RFQ 24-1: Benefits Assessment of Accelerated Turnover of the On-Road Diesel Vehicle Fleet in the United States

Summary

The Health Effects Institute (HEI) is seeking proposals to identify and assess the potential emissions, air quality, human exposure, or human health benefits that can be achieved by replacing older medium- and heavy-duty diesel vehicles in the United States with lower-emission vehicle technologies. This RFQ has three aims: (1) to use a robust screening approach to identify an urban emissions hotspot in the United States that would be expected to benefit from fleet turnover; (2) to quantify potential effects of accelerating medium- and heavy-duty diesel vehicle fleet turnover in the selected hotspot on air pollutant emissions, concentrations, community exposures, and health; and (3) to identify current challenges or barriers to replacement of the older vehicles through engagement with owners and operators of medium- and heavy-duty vehicles and other audiences who are potential beneficiaries of fleet turnover or have relevant experience. HEI anticipates funding one study for a duration of 18 months (including writing of the final report) with a maximum budget of $500,000.

Background and Rationale

The Diesel Fleet

Diesel engines drive much of the world's transportation and industrial infrastructure. Compared to gasoline engines, diesel engines are more durable and fuel-efficient, and they produce greater torque. Despite those advantages, diesel engine emissions can affect the environment and human health with high emissions of particulate matter (PM, also known as soot), nitrogen oxides (NO_x), and hydrocarbons (including some carcinogens) (HEI, 2022).

Current and Anticipated Regulations and Programs

There are numerous federal, state, and local regulations, policies, and programs covering medium- and heavy-duty diesel vehicles and their emissions of air pollutants. A brief and noncomprehensive summary of current and anticipated regulations and programs in the United States is provided here.

Key regulations that address emissions from on-road medium- and heavy-duty diesel vehicles include U.S. Environmental Protection Agency (U.S. EPA) certification standards that set limits on tailpipe emissions of NO_x, fine particulate matter ($PM_{2.5}$), carbon monoxide (CO), and volatile organic compounds (VOCs), along with detailed methods for vehicle testing and certification (U.S. EPA, 2022, 2005, 1997). Additionally, fuel composition standards reduce sulfur content and stipulate biofuel content of commercial diesel to reduce PM formation and prevent poisoning of after-treatment catalysts (U.S. EPA, 2019).

The U.S. EPA, building on earlier required in-use testing of heavy-duty vehicles (U.S. EPA, 2005), recently promulgated new, more stringent heavy-duty engine and vehicle standards to reduce pollution from heavy-duty vehicles and engines beginning in model year 2027 (U.S. EPA, 2022). It is the first of three intended rules that will combine comprehensive regulations to reduce pollution from heavy-duty trucks under U.S. EPA's Clean Trucks Plan (U.S. EPA, 2023a). Other regulations that EPA has proposed under the Clean Trucks Plan include multi-pollutant emissions standards for model years 2027 and later for

light- and medium-duty vehicles and phase 3 greenhouse gas emissions standards for heavy-duty vehicles.

Concurrently, California has developed its own set of regulations. As directed by California Senate Bill 210, the California Air Resources Board (CARB) developed and approved the "Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments." These rules are being phased in beginning with model years 2024 and later (CARB, 2020). This multipronged regulation will substantially reduce the NO_x and PM emissions standards, require monitoring of all trucks operated in California by its heavy-duty vehicle inspection and maintenance program ("Clean Truck Check"), and extend the required emissions warranty period, among other steps. There are also regulations that target longevity of the after-treatment technologies, vehicle idling, and upgrade of certain fleet segments, such as buses and drayage equipment (CARB, 2023a). Looking toward the future, California's Advanced Clean Trucks Rule and Advanced Clean Fleets Rule require increasing percentages of medium-duty and heavy-duty vehicles sold and operated in California to be zero-emissions, starting with model year 2024 with full transition of high-priority fleets by 2042 (CARB, 2023b, 2021; DieselNet, 2024). Multiple states have adopted versions of California's clean truck and zero-emission vehicle standards (U.S. Department of Energy, 2024).

In conjunction with regulations, nonregulatory and incentive programs at the federal and state levels are intended to accelerate fleet turnover. For example, the U.S. EPA's Diesel Emissions Reduction Act (DERA) Program provides grants for the replacement or retrofit of old-technology diesel vehicles and equipment (U.S. EPA, 2024). The Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA) also provide substantial funding for vehicle and equipment replacement (U.S. White House, 2023, 2022). Various states have complementary programs to provide incentives for the replacement or retrofitting of older diesel vehicles and state-level inspection and maintenance programs to monitor and limit their emissions (e.g., CARB, 2023a).

Heavy-Duty Vehicle Technologies and Fuels

The stringency of PM and NO_x emissions standards for diesel engines increased during the 2000s (HEI, 2010: Table 2.1). Ultra-low-sulfur fuel (<15 ppm) was essential for reducing PM formation and for avoiding after-treatment catalytic poisoning of the catalysts used in after-treatment devices. At the same time, engine manufacturers developed catalyzed diesel particulate filters that use a diesel oxidation catalyst; together, they are extremely effective at removing diesel PM and VOCs (Khalek et al., 2011). Fleet turnover and retrofitting of older vehicles with new control technologies have also substantively reduced air pollutant emissions from the transportation sector, with per-vehicle-mile emission reductions occurring more quickly than vehicle miles traveled (U.S. EPA, 2023b). The emissions from well-maintained, late-model gasoline-powered and diesel-powered vehicles are the lowest they have ever been, and this has contributed to improvements in air quality.

Despite substantial reductions in NO_x emissions, heavy-duty vehicle emissions continue to be a large contributor to NO_x and the formation of ozone. Technological challenges include inefficiencies in selective catalytic reduction when the exhaust stream temperature is too low (that is, below 200 to 250 °C), for example, during conditions of cold-start, low-load, and stop-and-go driving that is typically encountered in urban areas. Those inefficiencies contribute to increased emissions (Boriboonsomsin et al., 2018; Posada et al., 2020). Battery and fuel-cell powered electric vehicles are a small but growing fraction of the heavy-duty vehicle market, and it remains to be seen how the technologies will grow in coming years.

HEI-Funded Research on Diesel Emissions and Related Air Pollution

HEI has provided rigorous, impartial, and relevant science to decision makers on the health effects of air pollution for over four decades. HEI's work on air pollution exposures and health effects is supported jointly by the U.S. EPA and the motor vehicle industry with additional funding from other domestic and international partners. HEI's approach is centered on funding high-quality, independent scientific studies that are strategically selected, are carefully designed, and use state-of-the-art scientific methods. Research topics are selected to address key national and international policy questions that are directly relevant to improving air quality and health.

HEI work related to health effects of diesel emissions includes assessments of the carcinogenicity of diesel exhaust (HEI, 2015a, 1999, 1995), a study on the effectiveness of goods movement actions in California to improve air quality and health outcomes (Meng et al., 2021), and a systematic review and meta-analysis of epidemiological studies on the health effects of long-term exposure to traffic-related air pollution (HEI, 2022).

HEI's Special Committee on Emerging Technologies (SCET) published a report titled "The Future of Vehicle Fuels and Technologies: Anticipating Health Benefits and Challenges" that described how new fuels and engine technologies would likely affect emissions, air quality, and potential health effects (HEI, 2011). Additionally, HEI has a long history of documenting emissions benefits of newer diesel technologies. For example, HEI documented with the Advanced Collaborative Emissions Study (ACES) the substantial improvements that can result from using new technologies, including diesel particulate filters and selective catalytic reduction for heavy-duty diesel engines (HEI, 2015b; Mauderly and McDonald, 2012; McDonald et al., 2015).

Rationale for the RFQ

Recent data suggest that just over one-third of the fleet of trucks and buses in 2022 were pre-2007 model year vehicles without diesel particulate filters or selective catalytic converters. Additionally, a substantial portion (40%–50%) of the fleet in 2022 were pre-2010 vehicles that had diesel particular filters but no selective catalytic converters (Diesel Technology Forum, 2023). It also appears that the older, more polluting vehicles tend to operate more frequently in intracity fleets in urban areas and historically marginalized communities than in long-haul fleets because new vehicles tend to travel greater distances per year than vehicles purchased on secondary markets (U.S. Census Bureau, 2021). Thus, air pollutant emissions from older diesels continue to affect health, and their transition to newer technologies likely carries substantial exposure and health benefits for communities residing in proximity to freight operation hotspots. Potential economic and societal opportunities *and* barriers also likely exist for owners or operators of older diesel vehicles.

To assess the potential air quality and health benefits of accelerating the replacement of older diesel vehicles with cleaner diesel vehicles and emerging technologies, HEI assembled a Panel of highly respected scientists. The Panel is chaired by Dr. Marianne Hatzopoulou of the University of Toronto and HEI's Research Committee. Dr. Hatzopoulou is a respected researcher in modelling road transport emissions, urban air quality, and population exposure to air pollution. Collectively, the Panel has substantial expertise in relevant fields, including heavy-duty diesel vehicle emissions, transportation systems, environmental justice, urban planning, air quality, and health impact assessment.

The Panel has identified important gaps in knowledge on the potential emissions, air quality, human exposure, and health benefits that can be achieved in the United States by replacing older medium- and heavy-duty diesel vehicles with newer and cleaner vehicle technologies. Specific information needed to inform new regulations, policies, and programs aimed at accelerating fleet turnover includes rigorous

identification of the most-affected populations, an understanding of the potential benefits that can be achieved, and increased understanding of owner-operator perspectives on the opportunities and barriers associated with existing and potential future requirements and incentives. Therefore, the Panel has prepared this RFQ to advance data and understanding in these areas. Although zero-emission technologies are likely to become more prevalent over longer time scales, this project will focus on the potential near-term benefits of switching from older vehicles to cleaner vehicle technologies and placing those options in context with the emerging technologies.

Specific Aims

HEI seeks a well-qualified research team to assess the potential benefits of the turnover of older heavy-duty diesel vehicles (see definitions below) in the United States through the accomplishment of the following aims:

1. Using a robust screening approach, identify an urban hotspot of older medium- and heavy-duty vehicle fleet activity in the United States that geographically overlaps with or is adjacent to a community that would be expected to benefit from reduced emissions associated with accelerated turnover of older medium- and heavy-duty diesel vehicles.
2. Quantify the baseline potential effects of accelerating medium- and heavy-duty diesel vehicle fleet turnover in the selected hotspot on air pollutant emissions, concentrations, community exposures, and health via phasing out the older medium- and heavy-duty diesel vehicles.
3. Identify current challenges or barriers to replacement of the older vehicles through engagement with owners and operators of medium- or heavy-duty diesel vehicles and other audiences who are potential beneficiaries of fleet turnover or have relevant experience.

To be responsive to this RFQ, all three aims must be addressed.

Budget, Timeline, and Deliverables

HEI intends to fund one project for a maximum budget of $500,000, including indirect costs. Researchers at for-profit institutions should contact HEI to discuss any indirect costs or fees before they apply. Researchers at non-profit institutions will have indirect capped at 30% of direct costs, and applications should go through the normal processes for their institutions.

The proposal must include a project timeline that indicates deliverables and project milestones. The duration of the study funded under the RFQ (including report writing) will be 18 months. HEI expects that the successful applicant will meet with HEI's Heavy-Duty Diesel Fleet Turnover Panel a) at study initiation, b) when the location selection methodology has been completed and the location has been selected, c) at the mid-point of the project, and d) shortly before the draft final report is submitted. Reporting requirements will include a progress report at the midpoint of the analysis period, a draft final report after the conclusion of 15 months of work, and a final report at the end of the study period. Meetings with the Panel will generally be held online, with travel expenses for any in-person meetings or site visits with the Panel during the study covered separately by HEI. HEI expects to publish the work funded under this RFQ alongside the Panel's work in an HEI Special Report, which will be independently peer reviewed.

Key Study Design Considerations

Definitions

For the purposes of this RFQ, the Panel has adopted the following definitions:

- **Near-term benefits** are those that can be achieved in the next 5-10 years using existing technologies. Potential benefits of future technologies or technologies that are not currently readily available are out of scope. HEI's focus is health benefits from reduced air pollution; however, improvements in the understanding of the potential emissions, air quality, and community exposure benefits for the communities most affected by the diesel emissions hotspot are considered fully responsive to this RFQ.
- **Older medium- and heavy-duty diesel** vehicles are Federal Highway Authority (FHWA) Class 3-9 diesel-powered vehicles that are 2010 or older model years. Where possible, applicants are expected to differentiate between different classes of vehicles and those with different emissions controls (e.g., diesel particulate filters became standard in model year 2007 and selective catalytic reduction became standard in model year 2010).
- **Hotspots** are areas of elevated emissions from older medium- and heavy-duty diesel vehicles. Examples of hotspots might include areas near intermodal transport facilities, ports, warehouses, or goods movement corridors. Because of the need for detailed local data and the accelerated timeline of this project, only one hotspot is expected to be included in the study; however, a study that incorporates multiple hotspots to increase generalizability of the results is welcome. The focus is on the hotpot and not vehicle registration locations, so vehicles at the hotspot should be considered regardless of state or country of registration.

Aim 1: Identification of the Study Site

Applications should include a rigorous screening approach to select an urban hotspot in the United States for diesel emissions from older medium- and heavy-duty diesel vehicles in which fleet turnover could result in potential reductions in exposure to air pollution leading to improvements in community health. The description of the methodology in the proposal should include site selection criteria, data sources or tools that will be used, and a description of the screening approach. Applications must describe how the community that geographically overlaps with or is adjacent to the study site could benefit from fleet turnover. Approaches to identify and define the study location will likely include combinations of local data on the age distribution of medium- and heavy-duty diesel vehicles, information on the potentially affected population (e.g., its size and whether it is a historically marginalized community, an environmental justice community, has a large low-income population, or has a large minority population), and other potentially important environmental exposures in the community.

The approach should identify sites with spatial scales and population characteristics that will allow benefits assessment and engagement of owners, operators, and other potentially affected audiences (i.e., Aim 2 and Aim 3) to be conducted. The availability of local data should not be considered at the initial stages of screening for potential sites but should be considered for the final site selection. Where possible, local measurements (e.g., from near-road air quality monitors) should be used to confirm that the selected site is a hotspot for diesel vehicle emissions. Although the study site might be in a nonattainment area, nonattainment is not a requirement. Applicants should describe the incremental contribution of the study to previously available information about diesel emissions in and around the hotspot.

Applications should include sufficient information on the approach to assure the Panel that an appropriate site will be identified. Applicants may either describe a rigorous methodology that will be used to identify a site or propose a specific site. If a site is not identified in the proposal, the research team will collaborate with the Panel during the study period to make the final site selection. If the application includes a proposal to conduct the work at a specific site, bypassing Aim 1, the application

must rigorously justify the selection of the site based on the RFQ criteria. Applicants should describe the ability of the selected site and the methodological approach that is applied to provide information that is translatable to other locations.

Aim 2: Benefits Assessment

Methodological Approach

HEI has not specified any particular methodology to assess the potential benefits of fleet turnover and accepts any methodology that directly addresses the goals of the RFQ. Potential approaches might include truck characterization methods, development of inventories of age-stratified fleet use or emissions in the local area, and measurement or modeling of air pollutant levels for the purpose of quantifying exposure to air pollutant emissions from on-road or other medium- and heavy-duty diesel vehicles in the area. The study design should consider whether the vehicles operate mostly within the geographic scope of the hotspot or arrive from across the United States when assessing how fleet turnover will affect the hotspot. Rigorous scenario analyses and health benefits assessments for the local population are welcome. However, if full health benefits assessment is not feasible, analyses related to changes in air quality and potential exposures would also be considered responsive and informative of the potential benefits to health of fleet turnover. The spatial resolution of the analyses must reflect the spatial resolution of the emissions and impacts. Averaging times for analysis of either air quality or exposure should be selected that are relevant to health effect endpoints. The base year for the benefits assessment should be the most recent year where sufficient data are available to complete the objectives of the proposed work.

Data Sources

Applications must provide information on the type of data available for use in the research, including the period, location, frequency, and quality assurance of measurements. Assessments should be conducted at the local level and draw on microscale data and models for commercial vehicle movements, emissions, and other inputs wherever possible. When selecting data for use, applicants should consider and account for any lack of comparability of data collected for different purposes, for example, because different measurement methods were used or data are spatially or temporally misaligned.

Given the short project duration and budgetary constraints, applicants are encouraged to make use of existing data wherever possible. It will be important to demonstrate that the applicants have access to necessary public or proprietary datasets before the start of the contract period. Primary data collection is allowable if the data are needed for the study and can be collected within the allocated resources.

Data collection and quality assurance protocols will be evaluated for all data used in the study. The proposal should include sufficient detail on the data collection methods, spatial and temporal resolution, and availability to assure the Panel of both the quality and appropriateness of the selected data sources for their intended uses.

Pollutants

The pollutants that are measured or modeled should be emitted by medium- and heavy-duty diesel vehicles and be relevant to policy or health. Inclusion of nitrogen oxides (NO_x) is required, with consideration of the effect of emission control technologies on the ratio of nitrogen oxide (NO) to nitrogen dioxide (NO_2). Other potentially relevant pollutants should be included. For example, black carbon (BC) and elemental carbon (EC) have been used as markers of diesel emissions and might be

useful to include. $PM_{2.5}$ provides less localized information but is very policy relevant and would be relevant if primary emissions were modeled. Other pollutants, including ultrafine particles (UFPs) and mobile source air toxics (MSATs), are often elevated in areas of high diesel emissions and would contribute to a better understanding of the overall emissions and air quality impacts of medium- and heavy-duty vehicles. The focus of the study should be on the effects of primary emissions of any included pollutants in the hotspot environment.

Categories of vehicles

The benefits assessment should consider a range of older medium- and heavy-duty diesel vehicles, as defined above. Given the wide range of vehicles included in this sector, the work should distinguish the potential benefits of fleet turnover for different categories of vehicles in terms of benefits as much as possible. Categories may be defined by vehicle age, emissions control technologies, types of deliveries, FHWA classification, or other features.

Aim 3: Engagement with Multiple Audiences Potentially Affected by Fleet Turnover

Engagement with multiple audiences potentially affected by fleet turnover is intended to provide qualitative or quantitative information on the potential opportunities and barriers associated with replacing older medium- and heavy-duty diesel vehicles. For example, receptibility of fleet owners to use of retrofit technologies, enhanced maintenance improving emissions, maintenance training, low-cost upgrades to truck emission systems, and disincentives to tampering would be worthy of consideration and emissions benefit calculation.

The engagement plan must involve a representative sample of truck owners and operators with different operation types (e.g., short-, medium-, or long-haul), business models (e.g., new or used fleets), or maintenance practices operating in or near the hotspot. Other interested audiences (e.g., school districts; municipal, state, or federal governments; transit providers; or community groups) who might be affected by programs to accelerate fleet turnover or have relevant experience should be engaged as appropriate for the site and the benefits being assessed. Applicants must define the audiences they will engage, the techniques they will use to engage them, and the appropriateness of the proposed engagement techniques. Any appropriate method of engagement will be responsive to this RFQ. Effective engagement at key intervals could be accomplished in many ways, for example, with focus groups, informal conversations, symposia, or surveys. Sharing of information within and outside of the study team should be accomplished by using appropriate communication vehicles (e.g., workshops, open houses, site visits, websites, fact sheets, and webinars or live-streaming events). A potential outcome of this work could be a narrative to help to understand why vehicles are not replaced under current incentive structures.

The proposal must include a preliminary plan for engagement that will be expanded and finalized after the study site is selected. The plan should provide the following information:

a. Objectives for engagement. Describe anticipated outcomes of engagement, including how it will benefit the research and multiple audiences, for example, policymakers or potential beneficiaries of fleet turnover. Specify goals for outcomes, for example, more informed general understanding of the perceived needs for fleet turnover and potential benefits and barriers.

b. Approach to engage multiple audiences. Describe the approach that will be used to identify potential partners and informants, including truck owners and operators and other people who might be affected by accelerated fleet turnover or have useful expertise. Include the broader context (e.g., historical or social) of efforts to address emissions from medium- and heavy-duty

vehicles, and how the proposed research will fit into these efforts. Describe who might benefit from their support of the study, how they might benefit, and any past, ongoing, or hoped-for future collaborations. Also, describe any anticipated roles of members of any of the engaged audiences in designing, implementing, or communicating the research. Include information on how community members and groups who might play a more active role in the research will be compensated for their time and expenses. Explain the strategy for lowering any potential barriers to participation.

c. Approach for communication of study designs and results. Describe the communication products that you plan to produce (e.g., posters, workshops, or manuscripts), intended audiences of those products, and approach to ensuring that research translation and communication of study design, progress, and results occur equitably and through culturally appropriate means.

d. Measures of success. Describe how you will measure progress of the objectives and desired outcomes for engagement based on both outputs and outcomes. Examples of output measures could include the number of workshops and open houses organized, the number of people participating in meetings, the diversity and range of interests represented at meetings, and the number of communication activities conducted. Other outcome measures could be obtained through surveys provided to owners and operators or other audiences that capture responses to engagement-related questions and that track changes over time. If the research consists of a formal partnership among multiple institutions or organizations, describe mechanisms for feedback and improvement over the course of the research.

e. Research team member expertise. Describe the expertise of team members who will implement the engagement plan, including their previous experience with stakeholder or community engagement, their existing relationships with audiences with interests relevant to the proposed project, and if those members have received training relevant to equity and equitable relationships with community groups.

Eligibility to Apply

Applications will be accepted from established consulting or research organizations with the appropriate expertise to complete the work in the indicated timeframe and budget. The lead organization for applications submitted under this RFQ must be based in the United States. Note that HEI and its funded institutions are subject to the Office of Management and Budget and U.S. EPA accounting regulations and a DUNS number for your institution will be requested. Questions about eligibility may be directed to Dr. Allison Patton, apatton@healtheffects.org.

Research Team

The research team should include members who have the broad range of knowledge necessary to conduct the proposed research, including prior experience with preparing and implementing quality assurance plans. It may include those who have expertise in diesel engine and control technologies, air pollutant emissions, air modeling and monitoring, impact assessment, stakeholder or community engagement, social science, exposure assessment, epidemiology, economics of trucking or transportation purchasing behavior, and statistics. The Principal Investigator (PI) must be an expert in a relevant field with a track record of producing high-quality and objective research on the topic of the RFQ. The PI should demonstrate experience in successfully leading a multidisciplinary team of scientists. The team's technical proposal ideally will be informed by engagement with experts who represent multiple sectors (e.g., academia, communities, regulatory and public health agencies, industry, and

nongovernmental organizations) and will include them in research as appropriate. The full team can include the PI, their immediate team (other faculty, research scientists, post docs, students, and technicians), co-investigators, or collaborator(s) at other institutions, community members, consultants, and other people who have expertise or experience relevant to the proposed project.

HEI strongly encourages applicants to diversify their research teams by including individuals from groups that are underrepresented in environmental exposure and health research and, to the extent appropriate given the study locations, to be attuned to and knowledgeable about the key audiences and communities in which the studies are taking place. For this purpose, HEI has adopted the National Institutes of Health (NIH) definition of underrepresented populations in the U.S. Biomedical, Clinical, Behavioral and Social Sciences Research Enterprise.[1]

Applications must include an organizational chart that clearly identifies each team member, their affiliation and role in the research, and lines of communication among team members and the PI who oversees the research and coordinates its successful completion. Any potential participation of HEI sponsors in advising the study must be described.

Facilities

The application should demonstrate that the research team has access to or the ability to purchase or rent facilities, equipment, instrumentation, data, or cloud computing services needed to support the proposed research. If the study requires access to a physical site or data managed by other groups, the team should demonstrate access, for example, by including letters of support from site owners or data managers in the proposal.

Data Management, Preservation, and Access

Providing access to data is an important element in ensuring scientific credibility and is particularly valuable when studies are of regulatory interest. It is the policy of HEI to ensure that access is provided expeditiously to data for studies that it has funded and to provide those data in a manner that facilitates review and verification of the work while protecting confidentiality and self-determination of any participants or communities involved in the study, and while also respecting the intellectual interests of contributors to the original work. Please refer here for the HEI Policy on the Provision of Access to Data Underlying HEI-Funded Studies.

Successful applicants will be expected to include a data management plan with an explicit description of how data are owned and shared. Where data are provided by a third party, a process for other investigators to obtain and work with the data should be outlined.

Wherever possible, any new data and tools should be provided in a way that they can be directly used or applied to other locations by the Panel and other researchers. A data availability statement will be required in compliance with HEI's Data Access Policy. HEI strongly supports sharing of data, with appropriate protection for proprietary and health data.

[1] NIH's definition of underrepresented populations includes individuals from racial and ethnic groups underrepresented in health-related sciences on a national basis, individuals with disabilities who are defined as those with a physical or mental impairment that substantially limits one or more major life activities, and individuals from disadvantaged backgrounds, recognizing that women from these three backgrounds face particular challenges at the graduate level and beyond in scientific fields (Source: https://grants.nih.gov/grants/guide/notice-files/NOT-OD-20-031.html).

Quality Assurance/Quality Control

All applicants should provide a high-level summary of the measures in place to ensure the quality of the data collection procedures, data processing procedures and analyses, and data and records management. Please list the standard operating procedures that exist or will be developed for the methods laid out in the proposal.

Detailed QA/QC information should not be submitted with the original application. If a study is recommended for funding, HEI will request a preliminary QA/QC plan to be submitted to HEI before contract initiation. A final plan approved by the Panel is required before implementation of the study protocols. HEI expects to contract an external QA auditor to conduct a QA/QC audit of the final report. The research and final report of the study team will also be reviewed by the Panel and external reviewers, as appropriate. See our research funding page for more details on other important information on HEI Investigator Commitments and QA/QC procedures.

Ethics Approvals

Applications must demonstrate how they will protect confidentiality and anonymity, as appropriate. The application should describe any ethics approvals (e.g., IRB if human participants are involved) that are required and whether approval has already been received. If approval is pending, include an anticipated timeline. If private business information (e.g., trade secrets, asset values, routing algorithms, market shares, existing contracts, telematics data) or information on tampering of emissions control equipment is to be collected, information on the methods for ensuring confidentiality must be included and non-business audiences should be made aware of any such contingencies related to participation of owners and operators. Additionally, the research team must obtain permission from the owners and operators involved or other participants to publish maps or data that might be able to identify homes or businesses that are more affected by diesel emissions. Implementation of the project cannot begin until any applicable ethics approvals are on file at HEI. Given the tight timeline for this project, applicants are requested to avoid approaches that require extensive approvals that are not already in place.

Application Components

The required application forms and instructions are compiled at https://www.healtheffects.org/research/funding/application-instructions. Forms from the **Full Application** package should be used. Not all forms are requested for this RFQ.

The application should consist of the following components:

1. Cover page (**Form F-1**)
2. Statement of Qualifications (6-page maximum; *no specific form required*) consisting of the following elements:
    a. A narrative of the analyses that will be conducted and associated QA/QC procedures that will be followed to achieve each Aim of this RFQ.
    b. Descriptions of data to be analyzed and their quality, how necessary data or facilities will be accessed, and how the data will be secured.
    c. A preliminary plan for engagement with multiple audiences.
    d. An organizational chart that clearly identifies each team member, their affiliation and role in the research, and lines of communication among team members and how they lead to the

PI who oversees the research and coordinates its successful completion. Note any potential conflicts of interest.

e. A milestone chart depicting the timeline for completing the research.

3. Description of the facilities, including data security procedures, available at the applicant institution. (**Form F-9**)
4. A budget for the study with justification of all line items. The assumed start date should be **September 1, 2024**. (**Forms F4a and F5a** for the PI's institution, and **Forms F4b and F5b** for any subcontracts if applicable)
5. Biographical sketches of the key personnel involved. (**Form F-10**)
6. Letters of commitment, collaboration, or support (if applicable).
7. Personal data form. (**Form F-12** --- optional)

How to Apply

All applications must be received by **April 18, 2024, by 11:59 pm ET**. A webinar with a Q&A session for potential applicants will be held on **March 19, 2024, at 1:00 pm EDT**. Register here.

This project is on an expedited timeframe. Please contact Dr. Allison Patton (apatton@healtheffects.org) no later than **April 4, 2024** to indicate your intent to apply. In the email, please briefly (1–2 paragraphs) describe your intended proposal and ask any questions you have about the RFQ.

The application should be submitted by email in PDF format by to Mr. Quoc Pham at funding@healtheffects.org. Applications should use the forms indicated under Application Components and not exceed a file size of 20 MB. Once the application has been submitted, please send an email without attachments to funding@healtheffects.org to notify HEI that your application has been submitted. HEI will acknowledge receipt of the application.

For details about HEI research and applying for funding, please consult documents on the HEI Research and Review Processes and Investigator Commitments. Instructions and forms are available on the Application Instructions page.

Review of Applications

HEI's Heavy-Duty Diesel Fleet Turnover Panel will evaluate applications according to the following criteria:

- **Relevance** to the aims and key study design considerations of the RFQ and HEI's overall mission to provide high-quality, policy-relevant research. The research is designed to be useful to scientists, government officials, industry, communities, or other audiences and broadly applicable to other populations, regions, states, tribes, regulatory climates, and times, and make substantive advances in scientific knowledge and methodology.
- **Scientific merit** and rigor of the study design, data collection and analysis methods, exposure generation or modeling approaches, data evaluation, and overall quality assurance.
- **Experience, competence, and diversity of the research team**, including PI, scientific staff, and collaborating investigators. If the application includes partnership with a community-based organization, community partners are expected to be included as part of the research team, and the research team should demonstrate a clear track record of community engagement and community relationships.

- **Adequacy of facilities**, including (1) access to study sites, instrumentation, and relevant data sets or specimens; and (2) adequacy and validity of facilities to implement the proposed research, including laboratory space, exposure and health measurement capabilities, computing facilities, and other support necessary to deliver high-quality research (as applicable).
- **Reasonableness of the proposed budget**. Allocation of adequate effort for each team member should allow for successful implementation of the proposed research, including engagement with relevant audiences and dissemination of the results. Community partnerships and community engagement should be reflected in the proposed budget if they are part of the application.
- **Plans for disseminating results.** Well-developed plan for research translation to inform decision-making. The plan clearly describes how and to whom results will be shared, as well as decision-making applications for communities, government officials, industry, or other potentially interested audiences, as applicable.

Applications might also be sent to external scientists for additional evaluation: (1) to evaluate a specific aspect not covered by expertise on the Panel, or (2) when Panel members have a conflict of interest with a particular proposal and are barred from participating in the review of that proposal, leaving the Panel short-handed in that area of expertise.

HEI's process does not allow submission of revised proposals, but in some cases the Panel may postpone a decision and ask for further clarification before making a final recommendation. The Panel could also negotiate that a specific aim be dropped or expanded and that the study duration and budget be adjusted accordingly. HEI will notify applicants of the decision and provide anonymous feedback from the Panel members and any external reviewers.

After all applications have been evaluated, the Panel will rank the top proposals and make a recommendation for funding to HEI's Board of Directors based on the available budget for the RFQ while making sure that the funded study addresses the objectives of the RFQ. The Board of Directors reviews whether the selection process has been followed and if any conflicts of interest have been handled appropriately then makes the final funding decision.

A response to all applicants is anticipated by **May 31, 2024**.

Conflicts of Interest

HEI's procedures for conflicts of interest are similar to the guidelines set forth by the National Institutes of Health. Members of HEI's sponsor community are excluded from participating in RFQ development, applying for support, application review, and funding decisions. Members of the Panel will be reviewers of applications and will not join any consultant's team. Their colleagues are welcome to apply to this RFQ with all potential conflicts declared. A detailed conflict of interest policy can be found here.

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