

**Legislature of the State of Wyoming
Clean Coal Technologies Research Program**

CALL FOR PROPOSALS

Issued by:

School of Energy Resources

University of Wyoming

Department 3012

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Issue date: July 23, 2010

Closing date: September 20, 2010

Additional copies of this solicitation for the Clean Coal Technologies Research Program are available from the School of Energy Resources or at www.uwyo.edu/ser/cleancoal

This program is subject to the affirmative action requirements that are prescribed by Executive Order 11246 (as amended), Section 202; by the Rehabilitation Act of 1973 (as amended), Section 503; by the Vietnam Era Veterans' Readjustment Assistance Act of 1974 (as amended), Section 402 (38 USC 2012).

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1. INTRODUCTION

The Clean Coal Task Force (CCTF) – composed of the members of the Wyoming Energy Resources Council to the University of Wyoming School of Energy Resources – requests proposals for research investigating low-emissions coal technologies. The research will be funded in part by the Clean Coal Research Account created by Original House Bill No. 301, Enrolled Act No. 121, enacted by the Legislature of the State of Wyoming during the 2007 General Session and updated during the 2008, 2009, and 2010 Legislative Sessions. The duties of the CCTF are described in W.S. 21-17-121, a copy of which is attached.

The Clean Coal Technologies Research Program was created to stimulate research and development in the area of low-emissions coal technology. Commercially successful deployment of low-emissions coal technologies is the ultimate goal of this program, and that goal will be one factor in decisions to fund. The objectives of the program are to:

- Enable and accelerate demonstration and early commercial deployment of technologies that have the potential to enhance and improve the use of sub-bituminous coal at high altitudes, specifically in Wyoming,
- Generate and test new ideas for significant improvement and cost reductions in next-generation low-emissions technologies, and
- Support collaborative R&D in the accomplishing the above objectives.

Proposals are solicited from academic institutions and private industry. They will be evaluated competitively, and the CCTF will seek to fund those judged to deliver highest probable benefits to the State of Wyoming through improved use of and expanded markets for Wyoming's coal resource. The results of the research shall be available for public dissemination.

The Legislature of the State of Wyoming appropriated \$14,000,000 for this research program in its 2010 budget session; the total amount appropriated to the fund since its inception is \$30,900,000. Funds for successful proposals approved by the CCTF will become available soon after review by the Joint Minerals, Business and Economic Development Interim Committee at their meeting that is anticipated to occur in November 2010. Funds are to be expended by March 31, 2014.

An essential requirement for successful proposals is a verifiable dollar-for-dollar match from funds available to the requesting organization. In-kind support may be used for a portion of the match, but the amount must be verifiable and may not constitute greater than 50% of the match. Requesting organizations may be from industry, academia, or other research providers. Collaboration is encouraged and will be assessed as part of the

evaluation. International collaboration is encouraged and foreign-derived funds¹ may be counted as match, but no dollars from the Clean Coal Research Account can be expended to support non-domestic work.

2. RESEARCH TOPICS

The Clean Coal Task Force (hereafter referred to as the “task force”) will accept proposals in the following categories:

- research and development of new technologies that reduce the emission from coal
- pilot-scale demonstration of emerging technologies
- engineering scale-up of demonstrated technologies, and
- integration and operation of carbon capture technologies.

The CCTF’s final assessment of proposals will attempt to create a balance across these categories and across all to the technology areas outlined below.

- A. Pre-combustion/pre-gasification coal technologies** – specifically the task force will accept proposals outlining research examining coal pretreatment, pre-combustion clean-up of regulated materials such as mercury and metalloids, and new technologies examining coal feed including slurring, dry feed or others that may support gasification, advanced combustion or existing combustion technologies.
- B. Combustion and gasification design technologies** – the task force seeks proposals outlining new methods supporting ultra-supercritical or supercritical combustion and gasification using Wyoming coals as the fuel source. These studies may include research that would mitigate the known effects of altitude or reduce water requirements that currently cause concern about the placement of ultra-supercritical or supercritical combustion facilities in Wyoming. They will also accept proposals examining the same using other oxy-combustion technologies. Finally, proposals seeking to refine gasifier design and operation – and thereby alleviate the current constraints on such facilities caused by altitude, water need or fuel source – will be welcome. Any other technologies (materials, processes, controls, etc.) that improve reactor design and therefore remove barriers to their use in Wyoming are encouraged.
- C. Post-combustion/post-gasification gas clean-up technologies** – proposals examining gas clean-up technologies are sought. The task force will entertain research aimed at removing regulated materials – SO_x, NO_x, mercury and/or carbon dioxide – from either coal combustion or coal gasification facilities. Proposals examining cold, warm and hot gas clean-up are welcome.

¹ The value of match derived from foreign funds will be determined by the exchange rate published by the Wall Street Journal for close of business in New York on September 20, 2010. The rate can be found at http://online.wsj.com/mdc/public/page/2_3021-forex.html. That rate will stay in effect for the duration of the project to avoid complications that might be caused by exchange rate fluctuations.

- D. Advanced cycle technologies** – proposals outlining advancement in the use of steam, heat or synthesis gas, new polygeneration technologies, and new heat capture and use technologies are encouraged.
- E. Air separation technologies** – proposals outlining new technologies that reduce the cost of air separation – and specifically for the generation or introduction of oxygen at higher altitudes to feed the advanced combustion and gasification technologies – are sought.
- F. Carbon capture and sequestration or use technologies** – the task force solicits proposals examining the capture and disposal or use of carbon dioxide from conventional and advanced combustion and gasification facilities. Any technologies that specifically remove carbon dioxide (pure or otherwise) from the flue gas or other waste streams will be considered. The task force will also entertain proposals dealing with aspects involved with the geologic sequestration of captured carbon dioxide. These may include new compression and transport technologies, modeling studies that examine the behavior of carbon dioxide at depth, geologic analysis of mineralization rates and other trapping mechanisms of stored carbon dioxide. Finally, the task force will consider proposals to investigate novel uses of carbon dioxide or other disposal techniques (i.e., mineralization and use or burial) that permanently keep capture carbon dioxide out of the atmosphere.
- G. *In situ* gasification technologies** – proposals outlining *in situ* coal gasification, both biological and thermochemical, are sought. Proposals for *in situ* gasification research must center on those elements of the technology that make this process amenable to Wyoming coals and must evaluate these technologies relative to environmental issues known to be associated with this type of gasification. Proposals for resource assessment, permitting, and other similar activities will not be considered.
- H. Coal-to-liquids/coal-to-natural gas/coal-to-hydrogen technologies** – proposals examining new technologies whereby Wyoming coal may be converted to liquids (including fuels and chemical feedstocks) or gas (methane or hydrogen) are encouraged. These studies may entail the development of new catalysts or advancements in known technologies using Fischer-Tropsch or water gas shift reactions. Also, studies that focus on commercial-scale bioconversion of coal to natural gas are welcome. Studies must focus on improved effectiveness, cost, and performance.
- I. Economic analysis** – studies examining the cost/benefit of combustion and gasification of Wyoming coals at altitude are sought. It is important to understand how location, altitude, fuel source, water and external factors such as carbon dioxide emissions mitigation (such as tax or cap and trade) will affect the ability of industry to install facilities in Wyoming. The result of economic studies should be written in such a way as to provide information from which policymakers can craft legislation and regulation.

3. FUNDING LIMITATIONS AND PROJECT PERIOD

Proposers may request between \$250,000 and \$7,000,000 in research program funding to be matched dollar-for-dollar by outside funds. No more than 50% of the outside match can be made up of in-kind support. All projects requesting more than \$500,000 should be stage-gated to ensure continuing support only on the basis of demonstrable achievement of clear milestones.

The task force will forward to the Joint Minerals, Business and Economic Development Committee the projects they recommend by no later than November 30, 2010. Projects will be completed and unexpended funds revert no later than March 31, 2014.

4. APPLICANT ELIGIBILITY AND QUALIFICATIONS

Participation in this program is open to all university and community college faculty and staff, to private industry, to government agencies, and to individuals that have the capability to undertake leading-edge R&D. Qualifications of the investigators and appropriateness of the research topics will be major determinants during review of the proposal. The task force encourages investigators to collaborate with other groups if they judge this will result in a better project. Where appropriate, the task force also encourages interdisciplinary interaction and approaches among researchers.

Proposals will only be considered if documentation verifying that the matching funds have been committed is included. Verification in the form of a signed letter from the actual non-Wyoming state funding organization(s) is required.

5. PROPOSAL PREPARATION

A. Minimum requirements

To be eligible for funding, proposals must describe how the research relates to improved low-emissions use of Wyoming coal at high altitude. All proposals submitted must contain each of the following:

1. Signed application form (Attachment 1)
2. Signed Confidential Disclosure Agreement (Attachment 2)
3. Table of contents
4. Abstract (300 words or less) (Attachment 3)
5. Introduction
6. Detailed explanation of the relationship of the research to improved use of Wyoming coal, increased use of Wyoming coal, low-emissions use of coal and transfer of the results to the State of Wyoming and user groups.
7. Scientific discussion (including experimental design)
8. Statement of work (including schedule and methods)

9. For requests that exceed \$500,000, full discussion of the how the project will be stage-gated to judge successful achievement of critical milestones. The proposed milestones must be measurable and must reflect progress towards achievement of the objectives of the project.
10. For requests between \$250,000 and \$500,000, discussion of how success of the research will be gauged (i.e., what milestones, goals, developments, deliverables, and/or accomplishments must be reached to determine that the research has met stated objectives).
11. Identification of all information in the proposal that the investigators deem proprietary, both by highlighting the proprietary text and by notation at the top of each page that contains proprietary information.
12. Description of how this research compares with and may advance the state of the art.
13. For those proposals seeking funds in the categories of demonstration or scale-up of emerging technologies, a side-by-side comparison with existing commercially available technologies/applications is requested for the purpose of evaluating the potential advantage of the technologies/applications proposed.
14. Full description of a business plan for commercialization of successful outcomes from this research, demonstration, or scale-up will strongly influence funding decisions.
15. Literature references.
16. Letters identifying the source and amount, and verifying match.
17. Appendix, to include:
 - a. Short vitae (maximum 3 pages) for principal investigators
 - b. Description of facilities and equipment to be used
 - c. Other pertinent information bearing on qualifications to conduct project
18. Budget (see below).

B. Budget format

A detailed budget is required. The following minimum information must be included.

1. Personnel costs – include descriptive job titles, rates of pay, and man-hours/months/days. Fringe benefits should be shown as a separate item, with a brief explanation of the formula used.
2. Supplies – show a breakdown by major category.
3. Equipment – show a breakdown by item. Existing non-consumable equipment costs will not be an allowable cost, but a portion of the original purchase cost may be considered as a match if justified. Only pro-rated costs for new non-consumable equipment (i.e., analytical instruments, computers, etc.) will be allowed unless the equipment is an integral part of the technology, plant, or implement to be developed.

4. Travel – only travel necessary to conduct the research plus attendance by one or more of the principal investigators, if requested, to review the project is allowed. Include detail about the purpose of travel. If a per diem rate is used, please explain the rate fully.
5. Consultant costs – information similar to that requested above for personnel items must be shown.
6. Subcontracted work – funds that will be dedicated to outsourced work through subcontract require full details as described in the previous items.
7. A clear statement of the total amount that is requested from the Clean Coal Technologies Research Program.
8. Indirect costs are allowable for outside (non-UW) agencies – specify the rate that is charged. Indirect costs that are judged to be excessive will be subject to negotiation and may lead to rejection of the proposal outright.
9. Matching – the portion of the total project budget that will be supplied or matched from other sources should be outlined with the same level of detail in all categories. Full information on the sources of the funds must be included. No more than 50% of the match can be in-kind. We recommend a budget format that includes a separate column for each source of funds.

6. SCREENING AND EVALUATION PROCESS

The members of the Clean Coal Task Force will screen all proposals prior to review to ensure compliance with the requirements for submission. The task force will submit all complete proposals to external reviewers and each proposal will be reviewed by at least two individuals with relevant technical expertise. All reviewers will execute the Confidential Disclosure Agreement (Attachment 2) prior to receiving individual proposals.

After consideration of any comments from external reviewers, the members of the task force will rank the proposals and select those with highest merit within the program guidelines up to the funding limit for this round. Decisions of the Clean Coal Task Force are final and are not subject to an appeals process. The task force will forward their recommendations to the Wyoming Governor and the Joint Minerals, Business and Economic Development Committee.

A. Evaluation criteria

Proposals will be reviewed initially for compliance with the Proposal Preparation guidelines (Section 5 above), especially for verification of matching commitments. Those proposals that are found to be in compliance with those guidelines will be evaluated by

use of the criteria described in Attachment 4. Budget information will be reviewed in detail and is a critical element of the proposal. Those proposals that are found not to be in compliance with the guidelines will be returned to the sender with a short deadline for resubmission.

The Rating Form (Attachment 4) will be used for the review of proposals by the members of the task force and by the external reviewers.

B. Applicant notification

All investigators who submit proposals for consideration will be notified by letter of the recommendation of the Clean Coal Task Force to the Governor and Joint Minerals, Business and Economic Development Committee by December 15, 2010.

7. RESEARCH CONTRACT REQUIREMENTS

The following research contract requirements are recommended by the Clean Coal Task Force. The reporting requirements are set forth in legislation as a condition of appropriating funds from the Clean Coal Research Account. Investigators whose proposals are funded are required to:

- A. Execute an **agreement** for the research to be performed
- B. Submit **Semi-Annual Progress Reports** during the life of the project
- C. Submit a **Final Executive Summary Report**
- D. Submit a **Final Technical Report** and
- E. Present a **Final Seminar** to user groups at a Clean Coal Technologies Workshop organized by the University of Wyoming School of Energy Resources.

A. Execute an agreement for the research to be performed

This agreement shall specify the terms and conditions under which the funds shall be disbursed, including but not limited to:

- A methodology, including the ability for the State of Wyoming to audit records as necessary, to ensure that matching funds required under the proposal are available and actually expended for the research to be performed.
- A means for the executive summary and final technical report to be submitted to the State of Wyoming to verify that the research described in the proposal for which funding was provided was accomplished in a manner and of a quality that was represented in the proposal.

For entities that are subcontracting portions of this award – the University of Wyoming will require a sub-contract document be in place prior to the actual effort begins. SER

will work closely with your contracting offices to setup this up soon after notification of award.

B. Semi-Annual Progress Reports

These reports shall be submitted by December 1 and June 1 of each year of active grant status to the Director of the University of Wyoming School of Energy Resources. Progress reports will be made available only to the task force. Progress reports should not exceed three pages, and should report status of work, variance in timing and activity versus project plan, and status of project budget.

C. Final Executive Summary Report

This report should be a concise non-technical summary of project results and recommendations. We intend the audience to include user groups, the general public, and non-specialists in the field. The Final Executive Summary Report should be less than 15 double spaced pages in length.

D. Final Technical Report

The Final Technical Report is intended for use by professionals and other scientists in the general field of low-emissions coal technologies. It should contain a complete and thorough report of project activities conducted. Minimum content of the technical report should be as follows:

1. Abstract (less than 300 words)
2. Introduction
3. Objectives
4. Methods
5. Results
6. Technical Information (not to exceed 40 double spaced pages)
7. Conclusions and Recommendations
8. Full description of business plan for commercialization of successful outcomes from this research, demonstration, or scale-up
9. Appendix with the following:
 - a. Abstracts of resulting theses/dissertations
 - b. Full citations for resulting publications and for manuscripts submitted for publication
 - c. Data on scientific collaborators (persons who worked more than 40 hours in one year), with full identification
 - d. Description of inventions
 - e. Other information that was specifically required by the terms of the award

Confidential information which forms part of the Final Technical Report may be attached as a separate Confidential Appendix. Any such confidential information will remain confidential to the task force and will neither be published, posted, summarized, nor abstracted by the task force or SER.

The Final Executive Summary Report and the Final Technical Report are due June 15, 2014, or 90 days after the completion of the projects, whichever comes first. **The Final Report should be submitted in hardcopy and electronic format in order that it be placed it on the School of Energy Resources website.**

E. Final Seminar

The School of Energy Resources will host a Clean Coal Technologies Workshop in June 2014. All investigators who are awarded funds from this offering of the Clean Coal Technologies Research Program will present a seminar at this workshop, which will be open to the public.

All presentations and publications that result from work that are supported wholly or in part with funds from the Clean Coal Research Account should acknowledge this support by use of the following language:

- Funding for this research project was provided by the Wyoming State Legislature.
- The state and federal awarding agencies reserve a royalty-free, nonexclusive, and irrevocable license to reproduce, publish or otherwise use, and to authorize others to use, for state and federal government purposes:
 - a) The copyright in any work developed under a grant, sub-grant, or contract under a grant or sub-grant, and
 - b) Any right of copyright to which a grantee, sub-grantee or a contractor purchases ownership with grant support.

8. Intellectual Property

In cases where funds from the Clean Coal Research Account result in intellectual property that may be copyrightable and/or patentable, an investigator must take all reasonable steps to secure copyrights and/or patents according to the rules and policies of their employment prior to submission of the Final Technical Report. The investigator is required to notify the task force of any intellectual property arising from the project. However, the condition applies that the Federal government and the State government reserve a royalty-free, non-exclusive, and irrevocable right to manufacture, produce, publish, copy, or otherwise use and authorize others to use the copyrighted and/or patented property developed with funding provided from the Clean Coal Research Account for purposes of government-sponsored work.

SUBMITTAL INFORMATION

Please deliver the original proposal, both in electronic and hard-copy form, to the address below before 5:00 pm Friday, September 20, 2010. No exceptions will be made for late arrival of proposals, for any reason.

School of Energy Resources
Attention: Sarah Schulmeyer
University of Wyoming
Department 3012
1000 E. University Avenue
Laramie Wyoming 82071

The electronic copy of the proposal must be emailed to serpros@uwyo.edu with “Clean Coal Technologies Proposal” in the subject line.

If you have questions regarding this funding program or if you need more information, please contact the School of Energy Resources at 307-766-6639 or email serpros@uwyo.edu with “Clean Coal RFP query” in the subject line.

Attachment 1

**CLEAN COAL TECHNOLOGIES RESEARCH PROGRAM
APPLICATION FORM**

(Please complete this form for each investigator)

Name			
Title			
Organization			
Address <i>Street or Box number</i>			
	<i>City</i> <i>State</i> <i>Zip</i>	<i>City</i> <i>State</i> <i>Zip</i>	<i>City</i> <i>State</i> <i>Zip</i>
Contact Info	<i>Phone</i> <i>FAX</i> <i>E-mail</i>	<i>Phone</i> <i>FAX</i> <i>E-mail</i>	<i>Phone</i> <i>FAX</i> <i>E-mail</i>
PROPOSAL TITLE			
Total \$ requested from Clean Coal Research Prg.			

Please complete abstract on attachment 3

Signature of Investigator		Date
Authority (name, title and contact information) from Organization	<i>Please type or print</i>	
Signature of Authority		Date

CONFIDENTIAL DISCLOSURE AGREEMENT

(Please complete this form for each company submitting a proposal)

University of Wyoming, School of Energy Resources, Dept. 3012, 1000 E. University, Laramie, WY 82071 understands that [**Submitting Company Name and Address**] ("**Company**") wishes to disclose to the **University of Wyoming School of Energy Resources** information related to "**Clean Coal Technology**" hereinafter referred to as "**Proprietary Information**" for evaluation purposes. All Proprietary Information shall be disclosed in writing and identified by **Company** as confidential or proprietary, or disclosed orally and then promptly reduced to writing and identified in such writing by **Company** as confidential or proprietary.

The **University of Wyoming School of Energy Resources** agrees (i) to hold Proprietary Information in confidence and to take all reasonable precautions to protect such Proprietary Information including, without limitation, all precautions that the **University of Wyoming School of Energy Resources** employs with respect to its confidential materials, (ii) not to divulge any Proprietary Information or any information derived therefrom to any third party, (iii) not to make copies of any Proprietary Information except as necessary for the purpose expressly allowed hereunder, (iv) not to use the Proprietary Information for any commercial purposes, except with the prior agreement of **Company**. Disclosure of Proprietary Information by the **University of Wyoming School of Energy Resources** shall only be made to those employees, directors, officers, consultants, and outside reviewers who have a need to know the Proprietary Information for the purpose described above and who are under similar obligations of confidentiality and non-use. Should the **University of Wyoming School of Energy Resources** be required by judicial or other governmental authority to disclose Proprietary Information, it shall inform and cooperate with **Company** in responding to such requirement.

The foregoing obligations shall not apply with respect to information the **University of Wyoming School of Energy Resources** can document (i) is in or enters the public domain through no improper action or inaction by the **University of Wyoming School of Energy Resources**, or (ii) was in its possession or known by it prior to receipt from **Company**, or (iii) was rightfully disclosed to it by a third party without restriction, or (iv) was independently developed by the **University of Wyoming School of Energy Resources** or its employees, without use of the subject Proprietary Information.

The **University of Wyoming School of Energy Resources** understands that nothing herein (i) requires the disclosure of any Proprietary Information; Proprietary Information shall be disclosed, if at all, solely at the option of **Company** or (ii) requires **Company** to proceed with any proposed transaction or relationship in connection with which Proprietary Information may be disclosed.

The **University of Wyoming School of Energy Resources** does not waive its sovereign immunity or its governmental immunity by entering into this agreement and fully retains all immunities and defenses provided by law with regard to any action based on this agreement. The laws of Wyoming shall govern this agreement.

This agreement is effective on the date of last signature hereto. This agreement shall expire one (1) year from the effective date, and all Proprietary Information shall be subject to the restrictions of this agreement for three (3) years after expiration.

University of Wyoming School of Energy Resources	Representing Submitting Company
<i>By:</i>	<i>By:</i>
<i>Typed Name: Dr. Mark Northam</i>	<i>Typed Name:</i>
<i>Title: Director, School of Energy Resources</i>	<i>Title:</i>
<i>Date</i>	<i>Date:</i>

CLEAN COAL TECHNOLOGIES RESEARCH PROGRAM

PROPOSAL ABSTRACT

(300 Words or less)

Attachment 4

RANKING FORM FOR PROPOSALS FOR CLEAN COAL TECHNOLOGIES RESEARCH PROGRAM

PROPOSAL NUMBER _____ Describe briefly the focus of the project (one or two sentences).

EVALUATION CRITERIA: Please rank the proposal from 1-5 (1 being poor – 5 being excellent) in each of the following categories by circling the desired ranking.

1. **Relevance and Importance:** Does this proposal directly address research areas that can be directly related to low-emissions coal technologies as described in the Call for Proposals? If so, does it deal with a subject of particularly high importance to present and future use of Wyoming coal? Does the project have relevance and importance to the economy of the State of Wyoming? Have format requirements been met?

Poor 1 2 3 4 5 **Excellent**

2. **Scientific Merit:** Does this proposal have potential to expand the fundamental knowledge in its specific area(s)? Is it scientifically sound? Is the investigator(s) cognizant of past work? Is the proposal well written, organized, and complete? If appropriate, does it represent an integrated interdisciplinary approach?

Poor 1 2 3 4 5 **Excellent**

3. **Feasibility:** Are the objectives, methodologies, designs, and techniques adequate and completely described? What is your judgment of the likelihood of success given the methods and time frame proposed?

Poor 1 2 3 4 5 **Excellent**

4. **Technology Transfer:** Does the proposal actively address the eventual transfer of results to user groups? Does it actively address the impact the results could have?

Poor 1 2 3 4 5 **Excellent**

5. **Qualifications:** Are the qualification of the investigator(s) commensurate with the proposed research? Are the facilities and equipment adequate? If appropriate, have external funding agencies and cooperators been identified? Has the nature of such cooperation been described?

Poor 1 2 3 4 5 **Excellent**

6. **Budget:** Is the budget reasonable and adequate for the work proposed?

Poor 1 2 3 4 5 **Excellent**

IMPORTANT! (EVALUATORS, PLEASE COMPLETE THE REVERSE SIDE OF THIS FORM)

PROPOSAL NUMBER _____

STRONG POINTS: (Novelty, need for study, exceptional qualifications, etc. Please feel free to use additional pages.)

WEAK POINTS: (Please provide substantive, constructive comments and state the shortcomings. Please feel free to use additional pages.)

NOTES TO REVIEWERS: Comments that do not appear on this form or on an attached sheet will not be considered. We will not search your copy of the proposal for comments. A synthesis of review comments will be provided to investigators if requested. Please return the Rating Form to: School of Energy Resources, University of Wyoming, 209 Bureau of Mines, Department 3012, 1000 E. University Avenue, Laramie, WY 82071.