APPENDIX C

CALCULATION OF REGULATION-INDUCED COSTS WHEN REFORMULATION NORMALLY OCCURS AT FIXED TIME INTERVALS

One complicating factor in estimating the cost of the regulation is the fact that product reformulation is a normal business activity in the architectural coatings industry. Therefore, rather than viewing the regulation as creating reformulation responsibilities (the maintained assumption throughout the analysis), one might take the alternative view that a different time pattern of reformulation is created, thereby leading to a lower estimate of regulatory costs. This appendix presents the issue analytically and develops a numerical example to quantify the difference in costs under the alternative assumptions.

Suppose a company routinely reformulates products every eight years. If the average product is product midway through its reformulation cycle, it will be reformulated four years in the future in the absence of the regulation. However, the regulation requires them to do the reformulation now rather than four years in the future and this acceleration imposes costs on the firm. To estimate the costs of this acceleration, assume the initial reformulation cost of $87,000 occurs in the first year. Then the net present value, today, of a cost otherwise deferred four years into the future is

$$NPV(-4) = \$87,000/1.07^4 = \$66,372$$

Instead, the company is required to reformulate today at a cost of

$$NPV(0) = \$87,000$$

The net effect on the company of accelerating the next formulation is then

$$\text{Initial Net effect} = NPV(-4) - NPV(0) = -\$20,628$$

Thus, if the regulation just accelerates the next reformulation, the one-time cost of that acceleration is approximately $20,000. This is substantially below the one-time cost of $87,000 currently assumed in the EIA. However, if it is assumed that this requirement also forces *all future reformulations to be moved up four years*, then the computation must be expanded to measure the present value of the current and all future adjustments. To start, the present value of an initial $87,000 cash expenditure repeated every eight years thereafter can be written

$$\begin{aligned} V(0) &= \$87,000 + \$87,000*(1/((1.07)^8 - 1)) \\ &= \$208, 139 \end{aligned}$$

Without the regulation, this stream of costs would be deferred four years into the future. Evaluating this in present value terms gives

$$V(-4)= V(0)/1.07^4 = \$158,788$$

Thus, the difference in present value between the two reformulation cost streams is the total net effect of accelerating this and all future reformulations.

$$\text{Total net effect} = V(-4) - V(0) = \$49,351$$

This can be viewed as conceptually equivalent to a *one-time cost* of the regulation for an average product that is over-the-limit. This explicitly accounts for the net present value of the regulation's affect on all future formulations. This one-time cost is substantially below the $87,000 one-time cost assumed in the analysis.

By comparison, if the product were otherwise to be reformulated one year in the future without the regulation, the present value of this cost acceleration can be computed is a similar fashion as $13,617 (16 percent of $87,000). If the previous reformulation had been implemented just one year before the regulation, then the present value of accelerating the future reformulation cycle by seven years would be $78,520 (90 percent of $87,000).

In summary, the one-time cost estimate of an accelerated reformulation schedule ranges from a small fraction to a large fraction of the reformulation cost estimate used in the EIA. In this example, the average product's one-time cost equivalent is less than 60 percent of the estimate used in the EIA. Thus, EPA contends that it has provided a conservatively high estimate of the true incremental cost of reformulating a product subject to the regulation.