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# CENTER FOR ADVANCED SEPARATION TECHNOLOGIES

## CAST III ROUND 3 REQUEST FOR PROPOSALS

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Prepared by:

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Proposal Due Date:

Friday, April 25, 2008, 4:00 PM

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## SECTION 1.0: INTRODUCTION

### Background

The Center for Advanced Separation Technologies (CAST) is a consortium of the seven universities listed below.

- Virginia Tech (Charter Member)
- West Virginia University (Charter Member)
- University of Kentucky
- Montana Tech
- University of Nevada Reno
- New Mexico Tech
- University of Utah

It was formed in 2001 to develop advanced technologies that can be used to efficiently produce cleaner fuels in an environmentally acceptable manner and to study the basic sciences and engineering involved. The new technologies developed as a result of CAST research and the highly skilled personnel trained during the course of its activities will help the U.S. meet the challenges of energy independence. These missions are consistent with President Bush's *American Competitiveness Initiative*, announced in his 2006 State of the Union Address. The President's new program includes doubling R&D commitments to basic research, supporting universities for world-class education and research opportunities, and training a work force with skills that can be used to better compete in the 21<sup>st</sup> century.

### Center for Advanced Separation Technologies

The Center for Advanced Separation Technologies (CAST) was formed initially between Virginia Tech and West Virginia University with the objective of developing advanced *solid-solid* and *solid-liquid separation technologies* that can help the U.S. coal industry produce cleaner solid fuels. In 2002, five other universities listed above joined the consortium to develop crosscutting technologies that can also be used in the U.S. minerals resources industry. As a result, the scope of CAST research was expanded to studies of *chemical/biological separations* and *environmental control*.

As a consortium, the Center can take advantage of the diverse expertise available in the member universities and address the interests of the different geographical regions of the country. Working together as a consortium is consistent with the recommendations of a recent National Research Council (NRC) report on the U.S. Department of Energy's fossil energy research, which states that "*consortia are a preferred way of leveraging expertise and technical inputs to the mining sector*, and recommends that DOE should support "*academia, which helps to train technical people for the industry.*"

Many of the separation technologies used in the coal industry are essentially the same as those used in the minerals industry. Thus, developing advanced separation

technologies for producing cleaner coal may lead to the development of crosscutting technologies that can also help produce mineral concentrates more efficiently. The Department of Energy encourages CAST to conduct basic research in order to address long-term, high-risk technology development. Investment in basic research can be a shortcut to developing breakthrough technologies.

### Purpose of Request for Proposals

The purpose of this document is to solicit research proposals from the member universities of CAST.

Research to be supported under this solicitation will be funded from a Cooperative Agreement Award made to CAST by the U. S. Department of Energy [DOE]. Total funding for Year 3 is \$1,000,000. Only faculty members and/or faculty equivalent academic professionals from these institutions are eligible to serve as principal investigators. The Site Coordinators at each university are responsible for distributing this announcement to appropriate researchers and forwarding the proposals submitted in response to this solicitation to the CAST Director for consideration. The Research Topics of interest to CAST are described in Section 2.0 (Research Topics) of this solicitation. Research priorities for these topics have been identified in the CAST Roadmap Document (copies are available from the site coordinators or from the CAST website, <http://www.castconsort.org/>). **Investigators are strongly encouraged to submit proposals that are related to coal and energy and are consistent with the objectives of the Fossil Energy Program (<http://www.fossil.energy.gov/>).**

## **SECTION 2.0: RESEARCH TOPICS**

The specific topics addressed in this solicitation are described in detail below. Each proposal submitted in response to this solicitation must be relevant to one of the four areas listed. The discussion under each topic describes the research goals and suggests topical research focus areas. The specific topical area to which a proposal is submitted must be clearly identified on the cover page. Proposals addressing multiple topics will not be considered.

### Topic 1: Solid-Solid Separation

Availability of new or improved technologies for separating valuable solid materials from waste rock is essential for the U.S. coal and mineral industries to compete in an increasingly competitive and environmentally conscious global market. Therefore, proposals that can lead to the development (or enhancement) of innovative solid-solid separation processes or improve the basic understanding thereof are sought. The solid-solid separation processes under consideration include sizing, classification, froth flotation, selective flocculation, selective agglomeration, gravity separation, electrostatic separation, and magnetic separation.

## Topic 2: Solid-Liquid Separation

Removal of moisture from coal and mineral fines is difficult using conventional mechanical dewatering methods. Although thermal drying can reduce the moisture to desired levels, it is not used widely in industry due to its high capital and O&M costs, pollution control requirements, and potential explosion/fire hazards. The development of new or improved methods of mechanically dewatering particles is highly desirable. Therefore, research proposals are sought that can lead to the development of novel methods for improving solid-liquid separation and/or improved scientific understanding thereof.

## Topic 3: Chemical/Biological Extraction

In the area of hydrometallurgy, proposals are requested that address both biological and chemical separation methods. In biological separation, methods of extracting metal values from low-grade and refractory ores will be considered for funding. This technology is becoming increasingly popular in the base metals industry for economic and environmental reasons. In chemical separation, novel methods of increasing the kinetics of extracting metal values from refractory ores and recycled materials will be considered for funding. In addition, proposals that demonstrate the potential to reduce costs, improve resource recovery, or lessen environmental impacts associated with hydrometallurgical operations will be considered for funding. Extraction of mercury from coal is highly relevant to this topical area.

## Topic 4 - Modeling and Control

In all topical areas, higher levels of plant efficiency can be achieved when microprocessor-based controllers are used to maintain the performance of each unit operation in a coal or minerals processing plant. Unfortunately, the U.S. lags far behind countries such as Australia, Germany, and South Africa in the development and application of process control technologies. Therefore, proposals are requested which address the development of microprocessor-based control systems and mathematical process models for particulate processing unit operations. Research topics will be considered in areas of process control for plant optimization (e.g., adaptive multivariable control, fuzzy logic, expert systems development, etc.), sensor development for process monitoring (e.g., alternatives to current nuclear or x-ray based sensors), and mathematical modeling for the simulation and control of unit operations (e.g., spirals, flotation cells, cyclones, jigs, mills, etc.).

## Topic 5: Environmental Control

Environmental control is a critical component of sustainable mining and mineral processing practices. Environmental control activities used in mining include prevention, abatement, remediation, and reuse of process residues, byproducts, and waste materials. Challenges in environmental control include i) emissions control, ii) remining, iii) waste

disposal and iv) mine influenced water (MIW). In emissions control, studies related to the chemical behavior and control of mercury, sulfur, and other regulated elements are of prime interest. In re-mining, proposals that seek to develop new and efficient separation methods for waste recovery, remediation or reuse will be considered for funding. In waste disposal, R&D projects are needed to address problem areas such as acid mine drainage, fly ash reuse/disposal, water treatment, and impoundment stability.

## **SECTION 3.0: PROPOSAL REQUIREMENTS**

### General Information

Proposals received under this solicitation shall be evaluated in accordance with the rules and regulations set forth by the CAST Organizational Plan and Bylaws. CAST reserves the right to accept or reject any or all proposals or any portion of a proposal, to request additional clarifying information, and/or to conduct discussions with offerors at its own discretion. Unless extenuating circumstances occur, however, it is the intent of CAST to make selections based on initial proposals received. Therefore, each proposal should be submitted on the most favorable terms from technical, environmental, and cost standpoints.

The work schedule for each proposal should be in the range of 1 to 2 years. Longer duration proposals will be considered only in exceptional cases. Each proposal should have a deliverable or other milestone event at the end of one year of effort. This information will be used by CAST for evaluating progress and making decisions about continued support.

Proposals will be reviewed by a Technical Review Committee. CAST will submit a list of projects recommended for funding to the National Energy Technology Laboratory (NETL), U.S. Department of Energy. DOE will be the final authority for project selections. For programmatic reasons, DOE may choose to select more of the coal-related projects.

CAST must provide 20% cost sharing on the DOE award that provides funding for this solicitation. Therefore, all offerors are required to provide a minimum of 20% cost sharing as part of any proposed project. The cost shared amount shall be based on the total estimated project cost (i.e., the sum of CAST funds requested and offeror funds provided). For example, if the total project cost is \$100,000, the maximum federal share would be \$80,000 and the minimum cost share would be \$20,000 (i.e., 20% of \$100,000). Allowable cost sharing must conform to applicable federal regulations. It is anticipated that the average federal support for funded proposals will be in the range of \$80,000-\$120,000 per annum since the focus of this research is in developing new technology as opposed to large-scale demonstration of mature technologies. However, projects outside this range will be considered.

## Evaluation Criteria

Proposals submitted in response to this solicitation will be evaluated based on criteria that include the following considerations:

- A. Relevance of the proposed work to the Research Topics identified in Section 2.0 of this Solicitation and the Research Priorities identified in the CAST Roadmap Document.
- B. Technical merit as established by an external review of the proposal by a Technical Review Committee.
- C. Programmatic considerations related to the availability of sponsor funds.
- D. Potential of the proposed research to result in the development of new technologies or a significant improvement in existing technologies (high risk/high reward projects will be viewed more favorably than proposals to make minor improvements in existing technologies).
- E. Adequacy of the proposed work plan compared with the deliverables (likelihood of achieving the objectives of the research).
- F. Credentials of the research team (including understanding of current state-of-the-art in the area of research proposed).
- G. Adequacy of resources for the research (facilities, institutional support, reasonableness of the budget, cost sharing, etc.).
- H. Clarity of the proposal and conformance to the guidelines for preparation and submission of the proposal.

Other factors to be considered in evaluation of the proposal include partnerships with industry such as co-participation in the research, co-funding, or advisory support; interdisciplinary projects; and transferability of the technology to other application areas.

## Proposal Instructions

Offerors are reminded that proposals submitted under this solicitation are subject to peer review and review by the CAST Advisory Board. Offerors are discouraged from including in their proposals data that they do not want disclosed to the public for any purpose or used by peer reviewers and the Advisory Board except for evaluation purposes. Proposals received that are marked as containing confidential or proprietary data will be returned to the offeror and not evaluated.

Offerors will be notified in writing regarding the evaluation of their proposal. For proposals that are not funded, the offeror may request in writing at the time of proposal

submission that all but the original copy of unsuccessful proposals be returned to the offeror. The original will be retained in confidence by CAST for record keeping purposes for such a period of time as required by federal regulations. Notice of all awards made under this solicitation will be provided to the U.S. Department of Energy and to all member institutions of CAST.

Successful offerors will be required to submit reports to the CAST Director as part of any award made under this solicitation. The type(s) of report(s), format, and frequency will be the same as any report(s) required under any prime award issued by DOE in support of CAST. These reports may include, but are not limited to: Hazardous Substance Plans, Hazardous Waste Reports, Semi-annual Technical Progress Reports, various financial and property reports, and a Final (Topical) Report. Additionally, no DOE funds may be expended by a successful offeror until a NEPA Environmental Questionnaire has been submitted and DOE notifies the recipient that all NEPA requirements have been satisfied for that specific project. Because of this requirement, all offerors are asked to submit this Questionnaire with their proposal and ensure that all relevant questions are answered. NEPA approval has been a major source of delay in the approval process.

#### Proposal Submittal

**Email the proposal (MS Word format) to [hullc@vt.edu](mailto:hullc@vt.edu) so that it is received no later than 4:00 p.m. on Friday, April 25, 2008. DOE require a signed copy of the environmental questionnaire so this must be submitted either as a scanned pdf or sent via mail. This must be received no later than Friday April 25, 2008. Contact information for the site coordinators is summarized in the following table.**

Virginia Tech Contact:

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It is expected that notification of award by DOE will be made by August 1, 2008 and that CAST funds will be made available to each institution on or before September 1 2008. Proposals may be withdrawn by written notice of the offeror at any time before award.

Communications or questions regarding this solicitation should be directed to the Site Coordinators at the respective universities and/or Dr. Roe-Hoan Yoon or Chris Hull at Virginia Tech.

### Proposal Costs

Costs associated with the preparation and delivery of proposals submitted under this solicitation, or for negotiation of awards made under this solicitation, are not allowable and shall not be included in cost estimates provided with proposals.

### Proposal Content

Offerors are requested to submit concise proposals. Sufficient detail should be included to enable peer reviewers to properly evaluate the technical merit and feasibility of the proposed effort; however, lengthy background discussions and literature reviews are discouraged. Since external examiners will review the proposals, proprietary information or data should not be disclosed.

Consistent with DOE Order 5900.2, all proposals shall use the SI (Le Systeme International d'Unites) Metric System of Units as the primary unit of measure. Where deemed necessary, the primary SI units shall be followed by the U.S. inch-pound system equivalent in parentheses ( ).

Proposals should follow the general outline shown below. Sections IV - VI are limited to a maximum of 5 single-spaced pages with 1-inch margins and with a minimum font of 12 pt. Shorter proposals consistent with an adequate presentation of the research topic are encouraged.

- I. Cover Page (include proposal title, offering institution and all participating subcontractors, and the principal investigator). The topical area addressed by the proposal must be clearly identified on the cover page.
- II. Public Abstract (may be released by CAST, DOE and other organizations for public information purposes)
- III. Table of Contents
- IV. Brief Introduction and Background Section \*
- V. Scientific Discussion \*

VI. Concise Statement of Work\*

\* Sections IV – VI limited to five pages as noted above

VII. Literature References Cited

VIII. Detailed Budget, broken down by federal and non-federal sources, for the budget categories listed below. Provide a budget page (using the format provided in the Appendix to this solicitation), along with supporting tables, narrative and/or documentation for each of these categories.

1. Labor: Identify individual labor categories and labor hours (or percentage of effort), salary or wage rates with applicable escalation factors, and separately identified fringe benefits.
2. Travel: All proposed travel must be itemized as to purpose, destination (both city and organization to be visited), number of travelers, length of trip and relevance to the proposed research. Rates used to estimate costs must be provided.
3. Subcontracts and/or Consultants: Identify any proposed subtier agreements and their relative costs, providing the same level of detail as that required for the offering institution. For consultants, the hourly/daily rate must be provided along with the basis of the rate, the need for the consultant(s), and certification whether or not the proposed rate is the consultant's "most favored customer" rate. Furnish resumes or other information regarding qualifications or experience.
4. Materials and Supplies: Identify categories of supplies and individual items where appropriate. Include the basis for the costs (i.e., catalog, quotes, etc.).
5. Equipment: Separately identify any equipment items and provide cost basis. Equipment provided by CAST funds will be the property of the proposing institution. Advanced instrumentation purchased using CAST funds is expected to be made available to other CAST researchers to avoid duplication.
6. Other Direct Costs: Identify type of cost item and cost basis.
7. Indirect Costs: List basis for calculating indirect costs.
8. Total CAST Funds Requested

9. Cost Sharing: A minimum of 20% of the total project cost is required as cost sharing. Provide a breakdown of cost sharing by the offering institution and any other participating organizations.

10. Total Project Cost:

**A SEPARATE BUDGET PAGE MUST BE COMPLETED FOR EACH FUNDING YEAR OF THE PROJECT AND FOR THE TOTAL PROJECT.** Under this requirement, a two year project would require the submission of three budget pages (i.e., year one funding, year two funding, and total funding).

IX. Appendices:

1. Existing facilities and or equipment to be used in the proposed research.
2. Other pertinent qualifications of the offering institution and subcontractor(s).
3. Past, current, and pending federal support related to the proposed effort (identify the federal agency and program).
4. Short vita for the PI and Co-PI(s), if any.
5. Fully executed **NEPA ENVIRONMENTAL QUESTIONNAIRE**. This document, No. 451.1-1/3 (Nepasol), “Environmental Questionnaire for Solicitations” can be found on the NETL Electronic Business Center site at [www.netl.doe.gov/business/forms/451\\_1-1-3.doc](http://www.netl.doe.gov/business/forms/451_1-1-3.doc). **Note that this is a new version of the NEPA and previous versions are unacceptable.** Ensure that the document is complete as failure to do so will result in rejection by DOE and delays in project approval.

#### Institutional Approval

Each proposal must be accompanied by a fully executed, university-appropriate Sponsored Programs Approval Form/Sheet, indicating approval by all Department Heads and Deans of units that have made commitments to the proposed project. In particular, this form must clearly outline (and show approval of) all cost sharing commitments made by the applicant(s). This form/sheet should be attached to the front of the original paper copy of the proposal.

APPENDIX

Sample Title Page Format

Sample Summary Budget Format

CAST III Year 3

**TITLE OF PROPOSAL**

A Proposal Submitted to:

Center for Advanced Separation Technologies

Proposal Topic Area:

- Solid-Solid Separation
  - Solid-Liquid Separation
  - Chemical/Biological Extraction
  - Modeling and Control
  - Environmental Control
- (Please check ONLY one)

Submitted by:

(Investigator Names)  
(Member Institution)  
(Address)

with

(Co-Investigator Names)  
(Participating Organizations)

Submission Date:  
(Submission Date)

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Principal Investigator Endorsement

BUDGET PAGE

Check One\*:       Year 1       Year 2       Year \_\_\_\_       Total

<u>Budget Categories</u>	<u>CAST Funds</u>	<u>Cost Share Funds</u>	<u>Total Cost</u>
<b>Salaries and Wages:</b>			
Principal Investigator(s)	_____	_____	_____
Graduate Assistant(s)	_____	_____	_____
Other (List Titles)	_____	_____	_____
Fringe Benefits:			
Faculty	_____	_____	_____
Staff	_____	_____	_____
Total Personnel Costs	_____	_____	_____
<b>Other Cost Elements:</b>			
Travel	_____	_____	_____
Subcontracts	_____	_____	_____
Materials & Supplies	_____	_____	_____
Equipment	_____	_____	_____
Awards/Tuition	_____	_____	_____
Other Direct Costs (List)	_____	_____	_____
<b>Total Direct Costs</b>	_____	_____	_____
<b>Indirect Costs (___%)</b>	_____	_____	_____
<b>Total Funds Requested</b>	_____	_____	_____

\* A separate budget page must be submitted for each funding year of the project as well as for the total proposed effort.