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Funds Awarded to Historically Black Colleges and Universities for Fossil Energy Research

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Washington, D.C. — The U.S. Department of Energy (DOE) has selected four research projects that will provide educational and research training opportunities for minority students while advancing key technical areas in fossil fuel utilization.

The annual funding opportunity titled Support of Advanced Fossil Resource Utilization Research by Historically Black Colleges and Universities and Other Minority Institutions (HBCU/OMI), recently announced awards to institutions under the HBCU/OMI designation. This DOE funding supports an important initiative by providing opportunities to students at minority institutions for meaningful research that contributes to the mission of DOE's Office of Fossil Energy and the National Energy Technology Laboratory (NETL). This funding also supports the development of high-risk fundamental and applied research that advances the safe and environmentally responsible use of fossil fuels.

Work conducted through this program enables HBCU/OMI to advance the technical skills of the recipients and provides a vital contribution to NETL's Crosscutting Research program. Grants awarded under this program are intended to enhance educational and research capabilities at minority colleges and universities in the fields of science and technology related to fossil energy resources.

DOE expects the research completed to advance the development of new nanostructured materials for application in carbon capture and to accelerate modeling of multiphase flow in fossil fuel systems. Together, these projects are intended to help reduce greenhouse gas emissions while improving computational modeling and simulation tools for the study of fossil fuel utilization.

The following three-year projects have been selected for this funding opportunity.

- **Delaware State University (Dover, Del.) — Novel Silica Nanostructured Platforms with Engineered Surface Functionality and Spherical Morphology for Low-Cost, High-Efficiency Carbon Capture in Advanced Fossil Energy Power.**
  Developments in nano-engineered materials have resulted in the discovery of a number of new materials which may have beneficial applications for carbon dioxide (CO_2) capture. This project aims to develop and evaluate silica-based nanostructure platforms containing amine-based solid sorbents for post-combustion CO_2 capture. The fabrication process will allow for significantly enhanced porosity and surface area, which will allow for increased CO_2 adsorption capacity. In addition, the use of inexpensive raw materials and low-cost synthetic processes will position these platforms as a competitive solid sorbent

for replacement of solution-based amine scrubbing technologies used in post-combustion CO_2 capture. (DOE award: $249,291)

- **Clark Atlanta University (Atlanta, Ga.) — Engineering Accessible Adsorption Sites in Metal Organic Frameworks for CO_2 Capture.**
  Metal organic frameworks (MOFs) are a newer class of ultra-high surface area materials that show great potential as selective adsorbents for CO_2. These highly porous structures have the capacity to hold large amounts of amine-based sorbents for enhanced CO_2 capture capacity. The research carried out under this award aims to synthesize MOFs with improved CO_2 adsorption and selectivity properties. It is anticipated that the outcomes of this research will guide rational design strategies towards producing advanced materials for CO_2 capture. (DOE award: $249,998)

- **Prairie View A&M University (Prairie View, Texas) — Post Combustion Carbon Capture Using Polyethylenimine Functionalized Titanate Nanotubes.**
  Faced with the challenge of producing effective and economical materials for CO_2 capture, this project is focused on developing and characterizing polyetheylenimine (PEI) impregnated Titanate nanotubes for post-combustion capture CO_2. PEI functionalized Titanate nanotubes will be synthesized and studied using computational fluid dynamics (CFD) model simulations and laboratory testing to develop and validate an optimized standard operating procedure for CO_2 capture. A successful outcome of this work will provide a very high-efficiency and low-cost method to capture CO_2 from effluents of advanced fossil energy systems. (DOE award: $249,996)

- **Florida International University (Miami, Fla.) — Development of Reduced Order Model for Reacting Gas-Solids Flow Using Proper Orthogonal Decomposition.**
  Multiphase flow is common in fossil fuel reactors such as coal gasifiers and chemical looping reactors. The flows in multiphase reactors span multiple time and length scales and are very difficult to scale up. Multiphase CFD models are increasingly being used for the design and scale up of such reactors. There is a need to develop computationally cheaper models based on high fidelity multiphase CFD simulation models. The goal of this project is to develop reduced order models (ROMs) using fluid dynamic models representative of reacting and non-reacting multiphase gas-solids flow in fossil fuel risers and vertical columns. Results of this research effort are expected to provide ROMs with improved computation speed and enhanced functionality for modeling of process uncertainty in coal gasifiers leading to more efficient fossil fuel conversion. (DOE award: $250,000; Recipient Cost Share: $29,305)