September 9, 2008

Report of the Clean Coal Task Force
To
Joint Minerals, Business, and Economic Development Interim Committee
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Background

2007 House Bill 301 created the Clean Coal Task Force (CCTF) consisting of the members of the current University of Wyoming Energy Resources Council. That legislation appropriated $2,500,000 to an account which could only be expended upon appropriation by the Legislature. The legislation also directed the Task Force to solicit proposals for research in clean coal technologies and required that the appropriation could not be disbursed unless there was a dollar for dollar match for the research from non-state funds. The legislation specified that the Task Force be staffed by the Governor's Office.

In September 2007, the CCTF recommended funding of 4 proposals. The recommendation was endorsed by the Joint Minerals, Business, and Economic Development interim Committee, and money was appropriated by the Legislature to fund those projects (see Table 1.) The total amount appropriated in the first round was $1,822,481, leaving $677,519 unspent.

Section 320 of the Legislature of the State of Wyoming's 2008 Budget Bill authorizes the DEQ to submit grant application to the federal government for AML funds for specified purposes. One project secured $3,800,000 for clean coal research to be expended pursuant to Section 2(f) of Original House Bill No. 301, Enrolled Act No. 121, to be added to the Clean Coal Research Account. Section 325 of the 2008 budget bill actually creates Section 2(f) by amending the 2007 legislation. Unlike the $2,500,000 appropriation in 2007, the CCTF is authorized to expend the $3,800,000 once the recommended projects are submitted to the Joint Minerals, Business and Economic Development Interim Committee for review.

The 2008 legislation also provides for funding additional research projects from the original $2.5 million that was not committed in the first round. Those dollars will have to be appropriated by the 2009 or subsequent legislature to fund projects recommended by the CCTF. The $677,519 is subject to the same process that occurred for the $1.8 million.

Finally, the 2008 legislation extended the deadline for expenditure for all of the funds to June 30, 2010.

Proposals for Research

The Task Force authorized the distribution of a request for proposals on April 25, 2008 (http://www.uwyo.edu/sersupport/docs/WCC_RFP_2008.pdf) with a submission deadline of August 1, 2008. Eight proposals were submitted and a total of $6,093,904 was requested.

Each proposal was reviewed initially for compliance with the proposal guidelines, especially verification of the outside match. Then each proposal was submitted to two qualified external

reviewers with relevant technical expertise. The proposals were evaluated against the criteria described in the RFP. These reviews were taken into consideration fully by the Clean Coal Task Force.

Table 1. 2007 Clean Coal Technology Fund Approved Projects.

Name of Proposal	Submitted By	Principal Investigator	Request	Match	Outside Match Org.	Total Funds	Technology Areas
Pre-Gasification Treatment of PRB Coals for Improved Advanced Clean Coal Gasifier Design	Western Research Institute	Dr. Alan Bland, VP	$399,981	$399,981	DOE, Nat'l Energy Technology Lab	$799,962	**Pre-combustion/ pre-gasification technologies**
Capture & Mineralization of Carbon Dioxide from Coal Combustion Flue Gas Emissions: Pilot Scale Studies	Dept. Renewable Resources, **UW**	Dr. KJ Reddy, Professor	$485,000	$487,115	Jim Bridger Power Plant	$972,115	**Carbon capture and sequestration technologies**
Carbon Capture from Coal Flue Gas on Carbonaceous Sorbents	**Supercritical Fluids, Inc.,** Laramie, WY.	Dr. Maciej Radosz	$375,000	$375,000	PacifiCorp Energy EPRI Supercritical Fluids, Inc.	$750,000	**Carbon capture and sequestration technologies**
Novel Fixed-Bed Gasifier for Wyoming Coals	**Emery Energy Company,** Salt Lake City, UT.	Benjamin Phillips, President	$562,500	$562,549	Emery Energy Co. WRI	$1,125,000	**Combustion and gasification design technologies**
		Total CCTF Match	**$1,822,481**				
		Total Res Program	**$3,647,078**				

The Task Force met on Friday, September 5, 2008 to review and evaluate the 2008 proposals. In accordance with the 2008 legislation reference above, the Task Force submits the following recommendations regarding the proposals received. The Task Force makes its recommendations on these proposals in light of their being the best methods for funding sustained research for clean coal technologies in Wyoming. Note that some of these proposals contain content of proprietary information. Task Force member and reviewers executed non-disclosure agreements with each submitting organization to protect their confidentiality as a condition of their being made available for review.

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Projects endorsed by the CCTF for funding are as follows. Information concerning project finance and matching funds for each project is contained in Table 2.

- "Development of a New Solid Sorbent for CO_2 Separation", submitted by University of Wyoming, Principal Investigator, Maohong Fan. This project will investigate new solid material for carbon capture that promise to increase CO_2 sorption rates and reduce total energy consumption for CO_2 separation from flue gases.

- "Geologic Sequestration of CO_2 in the Rock Springs Uplift (Southwest Wyoming): Experimentation and Modeling of CO_2/Brine Relative Permeability", submitted by University of Wyoming, Department of Chemical and Petroleum Engineering and Penn State, Principal Investigators, Mohammad Piri and Zuleima Karpyn. This project seeks to reduce of uncertainties in estimation of CO_2 storage capacity and improve understanding and representation of transport mechanisms of CO_2/brine systems.

- "A Novel Integrated Oxy-Combustion Flue Gas Purification Technology: A Near Zero Emissions Pathway", submitted by Western Research Institute, Principal Investigator, Alan Bland. This project will design and demonstrate an integrated oxy-combustion system that will remove SO_x, NO_x and mercury from combusted PRB coals and produce a relatively pure pipeline-compatible CO_2 flue gas stream.

- "Feasibility of Hydrothermal Dewatering for the Potential to Reduce CO_2 Emissions and Upgrade Low Rank Coals", submitted by The Energy & Environmental Research Center, Principal Investigator, Brandon Pavlish. This project will investigate the feasibility of hot water drying for the reduction of CO_2 and upgrading the Btu-content of Wyoming coals.

- "Coal Electrolysis for the Production of Hydrogen and Liquid Fuels", submitted by Ohio University, Principal Investigator, Gerardine Botte. This project will demonstrate coal electrolysis as a process for deriving hydrogen and liquid products from Wyoming coals while avoiding the high temperatures and pressures and the need for gas clean-up to separate out CO_2 as in conventional gasification methods.

The total research funding in these proposals is summarized as follows:

Project	Proposed State Clean Coal Funds	Non-state match	Total
Sorbent for CO_2 Separation	$ 250,267	$ 253,394	$ 503,661
Sequestration of CO_2	$ 500,000	$ 500,000	$1,000,000
Flue Gas Purification	$1,454,552	$1,454,552	$2,909,104
Reduction of CO_2 Emissions	$ 70,000	$ 70,000	$ 70,000
Coal Electrolysis	$ 397,301	$ 397,332	$ 794,633
Totals	$2,672,120	$2,675,278	$5,277,428

As Table 2 indicates, the endorsed projects included just over $1.4 million in outside matching funds from federal sources. AML funds cannot be used to match these funds, and there is not sufficient money left in the state-funded pool to cover the entire amount. Therefore, SER will work with the PI's and with the UW Office of Research to seek a solution for funding the two projects in question while adhering to the rules for disbursement of the funds.

Finally, the Clean Coal Task Force authorized SER to prepare a new Request For Proposals to solicit new research proposals with a more restricted range of topics to complement successful proposals in the previous two rounds. The goal of this new RFP is to use the remaining funds in a timely manner to stimulate interest in important clean coal technology areas that have been under-represented to date.

Table 2. 2008 Clean Coal Technology Fund Endorsed Projects.

Proposal Title	Submitted By	Funding Requested	Outside Match	Outside Match Organization	Project Total Funds	Technology Areas
Development of a New Solid Sorbent for CO2 Separation	UW Chemical & Petroleum Engineering	$250,267	$253,394	EnviroTech	$503,661	Carbon capture technologies
Geologic Sequestration of CO2 in the Rock Springs Uplift(Southwest Wyoming): Experimentation and Modeling of CO2/Brine Relative Permeability, Hysteresis, Permanent Capillary Trapping and Salt Precipitation	UW & Penn State	$500,000	$500,000	UW Research Penn State	$1,000,000	Sequestration technologies
A Novel Integrated Oxy-Combustion Flue Gas Purification Technology - A Near Zero Emissions Pathway	Western Research Institute (WRI)	$1,454,552	$1,454,552	DOE - $1,352,552 Southern Co. - $800,000 Coal Co. - $2,000	$2,909,104	Combustion and gasification design technologies; post-combustion gas clean-up;
Feasibility of Hydrothermal Dewatering for the Potential to Reduces CO2 Emissions and Upgrade Low Rank Coals	EERC/Pavlish	$70,000	$70,000	DOE - $70,000	$140,000	Pre-combustion coal technologies.
Coal Electrolysis for the Production of Hydrogen and Liquid Fuels	Ohio University	$397,301	$397,332	Ohio University	$794,633	Coal-to-liquids/coal-to-hydrogen technologies.
	Totals	**$2,672,120**	**$2,675,278**		**$5,347,398**	