

eliminated joint venture manufacturers because these manufacturers would still need to invest in tooling to make the engines even if they do not conduct any R&D. We have assumed that all tooling costs are incurred one year in advance of the new standard and are recovered over a five year period following implementation of the new standard; all tooling costs are marked up seven percent to reflect the time value of money. As done for R&D costs, we have attributed a portion of the tooling costs to U.S. sales and a portion to sales in other countries expected to have similar levels of emission control. More information is contained in Chapter 6 of the draft RIA and we request comment on how we have applied our tooling cost estimates and to whom we have applied them.

Using this methodology, we estimate the total tooling expenditures attributable to the proposed standards at \$67 million.

### iii. Engine Certification Costs

Manufacturers will incur more than the normal level of certification costs during the first few years of implementation because engines will need to be certified to the new emission standards. Consistent with our recent standard setting regulations, we have estimated engine certification costs at \$60,000 per new engine certification to cover testing and administrative costs. To this we have added the proposed certification fee of \$2,156 per new engine family. This cost, \$62,156 per engine family was used for <75 horsepower engines certifying to the 2008 standards. For 25 to 75 horsepower engines certifying to the 2013 standards, and for >75 horsepower engines certifying to their proposed standards, we have added costs to cover the proposed test procedures for nonroad diesel engines (*i.e.*, the transient test and the NTE); these costs were estimated at \$10,500 per engine family. These certification costs—whether it be the \$62,156 or the \$72,656 per engine family—apply equally to all engine families for all manufacturers regardless of into what markets the manufacturer sells. We have applied these certification costs to only the US sold engines because the certification conducted for US sales is not presumed to fulfill the certification requirements of other countries.

Applying these costs to each of the 665 engine families as they are certified to a new emissions standard results in total costs of \$72 million expended during implementation of the proposed standards. These costs are attributed to NO<sub>x</sub> and PM control consistent with the

phase-in of the new emissions standards—where new NO<sub>x</sub> and PM standards are introduced together, the certification costs are split evenly; where only a new PM standard is introduced, the certification costs are attributed to PM only; where a NO<sub>x</sub> phase-in becomes 100% in a year after full implementation of a PM standard, the certification costs are attributed to NO<sub>x</sub> only. All certification costs are assumed to occur one year prior to the new emission standard and are then recovered over a five year period following compliance with the new standard; all certification costs are marked up seven percent to reflect the time value of money.

### b. Engine Variable Costs

This section summarizes the detailed analysis presented in the draft RIA for this proposed rule. We encourage the reader to refer to chapter 6 of that draft RIA for the details of what is presented here and encourage comments and supporting data and/or analysis regarding those details. Of particular interest are comments regarding the costs of precious metals, or platinum group metals (PGM). The PGM costs are a significant fraction of the total costs for aftertreatment devices. For our analysis, we have used the 2002 annual average costs for platinum and rhodium (the two PGMs we expect will be used) because we believe they represent a better estimate of the cost for PGM than other metrics. We request comment on this approach and whether an alternative approach would be more appropriate. Specifically, we request comment regarding the use of a five year average in place of the one year average we have used. Additionally, EPA invites comment on the impacts, if any, that this rulemaking would have in the context of a variety of rulemakings on the market impacts on precious metals.

### i. NO<sub>x</sub> Adsorber System Costs

The NO<sub>x</sub> adsorber system that we are anticipating would be applied for Tier 4 would be the same as that used for highway applications. In order for the NO<sub>x</sub> adsorber to function properly, a systems approach that includes a reductant metering system and control of engine A/F ratio is also necessary. Many of the new air handling and electronic system technologies developed in order to meet the Tier 2/3 nonroad engine standards can be applied to accomplish the NO<sub>x</sub> adsorber control functions as well. Some additional hardware for exhaust NO<sub>x</sub> or O<sub>2</sub> sensing and for fuel metering will likely be required. The cost estimates include a DOC for clean-up of

hydrocarbon emissions that occur during NO<sub>x</sub> adsorber regeneration events. We have also assumed that warranty costs would increase due to the application of this new hardware. Chapter 6 of the draft RIA contains the details for how we estimated costs associated with the new NO<sub>x</sub> control technologies required to meet the proposed Tier 4 emission standards. These costs are estimated to increase engine costs by roughly \$670 in the near-term for a 150 horsepower engine, and \$2,070 in the near-term for a 500 horsepower engine. In the long-term, we estimate these costs to be \$550 and \$1,670 for the 150 horsepower and 500 horsepower engines, respectively. Note that we have estimated costs for all engines in all horsepower ranges, and these estimates are presented in detail in the draft RIA. Throughout this discussion of engine and equipment costs, we present costs for a 150 and a 500 horsepower engine for illustrative purposes.

### ii. Catalyzed Diesel Particulate Filter (CDPF) Costs

CDPFs can be made from a wide range of filter materials including wire mesh, sintered metals, fibrous media, or ceramic extrusions. The most common material used for CDPFs for heavy-duty diesel engines is cordierite. We have based our cost estimates on the use of silicon carbide (SiC) even though it is more expensive than other filter materials. We request comment on our assumption that SiC will be used in favor of cordierite. We estimate that the CDPF systems will add \$780 to engine costs in the near-term for a 150 horsepower engine and \$2,770 in the near-term for a 500 horsepower engine. In the long-term, we estimate these CDPF system costs to be \$590 and \$2,110 for the 150 horsepower and the 500 horsepower engines, respectively.

### iii. CDPF Regeneration System Costs

Application of CDPFs in nonroad applications is expected to present challenges beyond those of highway applications. For this reason, we anticipate that some additional hardware beyond the diesel particulate filter itself may be required to ensure that CDPF regeneration occurs. For some engines this may be new fuel control strategies that force regeneration under some circumstances, while in other engines it might involve an exhaust system fuel injector to inject fuel upstream of the CDPF to provide necessary heat for regeneration under some operating conditions. We estimate the near-term costs of a CDPF regeneration system to be \$190 for a 150