

DOE *TechLine*

Projects Selected to Study Coal Plant Particulate Matter, Human Health

PITTSBURGH — The Department of Energy has selected three projects to help determine whether fine particulates emitted from coal-fired power plants affect human health, and which components of the particulates may be most problematic.

Past studies have established that particulate matter smaller than 2.5 microns in diameter from all sources does affect human health, but there is scant information to provide a link between PM_{2.5} emitted specifically from coal plants and cardiac or respiratory health problems in humans. PM_{2.5} refers to particles—invisible to the eye—no more than 1/30th of the width of a human hair. Coal plants emit only small quantities of “primary” PM_{2.5} (e.g., fly ash) because all plants have high-efficiency particulate-collection devices. However, coal plants are responsible for a great deal of “secondary” PM_{2.5}, which forms in the atmosphere from emissions of sulfur dioxide (SO₂) and nitrogen oxides (NO_x). Data collected in the new studies will be used to help design standards reviews and to devise strategies for controlling power plant emissions of PM_{2.5}, SO₂, and NO_x.

The Energy Department’s National Energy Technology Laboratory collected air samples from 1999 to 2003 from various locations in the Pittsburgh metropolitan area to determine the exact chemical composition of PM_{2.5} in the region; however, the air quality and health database collected during this timeframe may not be sufficient to provide statistical power for a meaningful epidemiology study.

With that in mind, the Department solicited research proposals to design an epidemiology study that will maximize the use of the existing air quality database in Pittsburgh and assess the feasibility of such a study. In addition, to address the current lack of data on the toxicology of specific PM_{2.5} components, the Energy Department solicited proposals for multidisciplinary research that examines specific mechanisms that may cause adverse human health effects through realistic exposure to PM_{2.5} emitted from coal plants.

The total award value of the three new projects is about \$5.8 million, to be spent over four years. Energy Department funding will be approximately \$2.9 million, with the remainder coming from the award winners and their partners. Here is a brief profile of each of the winning projects:

The University of Pittsburgh (Pittsburgh, Pa.) will determine if a retrospective epidemiological study could produce reliable health-effects estimates for coal-fired power plant emissions. If so, a roadmap for the actual study will be outlined. The work involves initiating a comprehensive inventory and assessment of air-monitoring data in the Pittsburgh region with similar inventory and assessment of available health data from 1999 to 2003. A variety of methods that handle exposure and weather data and other factors, including co-pollutants, will be investigated and evaluated, along with methods that confirm previously collected data from Pittsburgh and similar regions. Statistical modeling methods that relate health outcomes to coal-fired emissions sources will be

evaluated. An overall strategy will be developed and assessed based on the project's ability to isolate the effects of coal-plant emissions on human health in the Pittsburgh region. (Project duration: 12 months; Total award value: \$511,066)

The Electric Power Research Institute (Palo Alto, Calif.) will evaluate the potential for adverse cardiopulmonary effects from exposure to coal plant and traffic-related particulate matter by conducting a multi-site field study. The study will also provide information on the toxicity of particulate-induced cardiopulmonary effects, especially as they relate to susceptible subpopulations, and will produce toxicological data to correspond to epidemiology and exposure assessment data from concurrent studies based at one of the project locations. The project features a mobile ambient particle concentrator coupled with a mobile toxicological laboratory to evaluate the effects of particulate matter from different sources. Animal data that is directly comparable to exposure in humans will be generated, combining toxicology, epidemiology and exposure assessment. (Project duration: 48 months; Total award value: \$2,064,546)

Lovelace Biomedical & Environmental Research Institute (Albuquerque, N.M.) will conduct a toxicological evaluation of cardiorespiratory effects by exposing rats and mice of various strains, ages, and gender to a mixture of particulate matter and gases from a laboratory coal combustor whose emissions have been processed to simulate actual downwind emissions from coal-fired power plants. Coal-emissions exposure data will be compared with diesel and gasoline emissions, hardwood smoke, and street dust using an identical experimental protocol. Evaluations will be conducted using the National Environmental Respiratory Center's framework, allowing for direct comparisons among source categories and providing a database of health effects analyses extending across a variety of source compositions. (Project duration: 36 months; Total award value: \$3,269,342)

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