

The intent of my comments on this Request for Information (RFI) is to highlight the value of technology advancements and engineering controls to provide better and healthier working conditions for all those employed in the underground mining industry. I am offering my comments as an outsider of the mining industry but as a safety, environmental, and health professional that understands the challenges to assess and manage the risk posed by the presence of airborne contaminants in enclosed spaces.

The supporting materials on the RFI, but in particular the research conducted by the National Cancer Institute (NCI) and the National Institute for Occupational Safety and Health (NIOSH) show a clear relationship between exposure to diesel exhaust and the potential for it to cause lung cancer. For me, there is no doubt that inaction to improve controls to reduce or prevent exposure to diesel exhaust can result in preventable and unnecessary health deterioration for underground miners. With almost 180,000 workers in the mining industry (BLS, 2020), this topic is highly relevant for frontline workers in underground mines, in particular equipment operators. They are already a vulnerable population to health hazards due to the challenging physical conditions of underground work, like light alteration, airborne contaminants depending on the material they are mining, the formation conditions, and the technology and process used.

Comments to A1 question. I support other public comments stating that it is regrettable to maintain exceptions of the Environmental Protection Agency (EPA) Tier 4 standards for underground mining. These standards have been required for all non-road engines for more than six years for the later phases of implementation, and twelve years in many cases for the first adopters (EPA, 2004). The standard was issued to reduce health hazards for workers, the public, and reduce ambient contamination. It is

ironic and a social inequality that these standards are in effect except in underground mining, where there is a higher risk to suffer from the adverse effects of exposure to diesel exhaust.

Comments to A2 question. The requirement to meet 2.5 g/hr. of Diesel Particulate Matter (DPM) should not have any engineering or technological challenge because the technologies in this field are already advanced, and the EPA regulations for Tier 4 emissions, forced the market to make this technology available. There is always an administrative load to procure, maintain, and dispose of equipment. Still, there should not be any significant change and even less a challenge to manage a cleaner technology than an outdated one. Several commenters have included references to the cost and maintenance associated with filters. However, obsolete technology also requires maintenance, and the challenge is more on the financial field. That is an essential factor in the regulatory process, but should not be the primary or more influential driver in a safety and health review process, and instead weighted criteria to balance business sustainability with reasonable risk.

Comments to A4 question. The current comments and data included by the EPA on the RFI indicate that only 90 light-duty equipment units out of 3400 have engines that meet the Tier 4 requirements. Also, there are three representative mining states, Pennsylvania, West Virginia, and Ohio, which already require all light underground mining equipment to meet that requirement. The fact that these states have higher standards is not good per se. Still, the agency should review in more detail the benefits and challenges that this approach has brought for the mining industry and its workers in these regions and use it as an essential input for decision making.

Comments to A5 question. The agency should consider an alternative approach in this question, complementary to modifications to existing equipment. One of the

commenters indicates that the technology on several diesel engines cannot be adapted to new technologies or filtration systems to meet the Tier 4 standard. The financial implications of replacing an entire fleet of equipment can have significant detriment for mining operators, but not implementing change will maintain a high-risk factor in detriment of the underground mining workers. A middle point to consider in the regulatory process should be to phase the technology replacement with deadlines commensurate with the risk and the conditions of each operation, a not as blanket timeline. There should be strict requirements for operations where the ventilation conditions and diesel exhaust exposure are placing the workers in immediate danger, and the life of those workers should prevail over the financial criteria. The studies from the International Agency for Research on Cancer (IARC, 2012) should have a heavyweight on this analysis.

Comments to B8 question. The comments that are already posted for this question coincide on the need to quantitatively measure emissions on a frequent basis, but the frequency is still not well supported and seems more a randomly and traditional approach. The emissions measurement frequency should consider hours of operation and the conditions of the area where the equipment is operated and requiring automated measurements with standard equipment should be an important consideration, otherwise the measurements could be ineffective to validate concentrations emitted. The administrative burden of recording and tracking measurements for multiple units should be another consideration on the decision-making process.

Comments to B13 question. Workers in underground mining operation should have awareness knowledge of the hazards of diesel exhaust and the criticality of the equipment preventive and corrective maintenance, however the emission controls

should be little to not dependant on the training of the operators with respect to it. The primary safety and health benefits will be associated with the correct operation, but the technicalities will add very little value for workers safety and reduction of exposure. Training is an important administrative control, but unless the same operators conduct service to the equipment, the correct functioning of the emission controls should be independent of their intervention. One of the commenters expanded on the scope of training related to inspections, ventilation, emergency procedures and recordkeeping, and I consider that those are important elements that should be required as an addition, but even those, do not relate directly to the emission control of the equipment. The length of the training should be determined by the areas that apply for each operation depending on the technology and a base of topics that are applicable to any diesel equipment and the operational area to maintain control of the emissions. Establishing a minimum number of hours (16) like one of the commenters proposed could be viable and needed in operations where the effectiveness of the equipment emissions and the ventilation controls are highly dependent on the mining workers, but could have little value in operations that are engineering with safety in design principles and with engineering controls that reduce dependence on frontline employees intervention. The regulation can have a stronger effect if the training is established with topics that are scalable with defined criteria based the type of the equipment, the operational conditions, and the scope of work for the frontline workers, which might or might not include servicing the equipment.

Comments to C18 question. Their current information does not include comments relative to this question. However, from a practical perspective and going back to the questions of requirements to meet EPA Tier 4, all equipment used inside the mines should be meeting this standard. High-efficiency DPM should be either part of the design of the equipment or the filtration system utilized by the equipment, and it

should already be efficient enough to comply with Tier 4 requirements. Modifying equipment to add filtration systems could increase the administrative burden and the maintenance requirements so that should be a decision left to each organization, and the agency could simply establish the requirement to meet the criteria. Prescribing the type of filtration could be affected by rapid technology advancements and make the requirements obsolete in short period.

Comments to E28 Question. The comments that have been already posted refer to several alternatives but they confirm that the agency should consider requirements with a combination of controls, giving priority to reduction of emissions by equipment design and the use of less contaminant fuels like biodiesel, followed by filtration systems and lastly adopting efficient ventilation systems. Prescribing a certain type of control can be ineffective considering the diversity of mining conditions and availability of equipment and access to technology for each company. However, any combination of controls should be allowed if it helps the underground mining industry to control the emissions and comply with the EPA Tier 4 requirements, combined with monitoring and periodic assessment of workers exposure to diesel exhaust. An approach that follows the hierarchy of controls of ANSI Z.10 can be the most effective for the industry and the protection of its workers.

Comments regarding other information. The request of information is all focused on current technologies and regulations from EPA to reduce DPA in underground mining and reduce exposure of workers to diesel exhaust, and while it is not on the of the scope of the RFI, there is an opportunity for the agency to promote the use of cleaner technologies like electric operated equipment or combination of diesel/electric equipment which can eliminate or significantly reduce the exposure to the airborne contaminants generated by internal combustion equipment. Any

technology introduces other hazards and electrically operated equipment is not the exception. However the technological advancements in the widespread use of underground electrically powered equipment in other countries like Australia and Canada, could serve as a starting point to evaluate the feasibility or transition at least the equipment used in the areas where ventilation and emissions are harder to control. Besides the Health and Safety advantages of some electrically powered equipment, operations costs could be reduced by gradually transition to these technology (Varaschin & De Souza, 2015)