

## Previous Research Activities

### Environmental

- Analyzed mercury issues related to coal combustion by-product (CCB) utilization
- Characterized ammoniated ash
- Monitored disposed CCBs
- Assembled naturally occurring radioactive material data on CCBs
- Evaluated variability of coal fly ash

### Utilization

- Assessed the handling and use of flue gas desulfurization material
- Examined the use of CCBs in controlled low-strength material and concrete
- Determined CCB reactivity, rate of hydration, and behavior in products
- Assessed sulfate resistance of fly ash concrete
- Developed the Buyer's Guide to Coal Ash-Containing Products
- Performed a feasibility study on the use of coal ash in rammed-earth construction

### Testing and Standards Development

- Created American Society for Testing and Materials (ASTM) standards for coal ash utilization
- Compared available swell/expansion tests to develop an expansion test for CCBs
- Developed leaching protocols
- Formulated methods for real-time measurement of mercury release from ash

For a more complete list of research activities, visit [www.undeerc.org/carrc/html/publications.html](http://www.undeerc.org/carrc/html/publications.html)



*“CARRC<sup>SM</sup> leadership and innovative research have provided new insight into the fascinating world of coal ash utilization. The knowledge gained is invaluable in understanding its behavior and performance. The exchange of data, ideas, and experience is particularly valuable to the international participants.”*

*Dr. Richard Kruger  
Ash Resources, South Africa*

To learn more about CARRC<sup>SM</sup>, visit [www.undeerc.org/carrc](http://www.undeerc.org/carrc) or contact:

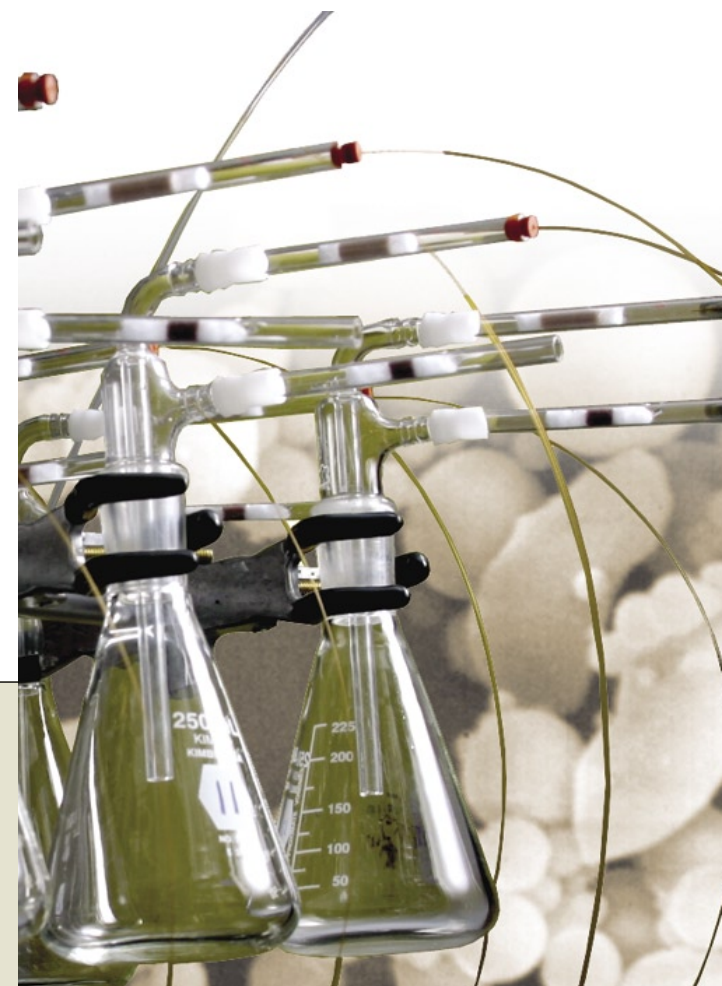
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# CARRC<sup>SM</sup>

*Improving the Technical and  
Economic Aspects of CCB  
Management*



## Chemistry • Engineering • Mineralogy • Marketing

**T**he Coal Ash Resources Research Consortium<sup>SM</sup> (CARRC<sup>SM</sup>) delivers practical and timely research on issues of greatest interest to its members. The CARRC<sup>SM</sup> team approach offers professionals the opportunity to tap into the collective knowledge of a world-renowned research staff and share ideas and information with other professionals active in the coal ash industry.

CARRC<sup>SM</sup> is dedicated exclusively to the advancement of coal ash utilization in a manner that is both environmentally safe and economically viable.

### Putting Research into Practice

Founded in 1985, CARRC<sup>SM</sup> is located at the University of North Dakota Energy & Environmental Research Center (EERC). The EERC aims to develop innovative solutions to energy and environmental problems worldwide and to facilitate commercialization of innovative new technologies.



### Representing Your Industry as a Technical Resource

By actively participating in various committees and organizations, researchers update members on pending regulations and other external forces that affect the industry. Known as a leader in standards development, CARRC<sup>SM</sup> is dedicated to developing key standards that will enhance coal ash utilization.

### Keeping You Informed

An unbeatable combination of responsiveness and targeted research keeps CARRC<sup>SM</sup> members up to date on cutting-edge research.

### Making the Most of Your Research Dollars

CARRC<sup>SM</sup> funds are matched by the U.S. Department of Energy (DOE) through a Jointly Sponsored Research Program (JSRP) at the EERC. New members are invited to a trial 1-year membership at a half-price membership fee of \$5000.

Special projects can also be performed through CARRC<sup>SM</sup> for both members and nonmembers if the research is consistent with CARRC<sup>SM</sup> objectives. These projects may also be eligible for matching funds through the DOE JSRP.



## CARRC<sup>SM</sup> Deliverables

### Reporting

- Topical reports provide members with a technical overview of current issues.
- Annotated bibliographies serve as a reference to members looking for additional credible information.
- Annual reports provide a concise overview of accomplishments.



### Evaluation of Member Ashes

- Member coal ashes are evaluated on physical, chemical, and mineralogical characteristics.
- Results are stored in the CARRC<sup>SM</sup> Coal Ash Properties Database and compared with results from other ashes.

*“CARRC<sup>SM</sup> offers the vehicle for people who compete in business to work with each other for the benefit of the industry and the environment. It does so by bringing the talents and resources of the researchers together with the needs and practical experiences of the members. Also, it makes my research funds go farther by leveraging them.”*

*Al Christianson  
Great River Energy*