

# ACARP

RESEARCH PRIORITIES

NEWSLETTER 2011

## PROCESS

ACARP assists the Australian coal industry to develop and adopt technology and mining practice that leads the world. The program is entirely funded, owned and managed by the Australian black coal producers. These priorities have been developed by the five technical committees responsible for proposal development and selection. The categories to which these priorities relate are **Underground, Open Cut, Coal Preparation, Technical Market Support and Mine Site Greenhouse Mitigation.**

These priorities are not prescriptive but should act as a guide to the areas in which ACARP is seeking research proposals.

ACARP is a collaborative program that utilises the experience and technical strength of both the coal mining industry and research institutions in solving technical problems and addressing issues of significance to the industry's long term future. Any proposed research project that is strongly supported by a mine site and is of interest to a number of coal operations is encouraged.

Safety remains a key driver in the program and will continue to be the focus of much of the underground work and a significant component of the open cut and coal preparation programs.

## FORMAT

Short proposals are limited to 5 pages maximum and should be prepared under the following headings:

- Executive Summary
- Project History
- Objectives
- Outcomes and Benefits
- Work Program
- Safety Implications
- Key Personnel
- Budget
- Support.

## HOW TO APPLY

Short proposals must include a Proposal Summary Sheet and should be emailed to ACARP at: [anne@acarp.com.au](mailto:anne@acarp.com.au)

The proposal summary sheet, and further information, can be obtained from the ACARP web site [www.acarp.com.au](http://www.acarp.com.au) or by phoning ACARP on 07 3229 7661.

**The closing date for short proposals is Wednesday, 18th May 2011.**

## 2011 TIMETABLE

MAY 18

Deadline for submission of short proposals.

AUGUST 3

Applicants notified of success in moving to second stage – full proposal is requested.

SEPTEMBER 7

Deadline for submission of full proposals.

MID DECEMBER

Applicants notified of funding allocation, success/failure.

PROJECT ADMINISTRATION

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THE UNDERGROUND RESEARCH REQUIREMENTS FOR 2011 COVER TWO SUSTAINABILITY AREAS – WELFARE OF COMMUNITY AND EMPLOYEES, AND PROFITABILITY. THIS RESEARCH TARGETS THE INVESTIGATION OF THE FOLLOWING KEY ISSUES INCLUSIVE OF MANAGEMENT PRACTICES, LEGISLATIVE BEST PRACTICE ALTERNATIVES AND RISK MANAGEMENT.

## IMPROVED HEALTH AND SAFETY

- Investigation of key health and safety issues and management practices, including legislative best practice alternatives and risk management as well as tools/approaches (this applies also to the exploration, coal preparation and open cut areas).
- Detection/Prediction of spontaneous combustion, ignitions (including by lightning strikes), explosions, outbursts and strata control.
- Improving equipment operator interfaces and collision avoidance, improved automation and remote control.
- Management of fatigue via reduced exposure to vibration and heat.
- Better controls for airborne contaminants (eg dust and diesel emissions) and noise exposure by attenuation.
- Equipment/operator interfaces to address musculoskeletal disorders with improved ergonomics, less repetitive heavy manual handling and more use of lightweight materials.
- Adequacy and effectiveness of emergency response measures.

## IMPROVED GEOLOGICAL DEFINITION AND GEOTECHNICAL ASSESSMENT OF COAL DEPOSITS

- Practical methods for increasing confidence in estimation and classification of resources and reserves.
- Improved coal quality and yield estimates through the quantification of impacts of pre-treatment on laboratory results.
- Improved processes for the derivation of additional value from downhole geophysical surveys, specifically in the areas of:
  - > Identification and evaluation of discontinuities.
  - > Improved rock mass characterisation.
  - > Derivation of credible coal quality estimates from geophysical logs.
  - > Establishment of 'best practice' work practices.
- Improved efficiency and effectiveness in detecting anomalies and discontinuities ahead of mining, using innovative methods of drilling, exploration and geophysical methods.
- Practical techniques and improved methods for the integration of multiple exploration data sets and reconciliation of exploration data with 'real time' operational information.
- Development of techniques and procedures to improve the effectiveness of ground control systems using monitoring systems, integrated real time models, industry wide analysis and improved design.

- Innovative approaches to address the specific issues associated with exploration and resource evaluation to support very deep mining (1,000m plus).
- Options for the standardisation and improved management of exploration data.

## HIGHER PRODUCTIVITY MINING

- Improvements in roadway development systems and equipment.
- Application of remote control and automation processes to increase productivity and reduce operator exposure to hazards.
- Improved reliability of longwall systems, and further development of non-traditional longwall methods (eg top coal caving, thin seam mining).
- Continuous improvement in the efficiency and effectiveness of gas drainage practices is required to support high productivity mining in gassy seams; better techniques to understand and test insitu gas conditions are required.

## EQUIPMENT AND MINING SYSTEMS RELIABILITY

- Improvements in the design and uses of equipment to maximise safety, operability, maintainability and energy efficiency.
- Increase the uptime of mining and services processes; in particular, improvements to the design of conveyor systems are encouraged to improve system reliability, safety and maintenance.
- Improving equipment operator interfaces associated with collision avoidance.
- Improved automation and remote control.

## IMPROVED HEALTH AND SAFETY

The industry is looking for direct or indirect improvements in health and safety across all mining and exploration operations. Areas of focus and interest for open cut mining are:

- Investigation of key open cut health and safety issues and management practices, including legislative best practice alternatives. Improved risk management tools/approaches (this applies also to the exploration, coal preparation).
- Personal back and joint damage. A number of improvements have been achieved but new approaches are required to further reduce injuries of this type.
- Protection and removal of personnel from hazardous situations such as those around the ground stability in the vicinity of voids and excavations, particularly during truck loading.
- General improvement to the health and safety of mining and maintenance operations through novel procedural, operating, or equipment changes.
- Manual handling aids for operational and maintenance activities including elimination of human intervention through automated technologies.
- Innovative processes to assist in the management of operator fatigue. This applies equally to the coal preparation, underground and exploration areas.
- Improving equipment operator interfaces and collision avoidance, improved automation and remote control.
- Development of systems and equipment that leads to the reduction of noise at the source and operators noise exposure.

## INCREASE THE PRODUCTIVITY OF MINING SYSTEMS

A reduction in unit costs of production is a key driver for the industry. Some specific issues are:

- Implementation of semi-automation or automation of production systems.
- Enhancements to major mining equipment to enable decreased cycle times, increased utilisation or maximise pay load.
- Innovations in operating techniques.
- Lower cost ways of fragmenting ground for optimum diggability and bucket filling.
- Development of innovative methods to improve coal recovery.
- Improvements in mine planning optimisation and visualisation tools.
- Development of efficient mine site communication networks.

## IMPROVEMENT IN THE EFFICIENCY AND RELIABILITY OF EQUIPMENT AND SERVICES

The industry believes that working with OEMs is of significant value and would also welcome projects that are supported by, or integrate with, OEMs:

- The application of alternative materials to high maintenance areas.
- Reliability engineering, including whole of asset approaches.
- Condition monitoring and its effective and useful integration.
- Innovations that help mine operators improve tyre life.
- Advances that help relate duty to work done across a range of equipment to define maintenance needs.
- Improved methods for reducing catastrophic equipment failures.
- Technologies that improve energy efficiency across the mine.

## IMPROVED GEOLOGICAL DEFINITION AND GEOTECHNICAL ASSESSMENT OF COAL DEPOSITS

For economic assessment, it is essential that the industry has the best possible understanding and definition of the resources and reserves underpinning all mining operations:

- Detection and characterisation of hazards in the de-stressed and de-watered zones ahead of mining.
- Better resolution of geological features in the undisturbed zone from surface to 100m depth including the cost benefit analysis of geophysical and geotechnical techniques.
- Minimisation of geotechnical risk with a particular focus on deeper excavations and higher spoils; including the improved understanding, modelling and management of the representation of principal hazards.
- Investigation of material properties and implications on dump design and stability of alternative methods of tailings disposal in spoil.
- Improved assessment and evaluation of hydrogeology on mining including:
  - > Impacts on wall stability and degradation of material properties.
  - > Impact of mining on groundwater including aquifer interaction.
- Practical methods for increasing confidence in estimation and classification of resources and reserves.
- Research to improve regional understanding of Australia's coal basins.
- Improved processes for the derivation of additional value from downhole geophysical surveys, specifically in the areas of:
  - > Identification and evaluation of discontinuities.
  - > Improved rock mass characterisation.
  - > Derivation of credible coal quality estimates from geophysical logs.
  - > Establishment of 'best practice' work practices.
- Options for the standardisation and improved management of exploration data.
- Identify and ameliorate risks associated with working an open cut above old underground workings.

PROPOSALS IN THIS CATEGORY WILL BE CONSIDERED BY THE UNDERGROUND, OPEN CUT OR COAL PREPARATION COMMITTEES, AS APPROPRIATE.

## MANAGEMENT OF MINE SITE ENVIRONMENT AND COMMUNITY ISSUES

In pursuit of sustainable development, the industry is calling for research to enable it to continually improve its ability to manage environment and community issues. Research is needed to fill knowledge gaps in and identify future issues such that stakeholders have confidence in the industry's ability to manage and reduce its impacts.

The industry is seeking proposals relating to the coal mining industry's license to operate, water management and effective mine site closure and lease relinquishment. The industry is particularly keen to see research address the following aspects:

- Management of mining impacts on surface or groundwater and the local or regional ecosystems supported by these resources.
- Techniques to achieve more efficient use of water leading to reductions in usage and innovative reuse of mine impacted water.
- Improved methods for managing biodiversity in association with mining.
- Improved methods for the prediction and management of dust, overpressure, vibration, fumes and noise impacts.
- Improved management of cumulative community impacts and competing land uses.
- Sustainable coal washery management with a focus on reduced environmental footprints and economic uses.
- Sustainability of mine rehabilitation (including landform design, soil profile development and revegetation).

## THE COAL INDUSTRY FACES A RANGE OF HIGH LEVEL SUSTAINABLE DEVELOPMENT ISSUES WHICH, IN THE CONTEXT OF COAL PREPARATION RESEARCH, TRANSLATE TO:

- Occupational health, safety and environmental improvements.
- Energy and water efficiency and usage improvements.
- Optimal resource/reserve recovery.
- Maximise the opportunities of the coal industry to market conditions.

Occupational health and safety is paramount and all efforts must be made to ensure continued improvement. Rejects disposal and tailings dams are of particular interest, from both environmental and water loss perspectives, noting that proposals for final rehabilitation of tailings dams should be directed to the open cut committee. Proposals offering practical and commercially viable outcomes that can be implemented relatively quickly are especially encouraged. Topics of specific interest are listed below in four broad themes. Consideration will also be given to projects addressing the traditional areas of coal preparation improvement, such as efficiency optimisation, moisture reduction and cost reduction.

### GROWTH

- Plant design to maximise coal product value in use.
- Reduced capital costs and construction times for new plants/expansions.
- Simplified plant flow sheet circuits to improve performance and efficiency.
- Increased yield and tonnage throughput potential for existing plants; understand tipping points as feed rates are increased.
- Reduction of unit costs through economy of scale, improved throughput rates, increased availability and/or improved efficiency.
- Lower cost alternatives to flotation for fines circuits that do not rely on surface chemistry.
- Better correlations to obtain plant design parameters from bore cores, especially slim cores, to improve the envelope for design.
- Improved prediction of plant feed sizing from bore core breakage analysis.
- Improved dewatering capacity at low capital cost.
- Increased equipment availability - improve equipment that suffers the most maintenance downtime.
- Reduced fines in plant feed via improved mining methods and techniques, eg, minimised dozer activity.

### METALLURGICAL EFFICIENCY

- Improved fines size separation efficiency, identifying performance and process constraints.
- Improved circuit design; optimising cut-points to individual unit operations.

- Improved understanding of treatment of clays and their impact on process efficiency.
- Improved and comprehensive product accounting and reconciliation.
- Incorporation of real maintenance impacts on process efficiency determination.
- Improved product dewatering, including maximised solids capture and operating performance.
- New approaches to achieving process efficiency improvements and measuring capability.
- Options for feed pretreatment including clays.

### OPERATOR ASSIST

Appropriate plant design, simplification and automation will reduce the amount of operator time spent on non-value adding tasks, enabling the workforce to expend maximum time on activities beneficial to the process. Suggested topics include:

- More and better sensors for critical plant performance parameters.
- Remote monitoring and process control capability.
- Autonomous equipment.
- Better job/task design and equipment layout.
- Development of e-learning and computer-assisted learning tools.
- Forecast future skill sets and technology needs.
- Online conditioning monitoring.

### SUSTAINABILITY

- Improved health and safety in coal preparation operations.
- Improve energy efficiency.
- Reduce environmental impacts and reduce greenhouse gas footprint:
  - > Improved reject and tailings management.
  - > Alternatives to existing mechanical dewatering technology and tailings dams.
  - > Stabilising tailings dams with a high proportion of clay minerals.
  - > Reduce water consumption and increase water recycling.
  - > Effect of dissolved salt build up on plant, product quality and separation processes.
  - > Noise and dust minimisation.
  - > Recovery of coal values from plant rejects and tailing dams.

The technical market support committee will consider proposals addressing technical issues that significantly and demonstrably affect the “value-in-use” of Australian coals in current technologies, especially where the impact is acknowledged and confirmed by an industry advocate. This may include:

- Understanding the properties of Australian coals which impact on utilisation performance and market acceptance.
- Incorporation of innovative testing and measurement techniques into new projects.
- Understanding properties of coals from key competitor nations.
- Environmental and sustainable performance of coal, taking account of current and emerging legislative regimes.
- Characterisation of the special requirements of coals from the emerging coal basins.

Proposals should clearly articulate:

- Industry needs and benefits.
- Knowledge of the current state-of-the-art.
- Capability to make a meaningful contribution.
- Realistic timetable for completion.

The major markets for Australian coals are electricity generation and iron production, and it is anticipated that the majority of proposals will address these markets. Proposals addressing the use of coal in other industrial applications will also be considered where a significant benefit to coal producers can be demonstrated.

Proposals must be clearly distinguished from existing work elsewhere and must also show a major benefit to coal producers to be considered for ACARP funding.

## THERMAL COAL

Technical issues of interest include:

- Combustion and related performance of blends of Australian with International coals.
- Trace elements, in particular factors affecting deportment/speciation behaviour.
- Environmental performance in use, (eg impacts of the emerging mercury treaty; effects resulting from utilisation of harder, more reactive coals).
- Fine particulate emissions, especially  $PM_{2.5}$ .
- Dust control, eg from coal handling and transportation systems.

## METALLURGICAL COAL

ACARP is particularly interested in cokemaking processes as they impact on the value in use of Australian coals, with emphasis on the following:

- Emerging coking mechanisms in:
  - > conventional coke ovens, particularly as they relate to variable operating conditions.
  - > non-recovery/heat recovery coke ovens, particularly as they relate to coke quality relative to conventional coke ovens.
- Blend optimisation under different cokemaking regimes, eg via stamp charging and other density enhancement techniques.
- Effects of pelltisation or briquetting of fine coal to improve bulk density.
- Interactive effects in blends, particularly understanding the factors that influence coke strength.
- Understanding overseas work on alternative cokemaking processes, in particular the implications for the use of Australian coals.
- Impact of coal ash mineralogy on coke behaviour in the blast furnace.

Current direction of pulverised coal injection, eg blending HV:LV coals.

Other smelting processes, while representing smaller markets, are also of interest. Proposals addressing the impact of coal properties on “value-in-use” in these processes will also be considered.

FUGITIVE GASES ARE THE LARGEST SOURCE OF GREENHOUSE GAS EMISSIONS FROM COAL MINING OPERATIONS AND AS SUCH ARE THE PRIMARY FOCUS OF ACARP PRIORITIES IN THIS AREA. THE MITIGATION AND ACCURATE MEASUREMENT OF FUGITIVE MINE SITE GAS EMISSIONS HAVE BEEN IDENTIFIED AS THE AREAS OF GREATEST POTENTIAL IMPACT.

## UTILISATION OR DESTRUCTION OF MINE GAS

Dilute sources of seam gas such as mine ventilation air are a significant challenge. Projects aimed at combusting or utilising dilute gas, or increasing the methane concentration to usable levels, in a cost neutral manner without the need for a supplementary fuel are encouraged.

## MEASUREMENT OF FUGITIVE EMISSIONS

It is critical for coal producers to be able to accurately determine their emissions and to know where improvements need to be made. The industry needs to understand the extent by source of mine site emissions and the uncertainty associated with these measurements. Proposals are sought to:

- Improve the reliability, accuracy and cost effectiveness of measuring, monitoring and reporting greenhouse gas emissions.
- Reduce the uncertainty of fugitive emissions measurement.

## CAPTURE OF MINE GAS

ACARP is interested in projects addressing open cut or underground operations with the potential to:

- Reduce gas drainage costs.
- Maximise pre and post-mining gas recovery.
- Improve the quality and consistency of mine gas production.
- Assess and manage the impacts of gas capture.
- Commercial power generation technologies for high purity methane such as drainage gas are being increasingly adopted and are not seen as a high priority for further ACARP research.

## GENERAL NOTE

The committee will only consider proposals addressing greenhouse gas emissions resulting from the production of coal, not due to the utilisation of coal.

## GUIDELINES

All proposals must have a Proposal Summary Sheet attached.  
This is available from [www.acarpp.com.au](http://www.acarpp.com.au) or by emailing [anne@acarpp.com.au](mailto:anne@acarpp.com.au)

- Extraneous material such as company profiles, lists of publications etc will be detached and discarded.
- Proposals must be no longer than 5 pages (including the proposal summary sheet).
- Proposals are to be emailed to ACAPP at [anne@acarpp.com.au](mailto:anne@acarpp.com.au)
- A copy of "Guidelines on the Preparation of Full Proposals" will be provided if a proposal progresses to the full proposal stage

### In preparing a proposal the researcher should consider the justification for the project:

- How will the results benefit the Australian coal industry?
- Should funding other than by ACAPP be sought?
- Does the proposal address at least one of the priorities specified in this publication?

### The proposal should:

- Clearly define the objectives of the research.
- Describe the benefits to coal producers from the research.
- Outline how the research will be carried out.

## FORMAT FOR SHORT PROPOSALS

Short proposals are ranked primarily according to the importance of the problem to the industry and the credibility of the proposed approach. Short proposals enable the ACARP committees to quickly gain a broad appreciation of these features.

Short proposals should be no longer than 5 pages (including the proposal summary sheet), and must include:

### EXECUTIVE SUMMARY

State the objective, outline the approach to be taken and state the outcome expected from the project.

### PROJECT HISTORY

If the proposal is a direct or indirect follow on from a previous ACARP project, this should be noted, giving a concise summary of the previous project's outcomes (include ACARP project number, start/complete dates, and ACARP funding).

### CLEAR STATEMENT OF OBJECTIVES

It is essential that the project objectives identify the problem to be solved. The objective should not be a précis of the work program, but a simple statement of what is to be achieved, eg develop a prototype machine, develop a technique, understand a mechanism.

### EXPECTED OUTCOMES AND BENEFITS

ACARP recognises that every research project has an element of risk and not all projects will succeed. The risks and rewards in the project should be made clear. Proposals should indicate:

- The likelihood of success and how the work fits within the priorities.
- Estimate the size and nature of the benefits of success, in dollar terms if possible.
- The outcomes that can be expected at the end of the project should be clearly stated. For example, if a new device is to be developed, is this project proof of concept, or will it produce an industry scale prototype?

### BRIEF SUMMARY OF THE WORK PROGRAM

There is no need for a detailed work program at this stage. The methodology the researchers will use to achieve the objectives, along with a technical justification, should be outlined. Points to cover include:

- Demonstrate a commitment to complete in a timely manner.
- Test procedures and facilities to be used.
- Whether this is a laboratory, pilot scale, or field demonstration project.

- The critical problems and how they will be solved.

### SAFETY IMPLICATIONS, IF ANY

The safety aspects of the proposed research must be clearly outlined:

- Any potential safety hazards in carrying out the research.
- Note the impacts of successful research on industry safety, health, environment and community performance.

### LIST OF KEY PERSONNEL

The project leader should be noted. This person will liaise with ACARP and will be responsible for the preparation of all relevant reports as well as the technical direction and management of the project. **Do not include detailed CVs, references or publication lists.**

### BUDGET

A detailed budget is not required at this stage, but proposals should demonstrate sufficient resources to ensure success. The total amount required, the funds requested from ACARP and funds from other sources should be indicated. The budget should include:

- Number of man-days.
- Cost of man-days including overhead component.
- Consumables and equipment purchases.
- Travel to site and six monthly review meetings.

Proposals should be costed on a GST EXCLUSIVE basis. Projects submit invoices quarterly, for agreed progress payments plus any GST payable.

### SUPPORT

If individual coal producers are to meet part of the project cost, or provide host sites for testing or other in-kind support, it is the responsibility of the researcher to provide confirmatory letters of support from responsible company representatives. The project will not commence until ACARP is satisfied that this in-kind support will be realised.

### COMPLIANCE WITH 125% TAX CONCESSION SCHEME

ACARP gives strong preference to proposals which comply with the requirements of the 125% R&D tax concession scheme. It should be noted that eligibility rules may change with legislative changes proposed, and these proposed changes will need to be taken into account when ensuring proposals meet the eligibility criteria. Proposals that do not meet the current or proposed criteria will only be considered in exceptional circumstances. Details can be found at [www.ausindustry.gov.au](http://www.ausindustry.gov.au) R&D Tax Concession.