST NOZZLES WITHIN FOUR YEARS OF AMENDMENT EFFECTIVE DATE

State law (Health and Safety Code § 41954.1) and certification procedures CP-201 and CP-206 currently specify that vapor recovery systems installed before the effective or operative date of additional or amended standards may remain in use for the remainder of their useful life or for up to four years after the effective date of the new standard, whichever is shorter. CARB staff's proposed regulatory amendments include an exception to this requirement that would allow existing GDFs to continue to use their nozzles until the end of the useful nozzle life, even if the period of usefulness extends beyond four years. As an alternative, staff considered not including this exception. This alternative would require GDFs with assist systems to replace any remaining non-EOR assist nozzles within four years of the effective date of the proposed amendments.

As described in Chapter V section B, under the proposed regulatory amendments the baseline wintertime ROG emissions are projected to decrease by 2.85 TPD by 2026, with a total emission reduction of about 3,266 tons by 2030. The emissions decrease is driven by the replacement of non-EOR assist nozzle with EOR assist nozzles. Under the proposed amendments, CARB staff predicts that more than half of the previously certified assist nozzles will be replaced by the end of 2020, about 90 percent will be replaced by the end of 2023, and the rest by the end of 2026. The replacement predictions are based on nozzle age data (Appendix J) that indicate more than half of assist nozzles are replaced within three years, and the rest are typically replaced within eight years. The emission reduction period begins in 2018 because in December 2017, Franklin Fueling Systems (FFS) ceased distribution of the Healy assist nozzle that does not have the EOR spout assembly. In addition, CARB staff's recent survey of seven parts distributors and 16 service contractors indicates that most no longer carry the old model, and those that do will deplete their inventory by the end of 2018 or sooner [CARB, 2018a]. Consequently, only the improved version of the assist nozzle with the EOR spout assembly will be available for much of 2018.

In contrast, Alternative 2 would require replacement of all assist nozzles by about the end of 2023, four years after the anticipated effective date of the new standard. The four-year deadline is defined as four years from the effective date, which in this case is the date the regulation is adopted by CARB, which is anticipated before the end of 2019.

Alternative 2 would achieve the same emission reduction rate as the proposed amendments, 2.85 TPD, but the reduction rate would be reached about three years earlier with Alternative 2 because about 10% of the assist nozzle population would be replaced up to three years more quickly. Consequently, as detailed in Table H-1, Alternative 2 would result in total emission reductions through 2030 that are about 5 percent (316,000 pounds) greater than would the proposed amendments.

Alternative 2 would preserve about the same cost savings as the proposed regulatory amendments ($3.47 million). Like the proposed amendments, Alternative 2 may have a small increase in initial nozzle certification costs and certification renewal costs for nozzle manufacturers. Table 4 in Chapter VIII provides a summary of cost calculations, information sources, and assumptions. CARB staff estimated a total cost of about $17,100 for re-certifying six nozzles, the three currently certified balance and assist vapor recovery nozzles that are still sold in California and the three ECO nozzles that might be certified before the effective date of the proposed amendments. CARB staff estimated a total potential cost of $2,280 for incorporating additional dimensions in the review of these six nozzles when nozzle manufacturers apply for certification renewal. The combined costs for re-certification and certification renewal equate to an additional cost of about $3,230 per nozzle. CARB staff estimated a total potential cost of about $1,140 for incorporating additional dimensions in the review of potential future prototype nozzles when nozzle manufacturers apply for initial certification and certification renewal. These costs sum to about $20,520 over the 11-year lifetime of the proposed regulations.

New direct costs related to Alternative 2's shortened compliance schedule consist of the following, which sum to about $1,660,855:

- As described in Table H-2, Alternative 2 would require about 10 percent of assist nozzles throughout the state to be replaced one to three years earlier than expected based on the typical life spans of assist nozzles. Doing this results in two costs that are not needed for the proposed amendments:
    - The equipment value lost by replacing nozzles before the end of their useful life, which CARB staff estimates to be about $890,190 (Table H-2 section A.2); and
    - The labor cost of replacing the nozzles, which CARB staff estimates to be about $766,865 (Table H-2 section B).
- As described in Table H-3, Alternative 2 also would require CARB certification staff to amend Executive Orders VR-201 and VR-202 to further implement its required four-year replacement period by revoking the certification for the older Healy assist nozzle that does not comply with the proposed dimensions. This results in a fiscal impact of about $3,800 to the State for Alternative 2 that is not needed for the proposed amendments.

In total, CARB staff estimates Alternative 2 will cost about $1.68 million over the 11-year lifetime of the regulations, which is a substantial increase compared to the estimated cost of the proposed regulatory amendments, $20,520.

The majority of Alternative 2's estimated cost ($1,660,855) is focused on decreasing emissions by 5 percent (316,400 lbs), which equates to a cost effectiveness of about $5.26 per pound (Equation H-1). For comparison, the cost effectiveness of control

measures for volatile organic compounds adopted between 1989 and 2013 ranged between about $0.28 and $7.22 per pound (in 2013 dollars) (CARB, 2013a). All of the additional cost for Alternative 2 would be borne by the GDF owners, most of which are small businesses.

Equation H-1:

Cost Effectiveness of Alternative 2 Requirement to Replace ~10% of Assist Nozzle Population by One to Three Years Earlier, Which Would Increase Total ROG Emission Reduction by ~5%

$$\frac{\text{Costs for 5\% Reduction Increase}}{\text{ROG Emission Reduction Increase}} = \frac{\$1{,}660{,}855}{316{,}000 \text{ lbs ROG}} = \textbf{\$5.26 per lb} \text{ (cost)}$$

ALTERNATIVE 3: DELAY THE ADOPTION OF NEW NOZZLE DIMENSION SPECIFICATIONS

CARB staff considered delaying the proposed regulatory amendments until the full menu of overpressure solutions is available. This alternative would delay by about a year the nominal cost of nozzle manufacturers and CARB certification staff assessing additional dimensions for certified and prototype nozzles as part of the CARB certification process. CARB staff assumes the cost of this alternative to be the same as the proposed regulatory amendments, as described in Table 4 in Chapter VIII.

ALTERNATIVE 4: REDUCE THE NUMBER OF NEW NOZZLE DIMENSION SPECIFICATIONS

Staff considered proposing fewer new nozzle dimensions. This alternative would result in very small cost savings to nozzle manufacturers and CARB by reducing the number of dimensions for prototype nozzles that need to be assessed as part of the CARB certification process. For example, reducing the number of dimensions in half would reduce CARB staff time needed to make direct measurements for each nozzle by about half (1 hour versus 2 hours), reducing the total cost by about $2,300, from $20,520 (Table 4 in Chapter VIII) to $18,240 (Table H-4 in this appendix) over the 11-year lifetime of the proposed regulations.

REFERENCES

CARB. 2011. Gasoline Dispensing Facility (GDF) Fueling Point Population Report. Prepared by Jason McPhee, P.E., Engineering & Certification Branch, Monitoring and Laboratory Division. July 20, 2011.

CARB. 2013a. Cost Effectiveness of VOC Control Measures Based on 2013 Dollars. Draft compilation (Microsoft Excel spreadsheet) prepared by staff of the Vapor Recovery and Fuel Transfer Branch, Monitoring and Laboratory Division, California Air Resources Board. July 1, 2013.

CARB. 2017d. 2013/2014 Field Study to Determine the Extent of the Overpressure Issue Occurring at California Gasoline Dispensing Facilities, Report Number VR-OP-G2. Overpressure Study Technical Support Document prepared by staff of the Vapor Recovery and Fuel Transfer Branch, Monitoring and Laboratory Division (MLD), California Air Resources Board (CARB). December 7, 2017. (Extent of Overpressure Study) Available at: https://www.arb.ca.gov/vapor/op/studies/gdf/vropg2.pdf

CARB. 2018a. Survey of GDF Service Companies and Equipment Distributors about Potential Healy Model 900 Assist Nozzle Replacement Costs. Prepared by staff of the Vapor Recovery and Fuel Transfer Branch, Monitoring and Laboratory Division, California Air Resources Board. May 2018.

CEC. 2016. ARB Data Request for 2014 CEC-A15 Gasoline Throughput. Microsoft Excel spreadsheet provided by California Energy Commission (CEC), Energy Assessment Division, on August 24, 2016.

CEC. 2017a. 2016 California Annual Retail Fuel Outlet Report Results (CEC-A15). Microsoft Excel file dated October 10, 2017, downloaded from California Energy Commission (CEC) website accessed on April 24, 2018: http://www.energy.ca.gov/almanac/transportation_data/gasoline/piira_retail_survey.html

CEC. 2018. California Retail Fuel Outlet Annual Reporting (CEC-A15) Results for 2016. California Energy Commission (CEC) website accessed on April 24, 2018: http://www.energy.ca.gov/almanac/transportation_data/gasoline/piira_retail_survey.html

Table H-1: Calculations and Assumptions for Estimating Long-Term ROG Emission Reductions with Alternative 2

Emission reduction between 2018 and 2023 *(assumes year-to-year reduction from 0 to 2.85 TPD, averaging 1.43 TPD)*	6	1.43	1,030	2,060,000
Emission reduction between 2024 and 2030 *(assumes continued EOR nozzle implementation maintains 2.85 TPD emission reduction)*	7	2.85	2,394	4,788,000
	Total Emission Reduction by 2030 with Alternative 2:		3,424	6,848,000
	Total Emission Reduction by 2030 with Proposed Amendments (Table 3):		3,266	6,532,000

Table H-2: Alternative 2 Cost Estimates for Replacing Some Assist Nozzles Earlier than End of Useful Life

Description [(a)]	
A. TOTAL EQUIPMENT VALUE LOST BY REPLACING NOZZLES BEFORE THE END OF THEIR USEFUL LIFE	
A.1 Estimate of how many assist nozzles may need to be replaced sooner than expected under Alternate 2's replacement deadline of end of 2023 (in other words, approximate number of nozzles that have a useful life span beyond 4 years from the Alternative 2 amendment effective date, which is assumed to be the end of 2019)	
Estimated # of assist nozzles statewide as of October 2010 [CARB, 2011] [(b)]	65,420
% of retail GDFs statewide with high throughput [(c)] (>250,000 gallons/month) [CEC, 2016]	10%
Estimated # of assist nozzles at high throughput GDFs = 10% x 65,420 assist nozzles statewide	6,542

Description [a]	
% of retail GDFs statewide with low throughput [c] (<250,000 gallons/month) [CEC, 2016]	90%
Estimated # of assist nozzles at low throughput GDFs = 90% x 65,420 assist nozzles statewide	58,878
Estimated % of assist nozzles at low throughput GDFs that are 1 to ≤4 years old [d]	40%
Estimated # of assist nozzles at low throughput GDFs that are 1 to ≤4 years old = 40% x 58,878 assist nozzles statewide	23,551
Estimated % of assist nozzles at low throughput GDFs that are 1 to ≤4 years old and might have a useful life that lasts through 2026 and therefore may need to be replaced up to 3 years sooner than expected [e]	10%
Estimated # of assist nozzles at low throughput GDFs that may need to be replaced up to 3 years sooner than expected = 10% x 23,551 nozzles	2,355
Estimated % of assist nozzles at low throughput GDFs that are 1 to ≤4 years old and might have a useful life that lasts through 2025 and therefore may need to be replaced up to 2 years sooner than expected [e]	10%
Estimated # of assist nozzles at low throughput GDFs that may need to be replaced up to 2 years sooner than expected = 10% x 23,551 nozzles	2,355
Estimated % of assist nozzles at low throughput GDFs that are 1 to ≤4 years old and might have a useful life that lasts through 2024 and therefore may need to be replaced up to 1 year sooner than expected [e]	10%
Estimated # of assist nozzles at low throughput GDFs that may need to be replaced 1 year sooner than expected = 10% x 23,551 nozzles	2,355
Total estimated # of assist nozzles that may need to be replaced sooner than expected = 3 x 2,355	7,065
Total % of all assist nozzles statewide that may have a useful life that extends beyond 2023 = 7,065 ÷ 65,420	11%
A.2 Nozzle cost and value lost by early replacement	
Cost of 1 replacement assist nozzle that meets proposed dimensions [f]	$450
Value lost for nozzles with an expected useful life of 8 years but replaced 3 years early (lost value = 3 ÷ 8 = 38%) = $450 x 38% x 2,355 nozzles	$402,705

Description [a]	
Value lost for nozzles with an expected useful life of 7 years but replaced 2 years early (lost value = 2 ÷ 7 = 29%) = $450 x 29% x 2,355 nozzles	$307,328
Value lost for nozzles with an expected useful life of 6 years but replaced 1 year early (lost value = 1 ÷ 6 = 17%) = $450 x 17% x 2,355 nozzles	$180,158
TOTAL EQUIPMENT VALUE LOST BY REPLACING NOZZLES BEFORE THE END OF THEIR USEFUL LIFE	**$890,190**
B. Labor Cost	
B.1: Number of GDFs that will need to replace nozzles sooner than expected	
# of retail GDFs statewide in 2016 [CEC, 2017a and 2018]	10,202
% of retail GDFs statewide with assist systems [Appendix I in this report]	52%
Estimated # of retail GDFs statewide with assist systems = 10,202 x 52%	5,305
Estimated % of GDFs statewide with both assist systems and low throughput [CEC, 2016; CARB staff assumes that the percentage of GDFs with assist systems that have low throughout (<250,000 gallons/month) reflects statewide percentage for all GDFs.]	90%
Estimated # of GDFs statewide with both assist systems and low throughput = 5,305 x 90%	4,775
Estimated % of retail GDFs statewide with assist systems, low throughput, and at least 1 nozzle that is 1 to ≤4 years old [g]	88%
Estimated # of retail GDFs statewide with assist systems, low throughput, and at least 1 nozzle that is 1 to ≤4 years old	4,202
Estimated % of retail GDFs statewide with assist systems, low throughput, and at least 1 nozzle that is 1 to ≤4 years old that will need to replace at least 1 nozzle early [e]	50%
Estimated # of GDFs statewide that will need to replace nozzles early = 4,202 x 50%	**2,101**
B.2: Cost for GDF employee to place service order	
Hourly rate for GDF employee (assumes minimum wage ($15/hour in 2023 plus overhead.)	$20
Time needed for GDF employee to place order for new nozzles (hours)	1
Cost for GDF employees to place order for service call = 2,101 GDFs x 1 hour x $20/hour	**$42,020**
B.3: Cost for nozzle replacement by ASP [h, i]	

Description [(a)]	
Hourly rate for Authorized Service Provider (ASP) [(i)]	$85
Travel time (hours) [(i)]	1.5
Travel distance round trip (miles) [assumed distance given most GDFs are in major urban areas]	60
Mileage rate [(i)]	$0.75
Time needed for Authorized Service Provider to replace each nozzle (hours) [(i)]	1
Time needed for Authorized Service Provider to test each nozzle (hours) [(i)]	1
Total charge for 1 service call = (3.5 hours x $85/hour) + (60 miles x $0.75/hour) = $342.50 (rounded to $345)	$345
Cost for nozzle replacement by ASP = 2,101 GDFs x $345/service call	**$724,845**
TOTAL LABOR COST	**$766,865**
GRAND TOTAL	**$1,657,055**

(a) These calculations assume all GDF owners wait until the end of 2023 to replace any remaining useful Healy assist nozzles that do not have the improved EOR spout assembly so that they maximize the remaining usefulness (value) of these nozzles.

(b) The statewide number of assist nozzles estimated in 2010 [CARB, 2011] is likely an over-estimate of the number of assist nozzles currently in use. Based on 2013 and 2018 surveys, the number of GDFs with assist systems (compared to balance systems) has decreased from ~70% to ~52% [CARB, 2017d; Appendix I in this report].

(c) CARB staff considered GDFs with high and low throughput separately because, as described in Appendix J, the assist nozzle age percentile values for the high throughput GDFs indicate nozzles are replaced more frequently, with more than half being replaced within two years and the rest within four years. In addition, the average nozzle ages for high and low throughput GDFs (2.0 and 3.5 years, respectively) are significantly different ($p<0.001$). Consequently, CARB staff assumes all assist nozzles at high throughout GDFs will be replaced with improved models before Alternative 2's required replacement deadline of 2023. In contrast, the nozzle age distribution for assist nozzles at low throughout GDFs indicates not all nozzles will be replaced by 2023. See Figure H-1 for an illustration of CARB staff's assumptions regarding what population of assist nozzles may not be replaced by 2023.

(d) CARB staff estimated the percentage of assist nozzles at low throughput GDFs that are 1 to ≤4 years old from the nozzle age distribution described in Appendix J. See Figure H-2 in this appendix for the distribution chart shown with percentages for the nozzle age categories. CARB staff assumes that the age distribution remains the same over time, i.e., represents the conditions the year the proposed amendment becomes effective.

(e) Per the nozzle age distribution shown in Figure H-2, there is a 6 to 9% chance each that the useful life of assist nozzles may extend to 6, 7, or 8 years. To provide conservative cost estimates, CARB staff rounded up to 10% for each of the age categories.

(f) Per CARB staff's 2018 survey of service companies [CARB, 2018a], most GDFs purchase rebuilt nozzles (including core credit) from their service contractors; for the 15 surveyed companies that provided nozzle pricing information, rebuilt nozzle prices range $318 to $515, average $424, and have median, 75th and 90th percentile prices of $434, $490, and $500, respectively.

(g) Eighty-eight percent of GDFs in Table J-2 in Appendix J that have low throughput have at least one nozzle that is between 1 and 4 years old. Of these, half have three or more nozzles that are between 1 and 4 years old, which substantially increases the odds that they will need to replace at least one nozzle early.

(h) This estimate assumes all GDF owners hire authorized service provider to replace nozzles, even if they are not specifically required to do so by Air District requirements. Per the CARB-approved IOM for both Assist Executive Order (VR-201/202) and Balance Executive Order (VR-203/204), GDF operators can replace the nozzle. VR-201/202: "However, GDF Owner / Operator can remove and install hanging hardware nozzle, curb hose, breakaway, flow limiter and whip hose)." VR-203/204: "NOTE: GDF Owner / Operator can remove and install hanging hardware nozzle, curb hose, breakaway, flow limiter and whip hose). Additional certifications may be required in accordance with local district requirements." Many of the Air Districts do have additional certification requirements. Further, CARB staff's field experience indicates many GFD owners prefer to hire service contractors with authorized service providers to replace and test the nozzles, rather than risk incurring liability associated with improperly installed nozzles.

(i) CARB staff's 2018 survey of 16 service companies that provided service visit pricing information [CARB, 2018a] found the following:

- Authorized Service Provider (ASP) hourly rates range from $75 to $86, with a median of $82/hour.
- Almost all service contractors charged the service technician rate for time spent driving plus a mileage fee.
- Mileage fees ranged from $0.56 to $1 per mile, with a median of $0.74 per mile.
- Most charge a one-hour minimum for service visits.
- All said their technicians could replace one to four nozzles in less than an hour, and test one to four nozzles in less than an hour, such that a service visit would need two hours or less to replace and test one to four nozzles.

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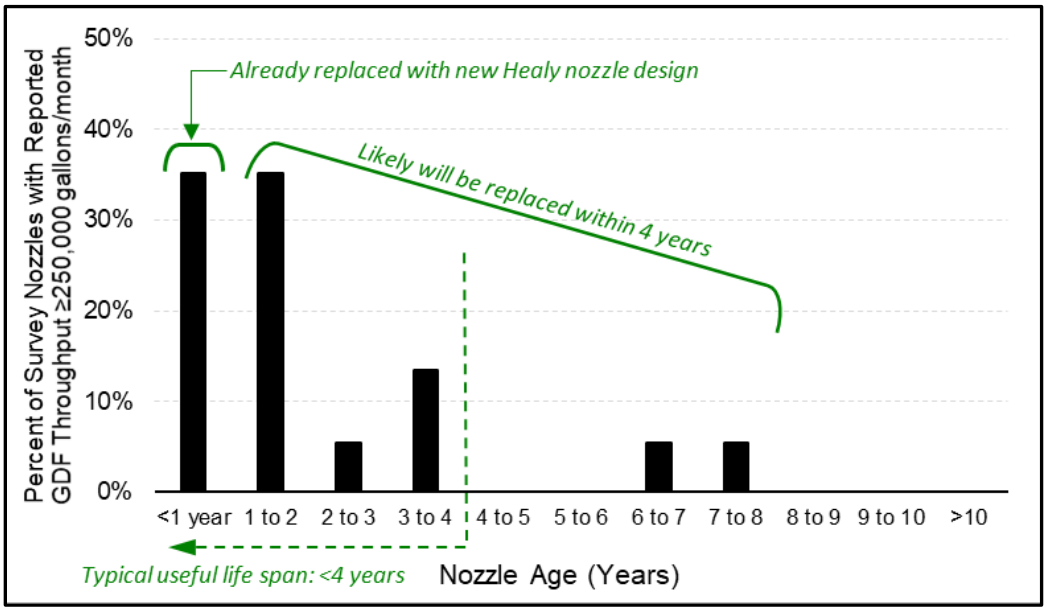
Figure H-1: Illustration of CARB staff's assumptions regarding which populations of assist nozzles at the time the proposed amendments are effective (anticipated by the end of 2019) may and may not be fully replaced within four years (by the end of 2023)

Important assumption: Only the Healy assist nozzle with improved EOR spout assembly will be available for sale in 2019, i.e., the older Healy model will not be available.

H-1(A): Assumptions for nozzles at high throughput GDFs (≥250,000 gallons/per month)



H-1(B): Assumptions for nozzles at low throughput GDFs (<250,000 gallons/per month)

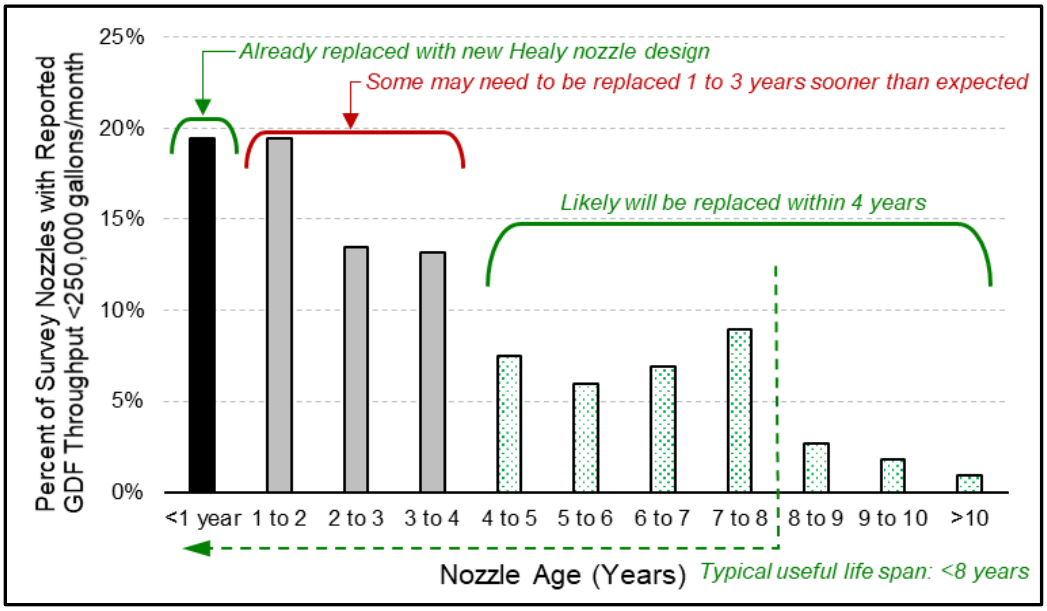


Figure H-2: Nozzle age distribution for low throughput GDFs (<250,000 gallons/month) with percentages for each age category

See Appendix J for additional information about the nozzle age distribution.

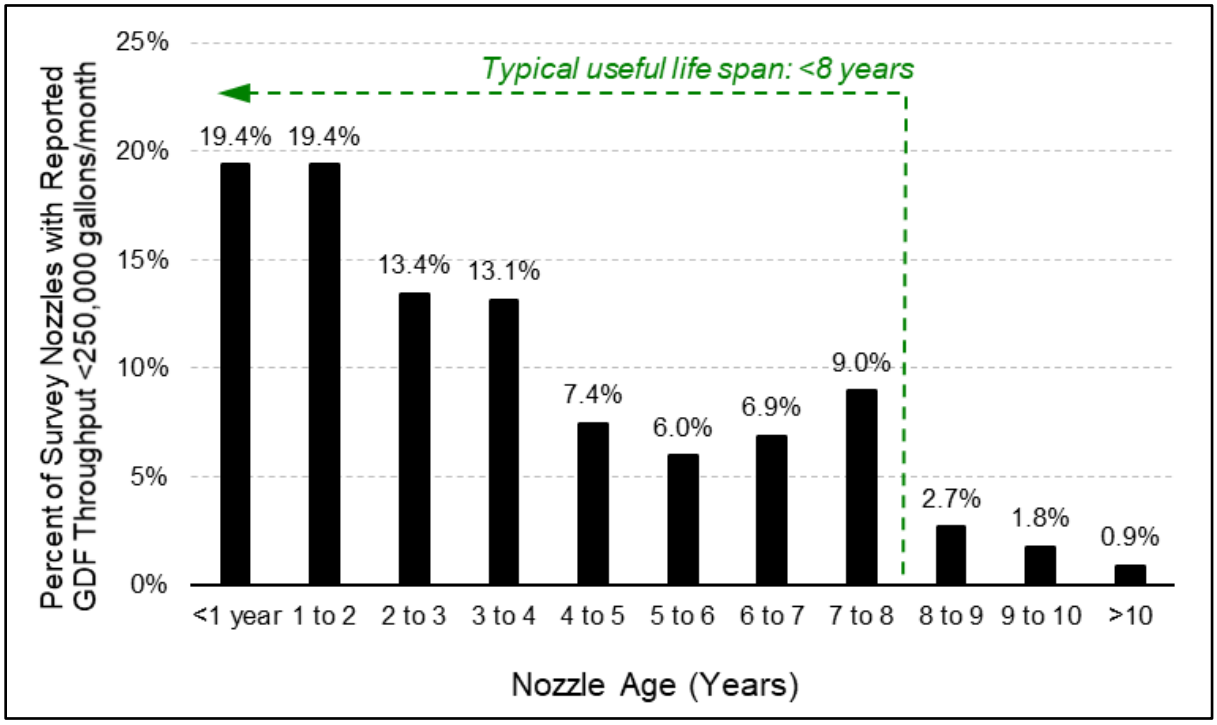


Table H-3: Alternative 2 Cost Estimate for CARB Staff Time Needed to Amend Executive Orders VR-201 and VR-202

These costs would not be billed to nozzle manufacturers.

Description	
One-time cost: CARB staff time needed to revoke one currently certified assist nozzle that does not meet proposed dimensions. (Healy Model 900 nozzle has already been discontinued by the manufacturer.) = 40 hours/nozzle x 1 nozzle x 1 staff x $95/hour	$3,800

Table H-4: Alternative 4 Cost Estimates

Description	
One-time cost: CARB certification staff time needed to amend Executive Orders to re-certify three currently certified nozzles still sold in California (1 assist nozzle and 2 balance nozzles [(a)]), and three ECO nozzles that might be certified before the effective date of the proposed nozzle dimension requirements (assumes all six nozzles will be re-certified in 2020). = 29 hours/nozzle x 6 nozzles x $95/hour	$16,530
Potential ongoing cost: CARB certification staff time needed to incorporate additional dimensions in four-year certification renewal process for six nozzles (assumes three vapor recovery nozzles and three ECO nozzles will have two certification renewals each before 2030, e.g., in 2024 and 2028) = 1 hour/nozzle x 6 nozzles x $95/hour x 2 renewals/nozzle	$1,140
Potential ongoing cost: CARB certification staff time needed to incorporate additional dimensions in certification application process, and four-year certification renewal process, for future prototype nozzles (assumes there might be two new nozzle prototypes submitted for certification review by the end of 2022, and two renewals each, in 2026 and 2030) = 1 hour/nozzle x 2 nozzles x $95/hour x 3 (1 certification + 2 renewals)	$570
Total cost for 11 years (2020-2030)	**$18,240**

(a) There are two balance nozzles (VST-EVR-NB (G2) and EMCO Model A4005-EVR) and one assist nozzle (Healy Model 900 with the improved EOR spout assembly) currently sold in California. VST no longer sells the Model EVR-NBBK nozzle in California, and Franklin Fueling Systems discontinued manufacturing the version of the Healy Model 900 without the EOR spout assembly.