Quarterly Management Report

WBS Element	Project Title	Contract Number	Contract Start	Contract End
UNDEERC-4	Materials Testing in Fossil Energy Systems	4000028064	10/01/94	06/30/07

Performer Name and Address	Principal Investigator(s)
Energy & Environmental Research Center University of North Dakota 15 North 23rd Street, Stop 9018 Grand Forks, ND 58202-9018	John Hurley

BUDGET AND COST REPORT

Prior Year Funds [$K]	125
Total Current Year Commitment $K]	68
Projected Current Year Costs [$K]	193

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Planned Costs	133	141	148	156	164	171	178	187	193	0	0	0
Actual Costs	130	134	137	142	144	146	0	0	0	0	0	0
Variance	3	7	11	14	20	25	178	187	193	0	0	0

MILESTONE REPORT

Milestone Designation	Milestone Description	Due Date	Revised Due Date	Completion Date
UND-4-1	Give presentation at the Annual Conference on Fossil Energy Materials	06/30/06		06/30/06
UND-4-2	Give presentation at the Annual Conference on Fossil Energy Materials	06/30/07		
UND-4-3	Create joints in FeCrAl ODS alloy using interlayers provided by ORNL	04/30/07		
UND-4-4	Prepare final report	06/30/07		

TECHNICAL HIGHLIGHTS

The University of North Dakota Energy & Environmental Research Center (EERC) is providing expertise and assistance to the Advanced Research Materials Programs investigating ceramic and alloy corrosion in fossil energy systems. It is difficult to simulate under controlled laboratory conditions all of the possible corrosion and erosion mechanisms to which a material may be exposed in an energy system. Therefore, the EERC is working with the Oak Ridge National Laboratory (ORNL) to provide materials scientists with opportunities to expose materials in pilot-scale systems to conditions of corrosion and erosion similar to those occurring in commercial power systems. In addition, the EERC is applying techniques developed under other programs to assist in manufacturing structures such as heat exchangers made from the high-temperature materials.

This program has been extended to June 30, 2007. The focus of the work during the extension is to test interlayer materials for joining PM2000, an iron–chromium–aluminum oxide dispersion-strengthened (ODS) alloy. As the name suggests, ODS alloys contain a small quantity of very fine particulate metal oxide particles dispersed throughout the structure to increase the creep resistance of the alloys. This makes them usable to much higher temperatures than similar alloys that do not have the dispersed oxide particles. However, to maintain creep resistance the alloys cannot be fusion-welded because melting would permit the oxide particles to agglomerate and lose their effectiveness in reducing creep. The joining method being tested at the EERC is called transient liquid phase bonding. It involves placing a thin layer of a reactive alloy between the pieces of PM2000 to be joined and heating to melt the joining alloy, causing it to dissolve a small amount of the PM2000. If successful, the joining alloy then diffuses away into the ODS alloy, leaving a continuous bond between the pieces.

During this quarter it was decided to continue the joining work with MA956 rather than PM2000 because Plansee has decided to no longer produce PM2000. MA956 is a FeCrAl ODS alloy produced by Special Metals. Although it also is no longer in production, Special Metals has retained the capability of producing the material if a large enough order, such as for heat exchanger tubing, is received. Another factor is that the EERC currently has approximately 25 feet of MA956 tubing on hand. In addition, new joining clamps were machined from Kovar, an alloy with a lower thermal expansion coefficient than MA956. The lower coefficient will ensure that the joints remain in compression during heating. Also, a new thinner foil of a potential joining compound was received from ORNL. Finally, the EERC has cut and machined three dozen quarter sections of MA956 pipe for joining testing. The tests will begin in the next quarter.

ISSUES

Report Prepared By	Date
John Hurley	05/07/07