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# ABOUT YOU, YOUR COMPANY, AND YOUR EXPERTISE

- THE NATIONAL ENERGY TECHNOLOGY LABORATORY'S (NETL'S) MISSION IS TO CREATE TECHNOLOGY SOLUTIONS AND INNOVATIONS THAT CONTRIBUTE TO AN AFFORDABLE, SECURE AND ENVIRONMENTALLY SUSTAINABLE ENERGY FUTURE. MATERIALS ENGINEERING & MANUFACTURING IS ONE OF 6 CORE COMPETENCIES OF THE LABORATORY, THE OTHERS FIVE ARE: COMPUTATIONAL SCIENCE & ENGINEERING, GEOLOGICAL & ENVIRONMENTAL SYSTEMS, ENERGY CONVERSION ENGINEERING, SYSTEMS ENGINEERING & ANALYSIS AND PROGRAM EXECUTION & INTEGRATION. THE MATERIALS ENGINEERING & MANUFACTURING DIRECTORATE CONDUCTS RESEARCH ON THE DESIGN, SYNTHESIS, PROCESSING, MANUFACTURING, CHARACTERIZATION AND PERFORMANCE ASSESSMENT AT CONDITION OF FUNCTIONAL AND STRUCTURAL MATERIALS, AND DELIVERS AFFORDABLE, DURABLE MATERIALS SOLUTIONS TO IMPROVE THE PERFORMANCE OF THE EXISTING FLEET AND ENABLE THE NEXT GENERATION OF EFFICIENT FOSSIL ENERGY SYSTEMS.
- DAVID ALMAN, PH.D., HAS OVER TWENTY FIVE YEARS EXPERIENCE IN THE DEVELOPING ADVANCED ALLOYS FOR EXTREME ENVIRONMENT APPLICATIONS. CO-INVENTOR OF NINE US PATENTS, AND PUBLISHED OVER 100 TECHNICAL SCIENTIFIC ARTICLES. IN 2009, AWARDED ASM INTERNATIONAL SOCIETY FELLOWSHIP FOR THE DEVELOPMENT OF NOVEL MATERIALS AND SURFACE STRUCTURES FOR POWER GENERATION AND HIGH TEMPERATURE APPLICATIONS. ALSO AWARDED TWO R&D 100 AWARDS.

# IMPORTANT WORK ALREADY UNDERWAY THAT WILL ENABLE THE SUITE OF ADVANCED MANUFACTURING APPROACHES FOR THE FUTURE OF CLEAN COAL AND CCUS TECHNOLOGIES

- CLEAN COAL AND CCUS ARE ONE OF THE MOST CHALLENGING APPLICATIONS FOR MATERIALS. MATERIALS MUST RESIST DEGRADATION TO HOSTILE ENVIRONMENTS FOR LONG SERVICE LIFE TIMES. FURTHER MANY COMPONENTS TYPICALLY ARE LARGE IN SIZE, WHICH ADDS COMPLEXITY DURING MANUFACTURING.
- IMPORTANT RESEARCH THAT IS ALREADY OCCURRING\*
  - BIG AREA ADDITIVE MANUFACTURING (BAAM) USING ELECTRON BEAM OR LASER WIRE OR POWDER DEPOSITION THAT CAN ENABLE HIGH RATE MANUFACTURING.
  - DEVELOPMENT OF POWERS DESIGNED SPECIFICALLY FOR ADDITIVE MANUFACTURING. CAN IMPROVING AM COMPONENTS – AND REDUCE COST OF AM.
  - POST HEAT-TREATMENT OF AM COMPONENTS TO IMPROVE PROPERTIES AND PERFORMANCE.
  - THE DEVELOPMENT OF CODE CASES AND STANDARDS FOR ADDITIVE MANUFACTURING PROCESSES – IMPORTANT FOR THE ADOPTION OF AM COMPONENTS.

\* Research occurring throughout the scientific community and not necessarily funded by Office of Fossil Energy

# SEED IDEAS FOR DISCUSSION TODAY, HOW DOE CAN BETTER USE THE SUITE OF ADVANCED MANUFACTURING APPROACHES IN FUTURE CLEAN COAL AND CCUS EFFORTS

- DEVELOPING METHODS TO MANUFACTURE A SINGLE COMPONENT FROM MULTIPLE MATERIALS (E.G., CERAMIC AND METAL). USING AM METHODS TO DESIGN MULTI-FUNCTIONAL MATERIALS.
- ADVANCED JOINING METHODS TO IMPROVE JOINING OF DISSIMILAR MATERIALS
- ADVANCED SOLID PHASE PROCESSING (E.G., NEXT GENERATION EXTRUSION PROCESSES AND OTHER SOLID STATE PROCESSES)
- RESEARCH TO NEXT GENERATION “TRADITION MANUFACTURING” METHODS TO REDUCE COST, IMPROVE RESULTANT MATERIALS AND RE-INVIGORATE “TRADITIONAL” US MANUFACTURING THAT IS CRITICAL TO CCUS AND CLEAN COAL EFFORTS.
- RESEARCH AND DEMONSTRATION OF ADVANCED PROCESS SIMULATIONS COUPLED WITH ADVANCED MANUFACTURING TO DESIGN NOVEL REACTORS THAT CAN INCREASE THE EFFICIENCY AND REDUCE THE COST CCUS AND CLEAN COAL (E.G., CARBON CAPTURE, CO<sub>2</sub> UTILIZATION, ETC).

