

under way for both the highway rule and for the Tier 2 light-duty highway rule (65 FR 6698). This learning could be done via seminars, conferences, and contact with highway manufacturers, emission control device manufacturers, and the independent engine research laboratories conducting relevant R&D. Therefore, for these manufacturers, we have estimated an expenditure of \$24.5 million. This lower number—\$24.5 million versus \$35 million in the highway rule—reflects the transfer of knowledge to nonroad manufacturers that would occur from the many stakeholders in the diesel industry. Two-thirds of this R&D is attributed to NO<sub>x</sub> control and one-third to PM control.

Note that the \$3.5 million and \$24.5 million estimates represent our estimate of the average R&D expected by manufacturers. These estimates would be different for each manufacturer—some higher, some lower—depending on product mix and the ability to transfer knowledge from one product to another.

For those engine manufacturers selling engines that would require CDPF-only R&D (*i.e.*, 25 to 75 horsepower engines in 2013), we have estimated that the R&D they would incur would be roughly one-third that incurred by manufacturers conducting CDPF/NO<sub>x</sub> adsorber R&D. We believe this is a good estimate because CDPF technology is further along in its development than is NO<sub>x</sub> adsorber technology and, therefore, a 50/50 split would not be appropriate. Using this estimate, the R&D incurred by manufacturers that have already done selling any engines into both the highway and the nonroad markets would be \$1.2 million, and the R&D for manufacturers selling engines into only the nonroad market would be roughly \$8 million. All of this R&D is attributed to PM control.

For those engine manufacturers selling engines that would require DOC-only or some engine-out modification R&D (*i.e.*, <75 horsepower engines in 2008), we have estimated that the R&D they would incur would be roughly one-half the amount estimated for their CDPF-only R&D. Using this estimate, the R&D incurred by manufacturers selling any engines into both the highway and nonroad markets would be roughly \$600,000, and the R&D for manufacturers selling engines into only the nonroad market would be roughly \$4 million. All of this R&D is attributed to PM control.

Some manufacturers of engines produce engines to specifications developed by other manufacturers. Such

joint venture manufacturers do not conduct engine-related R&D but simply manufacture an engine designed and developed by another manufacturer. For such manufacturers, we have assumed no R&D expenditures given that we believe they will conduct no R&D themselves and will rely on their joint venture partner. This is true unless the parent company has no engine sales in the horsepower categories covered by the partner company. Under such a situation, we have accounted for the necessary R&D by attributing it to the parent company. We have also estimated that some manufacturers will choose not to invest in R&D for the U.S. nonroad market due to low volume sales that probably cannot justify the expense. More detail on these assumptions and the number of manufacturers assumed not to expend R&D is presented in Chapter 6 of the draft RIA. We welcome comments and supporting documentation.

We have assumed that all R&D expenditures occur over a five year span preceding the first year any emission control device is introduced into the market. Where a phase-in exists (*e.g.*, for NO<sub>x</sub> standards on >75 horsepower engines), expenditures are assumed to occur over the five year span preceding the first year NO<sub>x</sub> adsorbers would be introduced, and then to continue during the phase-in years; the expenditures would be incurred in a manner consistent with the phase-in of the standard. All R&D expenditures are then recovered by the engine manufacturer over an identical time span following the introduction of the technology. We assume a seven percent rate of return for all R&D. We have apportioned these R&D costs across all engines that are expected to use these technologies, including those sold in other countries or regions that are expected to have similar standards. We have estimated the fraction of the U.S. sales to this total sales at 42 percent. Therefore, we have attributed this amount to U.S. sales.

Using this methodology, we have estimated the total R&D expenditures attributable to the proposed standards at \$199 million.

#### ii. Engine-Related Tooling Costs

Once engines are ready for production, new tooling will be required to accommodate the assembly of the new engines. In the 2007 highway rule, we estimated approximately \$1.6 million per engine line for tooling costs associated with CDPF/NO<sub>x</sub> adsorber systems. For the proposed nonroad Tier 4 standards, we have estimated that nonroad-only manufacturers would incur the same \$1.6 million per engine

line requiring a CDPF/NO<sub>x</sub> adsorber system and that these costs would be split evenly between NO<sub>x</sub> control and PM control. For those systems requiring only a CDPF, we have estimated one-half that amount, or \$800,000 per engine line. For those systems requiring only a DOC or some engine-out modifications, we have applied a one-half factor again, or \$400,000 per engine line. Tooling costs for CDPF-only and for DOC engines are attributed solely to PM control.

For those manufacturers selling into both the highway and nonroad markets, we have estimated one-half the baseline tooling cost, or \$800,000, for those engine lines requiring a CDPF/NO<sub>x</sub> adsorber system. We believe this is reasonable since many nonroad engines are produced on the same engine line with their highway counterparts. For such lines, we believe very little to no tooling costs would be incurred. For engine lines without a highway counterpart, something approaching the \$1.6 million tooling cost would be applicable. For this analysis, we have assumed a 50/50 split of engine product lines for highway manufacturers and, therefore, a 50 percent factor applied to the \$1.6 million baseline. These tooling costs would be split evenly between NO<sub>x</sub> control and PM control. For engine lines <75 horsepower, we have used the same tooling costs as the nonroad-only manufacturers because these engines tend not to have a highway counterpart. Therefore, for those engine lines requiring only a CDPF (*i.e.*, those between 25 and 75 horsepower), we have estimated a tooling cost of \$800,000. Similarly, the tooling costs for DOC and/or engine-out engine lines has been estimated to be \$400,000. Tooling costs for CDPF-only and for DOC engines are attributed solely to PM control.

We expect engines in the 25 to 50 horsepower range to apply EGR systems to meet the proposed NO<sub>x</sub> standards for 2013. For these engines, we have included an additional tooling cost of \$40,000 per engine line, consistent with the EGR-related tooling cost estimated for 50–100 horsepower engines in our Tier 2/3 rulemaking. This tooling cost is applied equally to all engine lines in that horsepower range regardless of the markets into which the manufacturer sells. We have applied this tooling cost equally because engines in this horsepower range do not tend to have highway counterparts. Tooling costs for EGR systems are attributed solely to NO<sub>x</sub> control.

We have applied all the above tooling costs to all manufacturers that appear to actually make engines. We have not