SEP Proposal Form

Organization Contact Information

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Organization Description:

SCAQMD is the air pollution control agency responsible for monitoring and regulating air pollution in the South Coast Air Basin (Basin) and the Riverside County portion of the Salton Sea Air Basin (SSAB) and Mojave Desert Air Basin (MDAB). The Basin comprises the Orange County and non-desert portions of Los Angeles, Riverside, and San Bernardino counties. SCAQMD jurisdiction is the second most populous urban area in the United States, and covers approximately 11,000 square miles with about 16 million inhabitants. SCAQMD is also responsible for the development and implementation of the Basin's Air Quality Management Plan (AQMP) for the inclusion in the state implementation plan (SIP) to attain and maintain national ambient air quality standards (NAAQS) for ozone and $PM_{2.5}$. The topography and climate of Southern California combined with the growing population, increasing vehicle miles traveled (VMT), San Pedro Bay Ports activities, and a segment of manufacturing, chemical, and refining industries make the Basin an area of high air pollution. The impact of air pollution on public health and welfare ranks high among public concerns in California and disproportionately affects the Basin more than the rest of California. Since 2000, the California Air Resources Board (CARB) has linked air pollution, especially diesel exhaust and other toxic air contaminants, to high annual cases of premature deaths, asthma attacks and other lower respiratory symptoms, school truancy, and missed work days. Despite the last two decades of aggressive efforts to reduce air pollution, the Basin still has some of the worst air quality in the U.S. based on the number of days the NAAQS for ozone are exceeded.

Organization Experience

SCAQMD has a long history of successfully collaborating with Basin stakeholders to reduce emissions from variety of mobile and stationary sources through research, development, demonstration, and deployment (RDD&D) of alternative fuel and clean fuels technologies in Southern California. These projects or studies address a diverse mix of advanced technologies, including advanced engine and emission control technologies, fuel cell, electric and hybrid technologies, health impacts, and fuel and emission studies. SCAQMD has installed air filtration systems at 71 schools near the Ports, Boyle Heights, San Bernardino, and the Coachella Valley. It has a decade of experience in air filtration starting with the SCAQMD air filtration pilot study.

SCAQMD has published results from the pilot study in the peer reviewed journal *Indoor Air* (2013) and conducted a national assessment (2010) of air filtration technologies (high performance filters and stand-alone units) at Sunnyslope Elementary School in Riverside, California to identify commercially available technologies meeting the standards in the pilot study.

Staff Expertise, Qualification, Knowledge, and Resources

SCAQMD has the staff resources necessary to meet the goals of the proposed project, and will administer project funds and provide comprehensive project management. The proposed project will be implemented by a program manager, an air quality specialist, an air quality instrument specialist, a financial specialist, a staff assistant, and a deputy district counsel.

Dr. Jason Low is Assistant Deputy Executive Officer of the Monitoring and Analysis Division for Science & Technology Advancement, responsible for ambient monitoring, source testing and laboratory analysis. He oversees the SCAQMD ambient network of over 40 air monitoring stations, the laboratory and numerous special air monitoring projects focusing on air toxics and the local impacts of air pollution. He received his B.S. in Chemistry and Biology, and M.S. and Ph.D. in Chemistry with a focus on atmospheric chemistry, all from the University of California, Irvine.

Dr. Andrea Polidori is Atmospheric Measurements Manager in the Division of Science and Technology Advancement and is responsible for innovative work conducted by AQ-SPEC and the advanced remote measurement programs. He will provide additional technical assistance on air filtration. He received his Ph.D. from Rutgers University in Environmental Sciences and was formerly a research professor at University of Southern California. His areas of specialty are aerosol formation and indoor/outdoor exposure to fine particulate matter.

Patricia Kwon is an air quality specialist in the Technology Demonstration group who will manage the day-to-day activities of the proposed project. She is currently managing several SCAQMD air filtration projects. Other technology areas include electric and hydrogen vehicle infrastructure planning and deployment, as well as solar projects. She has worked for over 14 years in the Technology Demonstration group and in the Socioeconomic Analysis group. She received her M.A. from University of California, Los Angeles in sociology, specializing in statistics and program evaluation, and a B.A. in biology from Johns Hopkins University.

Mary Leonard is the financial analyst whose duties will include managing the grant under the proposed project. She has over 12 years of experience managing administrative and financial aspects of federal and state grants.

As a result of a RFP, IQAir North America (IQAir) was selected and has worked with SCAQMD on the pilot study and an air filtration program for schools near the Ports of Los Angeles and Long Beach. Frank Hammes, president of IQAir, has over 19 years of hands-on and management experience in the design, engineering, and field application of air cleaning technologies for commercial, medical and residential applications. IQAir is one of the leading international providers of high performance indoor air quality engineering solutions.

Project Information

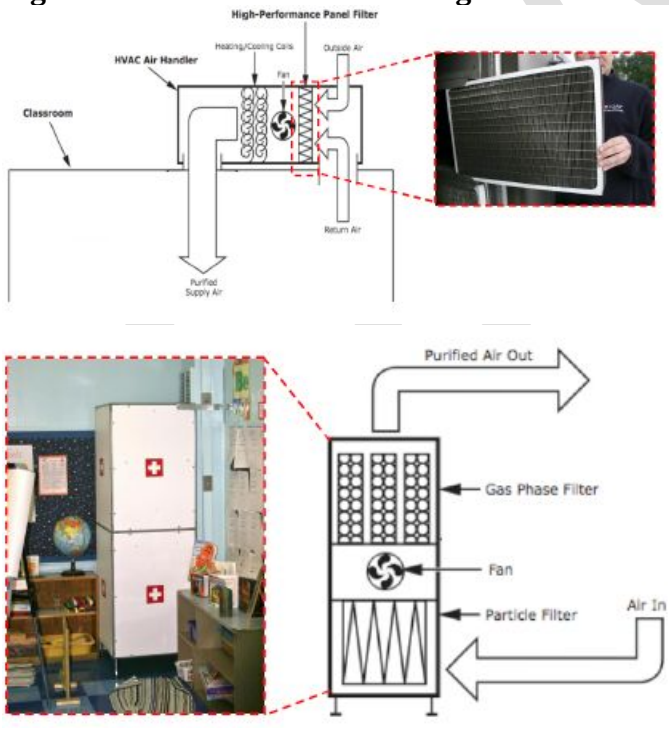
Project Title: Installation of Air Filtration Systems in Schools

Project Description

SCAQMD proposes a SEP to install and maintain high-performance air filtration systems in schools located in communities impacted by air pollution, especially Environmental Justice and/or Disadvantaged Communities disproportionately impacted by toxic air contaminants. It will partner with IQAir for installation of the air filtration systems, and work with the local community and school district on the mitigating impacts of air filtration. This program takes advantage of SCAQMD's expertise in air filtration technologies used in schools. School districts will provide access to schools, and will maintain the air filtration systems after their maintenance staff is trained on maintenance procedures for these systems.

Air filtration technologies such as high-performance air filters and stand-alone units have been successfully demonstrated in classroom environments to significantly reduce exposure to diesel particulates in the SCAQMD Pilot Study of High-Performance Air Filtration for Classroom Applications (2009) and *Indoor Air* journal article (2013). A Program Opportunity Notice (PON) for testing of air filtration technologies was released in May 2010. Testing conducted in August 2010 by UCR CE-CERT of 15 different air filtration technologies showed that high-performance filters and stand-alone units manufactured by IQAir were the only technologies that met the performance specifications in the PON.

Figure 1: Air Filtration Technologies



High-performance panel filters (top) and stand-alone units (below) used in the SCAQMD Pilot Study of High-Performance Air Filtration for Classroom Applications

<u>*Scope of Work*</u>: A task-by-task breakdown of the air filtration implementation project follows. The period of performance for this implementation project will continue for six months from the date of grant award for installation, with one additional year for post installation follow-up. The proposed scope of work includes tasks and deliverables to meet the objectives of the implementation project. IQAir shall perform the various tasks designed to complete the implementation project, facilitate cooperation from school districts in providing access to schools, and continued maintenance of the installed air filtration systems. SCAQMD will provide technical assistance as necessary to ensure smooth implementation based on past air experience in managing similar air filtration programs.

The implementation project will involve: 1) installation of high-performance air filtration systems in classrooms and common areas, 2) collection of air flow and monitoring data after installation of the air filtration systems results to verify the performance of the systems, 3) post installation reports, 4) training of school maintenance staff on maintenance of these air filtration systems to ensure their proper and efficient operation, and 5) five to ten year supply of replacement filters. Figure 1 shows two of the high-performance air filtration technologies (SCAQMD Pilot Study of High-Performance Air Filtration for Classroom Applications, 2009).

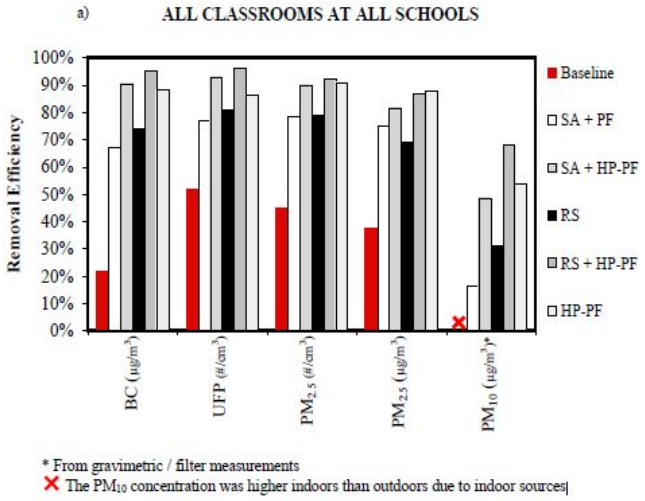
Project Location(s)

Schools in communities impacted by air pollution, including Environmental Justice and/or Disadvantaged Communities. School selection will be based on exposure to relevant pollutants and/or toxics, affected geographical locations, environmental health data or complaints from local school districts, and other pertinent selection criteria.

Emission Benefits

Air filtration systems in schools target fine and ultrafine particulate matter and black carbon found in railroad locomotives and trucks associated with goods movement activities in the region, and other toxic air contaminants. Results from the SCAQMD Pilot Study of High-Performance Air Filtration for Classroom Applications (2009) show reductions of in-classroom exposure to harmful particulate species by up to 90%. Testing results from the PON indicate that the Nanomax S-220 panel filter manufactured by IQAir had removal efficiencies between 89%-92% for ultrafine particulate matter and between 88%-91% for black carbon. The CleanZone SL stand-alone unit manufactured by IQAir showed removal efficiencies between 94% - 100% for UFP and 83% - 94% for BC, and was the only stand-alone unit that did not exceed the noise threshold of 45 decibels set by school districts for new in-classroom equipment. The specific air pollutants addressed by the air filtration systems are fine and ultra-fine particles, and diesel particles from combustion sources such as automobiles, trucks, locomotives, ships, industry and wildfires. In addition, these air filtration solutions are suitable to remove coarser particles such as fine dust, pollen, mold spores, and tire debris.

SCAQMD Air Filtration Pilot Study Results



The combination of a register system and a high-performance panel filter (RS + HP-PF) was the most effective solution for reducing the indoor concentrations of BC, UFP, and $PM_{2.5}$ (both mass and particle count), with average removal efficiencies from 87 to 96%. Replacing a conventional HVAC-based panel filter (PF) with a HP-PF resulted in a substantial reduction in the indoor levels of all particulate pollutants inside classrooms. When the HP-PF alone, the study average removal efficiencies were close to 90% (88, 86, 91, and 88%, for BC, UFP, PM2.5 count, and $PM_{2.5}$ mass, respectively). This is significantly higher than baseline (pre-existing) removal efficiencies of 20-50%.

Source: SCAQMD Pilot Study of High Performance

Health studies have determined that fine and ultra-fine particles, including potent air toxic diesel soot and other toxic air contaminants, present the greatest air pollution health risk to Southern California communities. Continued evaluation of high-performance filters and stand-alone units will provide the necessary data to support the commercialization of more cost effective filters and stand-alone units.

Performance Measures: Air filtration technologies need to meet the minimum performance requirements as specified in the SCAQMD Pilot Study of High Performance Air Filtration for Classroom Applications and thus provide a significant improvement in air quality conditions with respect to Baseline Conditions.

- Ultrafine Particles (UFP) – Particles roughly defined by an aerodynamic diameter less than 0.1 µm, estimated by measuring the total number concentration of all airborne particles down to at least 10 nm in diameter)
- Fine Particulate Matter ($PM_{2.5}$) – Particles with an aerodynamic diameter less than 2.5 µm, estimated with an established continuous or filter-based PM measurement method
- Black Carbon (BC) – Component of PM indicative of diesel emissions measured with established light absorption methods. Elemental Carbon (EC) measurements using established methods could substitute for BC measurements.
- Baseline Conditions – Percentage reduction in the indoor concentration of a particular air pollutant relative to its concurrent outdoor level before installation of any air filtration device.
- Minimum Average Removal Performance – Minimum percentage reduction in the indoor concentration of a particular pollutant relative to its concurrent outdoor level after installation of one or more air filtration devices, averaged over all time periods.
- Potential Average Removal Performance – Potential percentage reduction in the indoor concentration of a particular pollutant relative to its concurrent outdoor level after installation of one or more air filtration devices, demonstrated for several indicative time periods.

Demonstrated Effectiveness Inside Schools/Classrooms or Equivalent Environments: In the South Coast Air Basin, most schools are in close proximity to important sources of air pollution, including stationary sources such as refineries and mobile sources, especially heavily trafficked roadways. IQAir has previous experience with installation of particulate filtration devices in schools/classrooms located in close proximity to major sources of PM (e.g. major roadways with high percentages of diesel truck traffic) through its work on the pilot study and implementation program in schools near the Ports of LA and Long Beach. PM filtration (MERV 16 and HyperHEPA) is also highly effective for toxics such as hexavalent chromium+6. Furthermore, gas phase technology in its stand-alone units has been approved by CARB for removal of mercaptans for Porter Ranch residents in the Aliso Canyon gas leak.

Minimal Impact on Air Flow: Work on the pilot study and implementation programs demonstrate that IQAir's air filtration devices do not significantly reduce the existing airflow rates through the HVAC system and/or do not require higher power consumption to achieve similar flow rates.

Project Timeline
The program is divided into several phases: project administration, access agreements with the school districts (if not already executed), selection of schools, installation, training of school maintenance staff, air flow and monitoring to verify performance of the systems, and reporting (site assessments, post installation reports, annual O&M reports). Once funds are received and a contract amendment executed with IQAir, and MOAs executed with school districts (requiring school district board approval). Air filtration installation is after school hours and during vacations when school is not in session to minimize impacts upon students.

Itemized Budget
Site assessments for each school for installation and a 5-10 year supply of replacement filters will include a budget. Installations will be done to maximize the number of schools. Average costs for installation (with five year filter supply) for PM filtration are as follows: pre-K ($25,000), elementary ($80,000), middle ($120,000), and high school ($200,000). Installation costs will vary based on the number of buildings, existing HVAC systems, number of enclosed spaces, and other factors. Costs for HyperHepa and MERV 16 systems are slightly higher.

☑ **Acknowledgment:** By checking this box, you verify that you have read and understand the ARB SEP Policy and verify that all information given to ARB about your organization and your proposed project is factual.