

## Advanced Combustion Project Selections

Through these four selections, nearly \$37 million, \$26 million from the Energy Department and \$11 million in cost-share from industry, universities, and other research institutions, are being committed over four years to address CO<sub>2</sub> compliance required by the proposed regulations to reduce CO<sub>2</sub> emissions.

These projects will continue laboratory-scale experiments, pilot-scale evaluations, and complementary modeling to advance their respective combustion concepts. The intent is to develop technologies that can be applied to new or retrofit/repowered coal-based power plants which will make a step change in progress toward the Energy Department carbon capture goal, to have available for demonstration beginning in 2025, technologies and best practices for achieving 90 percent capture at less than \$40/tonne CO<sub>2</sub> captured.

Descriptions of the projects follow.

**Aerojet Rocketdyne** (Chatsworth, Calif.) — A novel process for pressurized oxy-combustion in a fluidized bed reactor (the Oxy-Fired Pressurized Fluidized Bed Combustion [Oxy-PFBC] process) was evaluated in Phase I. The pressurized combustion in oxygen and the recycle of carbon dioxide gas eliminates the presence of nitrogen and other constituents of air, minimizing the generation of pollutants and enabling a more economical capture of CO<sub>2</sub> gas. In Phase II, laboratory-scale tests and a pilot-scale integrated system will be used to validate the Oxy-PFBC process, mature the technologies, and close technology gaps identified in Phase I. The DOE investment in this project is approximately \$11.9 million.

**Alstom Power Inc.** (Windsor, Conn.) — Alstom Power, through prior U.S. DOE investments, has been developing a limestone-based chemical looping combustion (LCL-C™) technology. The company continued this work in Phase I by enabling the full analysis of the process through an engineering system and economic study along with the development of a screening tool for process improvements. In Phase II, Alstom Power will validate the improvement ideas and concepts generated in Phase I through implementation and testing in the company's 3-MWth LCL-C prototype plant. Ultimately, the project will advance the LCL-C concept to provide the performance and operating information necessary to successfully design, build and operate a reliable large-scale field validation facility. The DOE investment is approximately \$7.9 million.

**Washington University** (St. Louis, Mo.) — The research team in Phase I evaluated the technical feasibility and improved economics of a unique staged, pressurized oxy-combustion (SPOC) process. By staging the combustion, the temperature and heat transfer can be controlled. Phase I demonstrated the high efficiency and low capital costs associated with the SPOC process and identified through technology gap analysis a few areas of uncertainty which will be addressed in Phase II. The team will design and construct a laboratory-scale pressurized combustor in which they will conduct experiments to measure heat flux, temperatures, concentrations of gases, and ash deposition rates. These data will be used to better understand the SPOC process and to validate the computational fluid dynamics models used in Phase I. The DOE investment is approximately \$3.4 million.

**Babcock and Wilcox Power Generation Group, Inc.** (Barberton, Ohio) — In Phase I, the research focused on furthering the development of The Ohio State University coal direct chemical looping (CDCL) process. This process consists of a unique moving bed reactor where pulverized coal is fully converted using iron-based oxygen carriers. The reactor design and reaction pathway of the CDCL process allows for retrofit, repowering or new installations with significant reduction in the cost of oxygen production. In Phase II, the research team will conduct laboratory and bench scale testing and analysis to obtain critical information on performance in support of the scale-up of The Ohio State University CDCL process to a pilot plant and refine their commercial-scale plant design. DOE will invest approximately \$2.5 million in the project.