

APPENDIX B: METHODOLOGY FOR DETERMINING COST OF GROWTH AND NATURAL TURNOVER¹

I. Growth Cost Methodology for Private Fleets

To determine the cost of growth for private fleets over the 6-year life of the proposed amendments, staff assumed a 0.5 percent growth rate and used the following equation:

$$C_{\text{growth}} = [P_{2017} \times (1 + R_{\text{growth}})^Y - P_{2017}] \times C_{\text{report+label}}$$

Where	C_{growth}	= Total Cost of Growth
	P_{2017}	= Equipment Population in 2017 (86,730 pieces)
	R_{growth}	= Annual Rate of Growth (0.5% or 0.005)
	Y	= Life of Proposed Amendments (6 Years)
	$C_{\text{report+label}}$	= Cost to Report and Label (\$67 per piece)

Therefore,

$$\begin{aligned} C_{\text{growth}} &= [86,730 \times (1 + 0.005)^{(6)} - 86,730] \times \$67 \\ &= \$176,521 \text{ or approximately } \$176,500 \end{aligned}$$

II. Natural Turnover Cost Methodology for Private Fleets

To determine the cost of natural turnover for private fleets over the 6-year life of the proposed amendments, staff assumed that approximately 10.6 percent of the in-use fleet is replaced annually. The following equation was used to determine the cost that would be associated with natural turnover:

$$C_{\text{turnover}} = P_{2017} \times Y \times R_{\text{turnover}} \times C_{\text{report+label}}$$

Where	C_{turnover}	= Total Cost of Turnover
	P_{2017}	= Equipment Population in 2017 (86,730 pieces)
	R_{turnover}	= Annual Rate of Turnover (10.6 percent or 0.106)
	Y	= Life of Proposed Amendments (6 Years)
	$C_{\text{report+label}}$	= Cost to Report and Label (\$67 per piece)

Therefore,

$$\begin{aligned} C_{\text{turnover}} &= 86,730 \times 6 \times 0.106 \times \$67 \\ &= \$3,695,739 \text{ or approximately } \$3.7 \text{ million} \end{aligned}$$

¹ Please see Section VIII, Economic Impacts, of the Staff Report: Initial Statement of Reasons for further explanation on how staff derived the assumed population, annual rate of growth, and cost values. For an explanation of the assumed annual rate of turnover, please see Section IV of this Appendix.

III. Growth and Turnover Costs for Public Fleets

Staff used the same methodology above to estimate growth and turnover costs for federal, state, and local government agencies.

IV. Explanation of Assumed Annual Turnover Rate

To derive the annual turnover rate, staff first estimated the current penetration of battery-electric forklifts using forklift sales data² and industry estimates on the lifespan of LSI and battery-electric forklifts.³ From 2004 through 2014, battery-electric forklifts represented approximately 43 percent, on average, of forklift sales per year. However, because battery-electric forklifts are expected to last longer than LSI forklifts, staff estimates that battery-electric forklifts represent approximately 60 percent of the in-use forklift fleet based on the equipment sales data. While the proposed regulation would affect other types of LSI equipment (sweeper/scrubbers, industrial tow tractors, and airport ground support equipment), applicable data on those equipment types were limited. Therefore, while staff realizes that the actual proportion of zero emission equipment within those other equipment categories may not be the same as that for forklifts, for the purposes of this analysis, staff assumed they are the same. Using the estimates above, staff determined the weighted average lifespan of a piece of LSI equipment as follows:

$$\text{Weighted Average Lifespan} = (0.60 \times 11 \text{ years}) + (0.40 \times 7 \text{ years}) = 9.4 \text{ years}$$

Using the weighted average lifespan calculated above, staff derived an annual rate of turnover of 10.6 percent (100 percent/9.4 years).

² United States Factory Shipments, 1993-2014, Industrial Truck Association.
<http://www.indtrk.org/download/1407/>

³ Based on industry estimates, a piece of equipment using an LSI engine operates approximately 7 years, on average, before being replaced and a piece of equipment using zero emission technology in a typical LSI application operates approximately 11 years, on average, before being replaced.