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Executive Summary

Gasification of coal is generally considered the preferred path for implementing higher efficiency coalbased power generation, facilitating cost-effective carbon capture (and sequestration), and potentially even as a pathway to hydrogen production from coal. However, even after two successful commercial deployments of IGCC, the cost of coal gasification is still prohibitive. While we are closer to breakthroughs for lower-cost oxygen production, the cost of gas cleanup remains extremely high. Even as sorbent technology (some within this consortium) is developed for cleaning H_2S from the synthesis gas in the reactor, the technology to practically clean the sorbent and other particulate remains very costly. A low capital and operating cost, high-temperature gas cleaning technology that can be proportionally scaled to the size of the gasification reactor is strongly needed. The work proposed here is a significantly different approach to hot gas cleanup. Instead of treating the entire gas stream, particulate is concentrated into a small slip-stream, which can be easily cleaned and rejoined with the bulk gas flow with little change in bulk gas temperature. Many advantages could be realized from successful implementation of low cost syngas cleanup. Through potentially lowering the cost of coal gasification for power generation, the "playing field" for high sulfur Ohio coal would be leveled, not only against low sulfur coal, but also against natural gas, which is highly volatile in price. The specific goals proposed for Year 1 is to take the information learned from our existing lowtemperature bench-scale system at Ohio University and apply it to and measure collection in a scaled-up electrostatic separation unit (900 acfm) that is capable of concentrating 99+% of all particulate into 5-10% of the gas stream at 1000°F. In order to achieve that, a more extensive model of the interaction of centrifugal, electrical, frictional and adhesive forces must be developed to understand the effects of scale-up. After construction of the high temperature unit, baseline testing with polydisperse ash will be necessary to provide proof-of-concept needed to justify fundamental experimentation with monodispersed particles in later years. Data to be taken include particulate measurements at inlet and outlets of the separator using EPA Method 5 and analysis of particle size distribution using a Malvern Mastersizer to quantify separation capabilities.