THE INITIATION & DEVELOPMENT OF A SUSTAINABLE PARTNERSHIP FOR COMMUNITY ENVIRONMENTAL ASSESSMENT, EDUCATION AND EMPOWERMENT: THE BENNING POWER PLANT AND ITS AFTERMATH

Abstract: Benning Power Plant, one of the nation's oldest and dirtiest power plants, burnt coal until switching to fuel oil in 1976. The toxic pollution generated by the power plant when it operated as either a coal or fuel powered plant includes benzene, toluene, dioxins, furans, lead, arsenic, mercury, nickel, vanadium, polycyclic aromatic hydrocarbons, and radioactive materials such as radium and uranium. Health impacts of nearby community residents due to air pollution have revealed increases in asthma attacks, emergency room visits and hospitalizations.

This goal of this project is community empowerment through education to enhance science and environmental literacy and awareness in the impacted community. Project activities will include evaluating and assessing levels of various contaminants and environmental markers in soil and water samples from within and around nearby communities.

The proposed education, research and outreach activities will be developed and implemented through an Action Research Partnership, comprising participants from Science for the People, local schools and community organizations within the impacted community. This partnership will address the question: How has the Benning Road Power Plant affected our community? The ARP will use independent measurements of environmental parameters as a teaching tool to enhance and expand science literacy and environmental awareness within the community and engage in outreach, education and civic debate.

We will integrate the environmental science curriculum of local schools into a Community Assessment and Outreach Plan (CAOP) to evaluate and assess levels of various contaminants and environmental markers in soil and water, and examine the effects of pollution on flora and fauna growth. We will also study records of prevailing winds and dispersal patterns to evaluate and assess dispersion and distribution of toxin deposition. The project will involve community residents, students, and science teachers in collecting and analyzing samples, developing surveys for collecting data on ways the nearby community might encounter these residual toxins, and formulating ways of remediating the pollution, such as soil clean-up and soil replacement for local gardening.

Affected Community and Environmental and Public Health Information

The Benning Power Plant and Incinerator are located in Ward 7 in Washington, DC. According to the latest census report, Ward 7 is 96% Black, is among the highest in poverty, high school drop-out, incarceration, unemployment, child poverty and HIV rates in DC and in the country.[1]

[1] See, *e.g.*, http://www.neighborhoodinfodc.org/wards/nbr_prof.wrd7.html (Ward 7 has a 26% poverty rate, 40% child poverty rate, and 19% unemployment rate).

Potomac Electric Power Company (PEPCO) has operated an electric production facility at 3400 Benning Road, NE in Washing, DC since 1906. According to a 2004 Public Health Assessment, the Benning plant operated as a peak use power plant to meet the power needs of DC, and surrounding Montgomery and Prince George's counties.[2] Electricity was originally generated there using coal until 1976, then switched to No. 6 fuel oil, then in 1978 changed to No. 4 fuel oil.[3] Boilers were installed in 1975 with a design capacity of 202 million Btu per hour. The generators require 27,000 barrels/day of No. 4 fuel oil at full load with 1% maximum sulfur content.[4]

The hazardous pollutants that were emitted from burning coal at the Benning plant include hydrogen chloride, hydrogen fluoride, benzene, toluene, dioxins, furans, formaldehyde, lead, arsenic, mercury, polycyclic araomatic hydrocarbons, radium and uranium.[5] Air emissions due to fuel oil at the facility include sulfur dioxide, nitrous oxides, carbon dioxide, carbon monoxide, volatile organic compounds, and sulfuric acid.[6] PEPCO's visible emissions have been in violation of its permits consistently over the years, according to the ATSDR report, and has PEPCO has repeatedly been designated a "High Priority Violator."[7] Toxic releases reported for PEPCO included polycyclic aromatic hydrocarbon compounds from fugitive/non-point emissions and dioxin and dioxin-like compounds, mercury compounds, and sulfuric acid from stack/point emissions.[8]

In addition to the power plant, the Benning community has also been exposed to toxins via the Benning Road Transfer Station (BTRS). This is located at 3200 Benning Road, NE, and has historically handled 250 tons of solid waste per day.[9] Until 1994 this facility disposed of approximately 1500 tons of trach per day by incineration. Between

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[2] Public Health Assessment for River Terrace Community, Washington, DC, Agency for Toxic Substances & Disease Registry ("ATSDR report") at page 3 (July 14, 2004).

[3] *Id.*

[4] I*d*.

[5] Toxic Air: The Case for cleaning up coal-fired power plants, American Lung Association (2011).

[6] ATSDR report at page 4, citing Environment Protection Agency, Profile of the Fossil Fuel Electric Power Generation Industry, EPA Office of Compliance Sector Notebook Project, Washington, DC: EPA/310-R-97-007. Web site located at: http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/power2pt1.pdf (1997); Environmental Protection Agency, TRI Explorer Releases: Facility Report, Benning Generating Station, 3400 Benning Rd. NE, Washington, DC. Office of Environmental Information. Report generated on May 8, 2003.

[7] ATSDR report at page 4, citing DC DCRA 1996; Environmental Protection Agency. Enforcement and Compliance History Online: Envirofacts Data Warehouse Multisystem Report, PEPCO Benning Generating Station, 3400 Benning Road NE Washington, DC 20019. Report generated on December 26, 2002; Environmental Protection Agency. Enforcement and Compliance History Online: PEPCO Envirofacts Data Warehouse Multisystem Report, PEPCO benning Generating Station, 3400 Benning Road NE Washington, DC 20019. Report generated on May 8, 2003.

[8] ATSDR report at page 4, citing environmental Protection Agency. Envirofacts Data Warehouse Multisystem Report. PEPCO Benning Generating Station, 3400 Benning Road NE Washington, DC 20019 Query executed December 26, 2002.

[9] ATSDR report at page 4, citing DC Office of the Inspector General. Report of Inspection: District of Columbia Department of Public Works, Solid Waste Management Administration. Report No. 00-0003KA (2000).

1985-1994 the furnaces were gradually shut down for failure to meet clean air emissions standards.[10]

In 1983 the facility was reported to be the largest potential particulate emitter in Washington, DC and pollutants potentially include dioxins/furans, total gaseous non-methane organic hydrocarbons, oxygen and carbon diolcxide, as well as additional pollutants emitted by incinerators and depending on the wastes being burned. And, according to the ATSDR report, the total suspended particles (particulate matter less than 2.5 microns) exceeded the NAAQS in 1999 and 2000.[11]

Researchers at the Harvard School of Public Health examined the health impacts of fine particulate matter released by power plants in and near Washington, DC in 2002, including the Benning power plant, and found that persons most affected by this pollution were predominantly minority and poor, and impacts included increases in mortality rates, pediatric asthma related emergency room visits and elderly cardiovascular related hospitalizations.[12]

Organization's historical connection to affected community

DC Metro Science for the People is a grass roots group made up of researchers, engineers, teachers, students, service providers and community members engaged in analyzing, teaching and applying basic scientific principles for the common good. We focus on how scientific discoveries are mad and utilized by out society: Who benefits? Who does not, and why?

We have been involved in community science literacy programs in several ways. Examples of DCMetroSftP projects span the spectrum from informal community outreach and education through flyers and leafleting as well as engaging with local schools to provide supplementary and complementary course modules for summer programs in DC Public Schools. More generally, the group has experience and interest in outreach, education and public forums. Some of the specific activities engaged in and that demonstrate DCMetroSftP capabilities are highlighted below:

- Hosted a community roundtable on the HPV mandatory vaccine bill at the DC Social Forum at Catholic University in 200_. This roundtable included residents from wards throughout the District, and included residents concerned about the vaccine's side effects on their children, concerns of health care workers, students, and other professionals (lawyers, psychologists). We then provided a synopsis of the roundtable and the community's concerns to the District Council.
- Established a worm farm and conducted classes at a local elementary school about pollution and its causes, and tested pollution in various ways, including

[10] ATSDR report at page 4, citing DC Dept. of Public Works. February 12 letter from Sylvestre K. Yorrick, Solid Waste Management Administration, to Danielle Sass regarding ATSDR's River terrace Public Health Assessment (2003).
[11] ATSDR report at page 57, Tables 5, 7, Appendix B.
[12] Health Impacts of Air Pollution from Washington DC Area Power Plants, Clear Air Task Force (May 2002).

measuring air quality, particulate matter accumulation, and flora/fauna growth.

- Conducted film screenings and discussions about the local syringe exchange program in DC (Prevention Works), abusive prison conditions and the need for criminal justice reform, and challenges to validity of forensic evidence to combat wrongful convictions.
- Participated in public hearings opposing the paving of a highway in our local national park (giving supportive voice to community opposition to paving and opening Klingle Road in Rock Creek Park).
- Participated in a local Tent City demonstration (providing examples of appropriate technology for harvesting rainwater organic compost toilets and vertical gardening).
- Worked with Engineers without Borders-USA Howard University Student Chapter presenting an event at Howard University about Pollution in DC and Its Health Effects on DC Residents.
- Publish a newsletter annually and contributors from around the entire DC metropolitan area contribute their writings;
- Host a website (www.DCMetroSFTP.org) to enhance scientific literacy and promote the rationale and unemotional evaluation of science.

Organizational capacity and programmatic capability

As an organization, DC Metro Science for the People has NOT had any prior experience in managing federal funds.

As an organization, we bring together for this project community leaders, teachers, and collaborators with expertise in

- Meteorological determinations of toxin dispersal: In order to plan the most efficient soil sampling strategy, it is important to have information about prevailing wind patterns, atmospheric stability patterns and knowledge of how natural mechanisms function to deposit airborne pollution in the soil, *e.g.*, turbulent diffusion, dry fallout, rainout and washout via cloud droplet collection. One of the project participants is a career meteorologist specializing in cloud and precipitation physics and atmospheric turbulence. His contribution will be to enhance the experience of the students so that they are involved not only in collecting and analyzing the soil contamination data, but prior to this, in learning and applying techniques to evaluate the role of the atmosphere in the distribution and deposition onto the soil of the hazardous substances.
- Soil analysis: Soil inventory and initial sampling will be done to determine the most important places to test for contamination. Knowing the clay and organic matter content characteristics, as well as bulk density and pH/cation exchange capacity, can help predict where heavy metal compounds and organic compounds will be most likely retained in soils, and where they are more likely to have been leached or volatilized/broken down (*e.g.*, organic matter content and pH can give expectations regarding extent of microbial activity that could break down organic

pollutants). Knowing about the characteristics of the soils will give ideas about where to expect the most contaminated locations and where there can be likely leaching to groundwater, among other things.

- Soil and water testing: The Action Research Plan for this component of the study will be developed with DCMetroSftP working along with the teachers from the DC Public Schools for taking soil and water samples from across a transect of the community. Water samples will be analyzed by public school students and community residents who will have been trained in the sampling and analytical procedures at community workshops and in schools. Water analysis for water quality parameters such as pH, turbidity, fecal coliform, dissolved oxygen and temperature. These analyses will be conducted on site with sampling and analysis kits purchased commercially off the shelf. More sophisticated analytes such as heavy metals, PAH's and chlorinated organics will be analyzed on a more limited basis by providing the samples to appropriately selected analytical laboratories.
- SFTP will work effectively with community leaders and residents of Ward 7, including former and current Advisory Neighborhood Commissioners from the affected area will participate in drafting and disseminating surveys for assessing community contact with toxins in the soil and water (e.g. gardening, contact via visits to the river…), organizing town meetings and drafting educational materials about the health effects of toxins in the area, preparing testimony to present at public hearings and other public forums. Community leaders will share with community members approaches on how to defend against the placement of such toxin generating facilities in marginalized communities, and will seek to employ residents in the affected areas in implementing the project.
- We will collaborate with educators in local schools, local mentoring programs such as EnvironMentor's EnvironMentality Program, which is working in the target area of the project at Woodson High School and has agreed to incorporate our research project into their curriculum (see accompanying Letter of Support from the National Council for Science and the Environment).
- As promoters of community science literacy, SFTP has experience in practicing the Community Based Research Model. Unlike traditional academic research whose goal is to advance knowledge within a particular discipline, SFTP members have practiced the goal of community empowerment through education to enhance science and environmental literacy and awareness. In this project, the process will begin with conversations about individual and family histories in the community and impressions about the PEPCO plant. From the conversations will emerge community questions about the impact of the plant and an invitation to probe answers in a scientific manner, working as partners. This will involve a hand-on process of evaluating and assessing levels of various contaminants and environmental markers in soil and water. Independent measurements will be used as teaching tools to enhance and expand science literacy and environmental awareness within the community.
- The project will integrate with the environmental science curriculum of Woodson High School by expanding the findings of our environmental assessment to a student and community examination of the effects of pollution on local flora and fauna growth. In collaboration with the school's science teachers, the student

study will include community residents in collecting and analyzing samples, developing surveys for collecting data on ways the nearby community might encounter theses residual toxins, and formulating ways of remediating the pollution, such as solid clean-up and soil replacement for local gardening.

- The report findings may take multiple and creative forms, including video, street theater, wall art and written narrative. Residents and students may elect the forums that will have the widest impact, including public meetings, press releases and reports or testimony to legislative bodies.

Qualifications of the Prinicipal Investigators/Project Managers

Peter Caplan, PhD is a meteorologist who worked at NOAA for over 20 years on developing model diagnostics, evaluation of model performance for the National centers for Environmental Prediction, as well as developing and testing physics parameterizations for global prediction model development, with an emphasis on cloud and precipitation processes. He also served as a liaison for NCEP's Hydrological Prediction Center and its International Desks.

Salvatore Engel-Di Mauro PhD works, presents, and writes on soil degradation, society-environment relations, socialism, Hungary, and the European Union. He serves as editor for Capitalism Nature Socialism and Book Review Editor for Human Geography: A New Radical Journal. He teaches geography courses at SUNY New Paltz and is currently involved in soil studies around the country (including Baltimore Maryland with the University of Maryland) and internationally.

John Tharakan, PhD received his undergraduate and graduate education in chemical and biochemical engineering and is currently Professor of Chemical Engineering at Howard University and an active member of DCMetroSftP. His research interests, experience and expertise span biotechnology and environmental engineering and education, and appropriate technology research, development and education. His research and pedagogy are focused on analysis and development of appropriate technologies for water treatment and conservation, on renewable energy production using solar and biomass technologies, on appropriate waste management and recovery technologies and on the ethics and philosophy of appropriate technology. He has also worked on appropriate technology implementation in developing countries as Faculty Advisor to Howard University's Engineers Without Borders Student Chapter. Dr. Tharakan has worked extensively with students as well as local communities to provide support for education and development.

Rick Tingling Clemmons, PhD candidate, MA, BA, is a community leader in Ward 7. He has served as an Advisory Neighborhood Commissioner for several terms, working on various environmental issues in that ward. He has extensive experience in coordinating adult education and literacy programs in the community, conducting ethnography studies of Ward 7, conducting focus groups and community surveys on various issues related to public health in the community, and has taught social studies, math, science and English to students spanning all ages.

Jane Zara, PhD, J.D. is a biochemist, community activist and lawyer who has extensive experience working with community groups on issues of poverty, and has worked with local schools developing outreach and educational programs and modules to address issues of scientific literacy and environmental awareness.

Past performance in Reporting on Outputs and Outcomes

We as an organization do **NOT** have any prior experience in reported outputs and outcomes.

Quality assurance project plan information

Our project will involve both the use of existing environmental data (meteorological data), as well as actively studying the quality of soil as it impacts analyses for the presence of toxins. We will also research existing archives for available data from past impact studies and related reports to determine where and what to sample in the soil and water of the affected community. We will accumulate data on the possible sources of contact with the hazardous pollutants by surveying the community as to the use of and contact with affected soil, water and sediment (gardening, children playing in affected areas…).

Project performance measures

Activities will include performing and sharing the following:

- computer meteorological data;
- field work in gathering samples with students;
- classes about the toxins emitted and what is known about the related health effects
- community workshops/town halls addressing the environmental impacts of Benning Road power plant and Incinerator;
- work with grass roots community organizations to develop impact survey
- coach students to eventually testify at hearings about the impacts on the community of location of this power plant over time and lack of community input in the decision to place it here in the first place;
- designing surveys, collecting and summarizing data of potential exposure to toxins; community meetings.

Outputs and outcomes:

- number of students and residents trained for meteorological data access;
- number of students, schools and residents trained in collecting and analyzing soil and water samples;
- number of students, schools and residents literate about the toxins released and their potential impacts on health;
- number of town meetings, or other public forums;

- survey design, distribution and data obtained;
- number of persons involved in the preparation of testifying at public hearings,
- list of community concerns and comments;
- number of community residents who changed habits of interaction with the environment to minimize exposure/contact;
- number of community residents with enhanced awareness of environmental issues

Short term outcomes:

- Enhanced literacy and skill sets gained in collection and analysis of data;
- Enhanced public speaking skills;
- Enhanced analytical skill sets.

Long term outcomes:

- Increased community awareness of the dangers to communities of being forced to host power plants;
- Increased community empowerment about health impacts, pollution, and
- ways to combat the ability to house such pollution generating centers in a person's community;
- Formulate, articulate and evaluate available compensation and remedial measures.