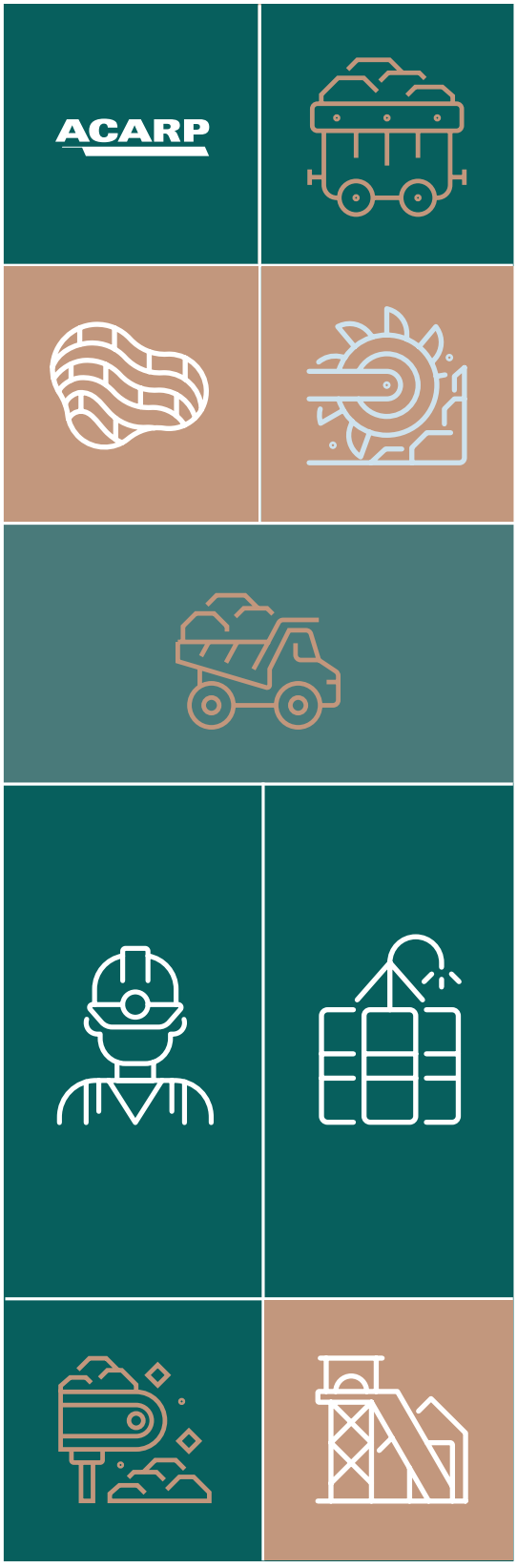
20 RESEARCH 25 PRIORITIES



ACARP helps the Australian coal industry to develop and adopt world leading mining practices and technology. The program is funded, owned and managed solely by Australia's black coal producers.

ACARP is a collaborative program that utilises the experience and technical strength of the coal mining industry and research institutions to solve technical problems and address issues significant to the industry. **ACARP is seeking research driving minimised emissions and environmental impact of industry**.

Safety, environment, emissions measurement, mitigation and management remain key drivers in the program and will continue to be the focus of much of the program of work and a significant component of the underground, open cut and coal preparation programs. Any proposed research project that is strongly supported by a mine site and is of interest to several coal operations is encouraged.

HOW TO APPLY FOR FUNDING

Proposals are sought annually; with short proposals of no more than six pages requested in the first instance. Short proposals should be prepared using the headings listed in the guidelines included in this document.

Short proposals are ranked according to the priority of the problem to the industry and the credibility of the proposed approach, enabling the committees to quickly gain a broad appreciation of these features.

Short proposals must include the **current proposal summary sheet**. The proposal summary sheet and further information can be obtained from www.acarp.com.au.

The closing date for receipt of short proposals is **Wednesday, 30 April 2025, emailed to anne@acarp.com.au**.

Receipt of proposals is acknowledged by return email. It is the researcher's responsibility to seek this confirmation if not received within a week of the closing date.

TIMELINE

If short proposals receive a favourable industry review, long proposals will be requested as per the following:

18 July - Applicants notified by email of success in moving to second stage – long proposal is requested.

20 August - Deadline for submission of long proposals.

Mid Dec - Applicants notified of funding outcome.

CONTACT

Phone 07 3225 3600
Email proposals to anne@acarp.com.au.

STRATEGIC DIRECTION

ACARP is seeking research driving minimised emissions and environmental impact of industry.

Proposals should have the scope to deliver significant benefit to industry in the following key priority areas.

Underground	Open Cut	Coal Preparation	Technical Market Support	Mine Site Greenhouse Gas Mitigation
• Minimise scope 1 and 2 emissions. • Management of seam gas in ventilation and optimising gas drainage systems. • Extending automation and roadway development technologies. • Improved understanding of geological conditions to be encountered prior to mining.	• Lowering / removing emissions generation activities. • Alternative land use post mining beyond the traditional vegetation replacement. • Water contamination, use and efficiency management. • Tailings management alternatives. • Improved collection and utilisation of data to generate understanding of geological conditions in mine planning.	• Optimal tailings management and closure practices. • Energy and water efficiency. • Remote and autonomous development technologies on stockpiles. • Asset utilisation, maintainability and reliability.	• Research using the pilot scale HELE testing facility with complementary techniques. • Metallurgical coke and PCI to support low carbon blast furnace ironmaking. • Coal to coke conversion and coke performance linked back to properties of coal. • Laboratory scale demonstration of potential new large scale products from coal and waste products.	• Innovative means for safe mitigation and accurate measurement of fugitive mine site gas emissions.

Complementary priorities have also been developed by ACARP's technical committees in line with this strategic direction and are separated into the areas of:

- Underground
- Open Cut
- Coal Preparation
- Technical Market Support
- Mine Site Greenhouse Gas Mitigation

Researchers are encouraged to consider how quickly they can deliver their research, and larger significant projects will be strongly considered.

ACARP's committees encourage researchers to proactively engage with them on the scope of prospective submissions and will provide guidance in shaping the proposals to effectively address the issues.

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

GUIDELINES

- All proposals must include the **2025 proposal summary sheet**. This is available from www.acarp.com.au.
- Proposals must be no longer than six pages (including the proposal summary sheet).
- The submission should be a **single unsecured PDF document**.
- Letters of commitment from other sources are not required at short proposal stage.
- Background materials such as company profile, publication lists, and detailed CVs should not be included.
- **Send proposals to anne@acarp.com.au**.

In preparing a proposal, consideration should be given to the justification for the project:

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

The proposal should clearly define the objectives of the research; describe the benefits to coal producers from the research, and outline how the research will be carried out.

FORMAT FOR SHORT PROPOSALS

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

Executive Summary

- State the objectives, outline the approach to be taken and state the expected outcomes.
- The Executive Summary should be the only item on page two of the submission and should be no longer than a single page.

Project History

If the proposal directly or indirectly follows on from a previous ACARP project, this should be noted, with a concise summary of the previous project's outcomes (include project number).

Clear Statement of Objectives

It is essential that the objectives identify the problem to be solved. The objectives should not be a précis of the work program, but a simple statement of what is to be achieved, e.g. 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 and should indicate:

- The likelihood of success and how the work fits within the priorities.
- Estimate the size and nature of the benefits of success.
- The outcomes that can be expected 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 used 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.
- Detail the critical problems and how they will be solved.
- Document methods of delivery for technology transfer e.g. workshops, papers etc.

Safety Implications, if Any

The safety aspects of the research must be clearly outlined:

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

GUIDELINES
CONTINUED

List of Key Personnel

- The project leader will be the primary point of contact with ACARP and will be responsible for the preparation of all relevant reports as well as the technical direction and management of the project.
- Other key personnel should be listed.
- **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 completion of the research. The total amount required, the funds requested from ACARP and funds from other sources should be indicated. The budget should include:

- Number of work days.
- Cost of work days including overhead component.
- Consumables and equipment purchases.
- Travel to site and six monthly review meetings.
- Costs related to site access (inductions etc).

Proposals should be costed on a GST EXCLUSIVE basis. Project invoices will be for agreed progress payments plus any GST payable.

Support

- If other organisations or individual coal producers plan 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 confirm this.
- **Letters of commitment or site access forms are not required at short proposal stage.**

UNDERGROUND

The Underground Committee is seeking research proposals to improve health and safety outcomes for mine workers, and to address the sustainability of underground mining operations. In particular, the industry is seeking proposals dedicated to addressing the following:

- **Minimise scope 1 and 2 emissions from underground mines.**
- **Management of seam gas in ventilation and optimising gas drainage systems.**
- **Extending automation and roadway development technologies.**
- **Improving understanding of geological conditions to be encountered prior to mining.**

Proposals that address the KEY strategic direction (see page 2) will be given priority.

Underground proposals are also sought in, but not limited to, the following complementary areas:

IMPROVED HEALTH AND SAFETY

- Preventing harm from spontaneous combustion, ignitions, mine fires, extreme heat, explosions, outbursts, coal bursts, respirable dust, silica dust, ventilation and strata failures.
- Improving understanding, detection, prediction, protection, selection and design of major hazard management systems.
- Improving automation, remote monitoring and control.
- Reducing airborne and noise contaminants: reviewing sampling practices, measure and control effectiveness and understanding risks associated with contaminants.
- Improving emergency response measures: adequacy and effectiveness.
- Improved psychosocial and mental health outcomes.

IMPROVED TECHNICAL ASSESSMENT OF COAL DEPOSITS

Exploration

- Improved processes for the derivation of additional value from downhole geophysical surveys.
- Geological features: Better resolution in the interval between surface and target seams with emphasis on near surface.

Resource Evaluation

- Development of coal deposits with specific focus on detection and management of hazardous ground conditions and applicable mining methods.

Strata Control and Hydrology

- Scanning detection methods for underground roadway monitoring, rock mass classification, ground movement and hazard detection.
- Prediction of strata anomalies and discontinuities (equipment automation, monitoring data acquisition).
- Gas and hydrogeology – Improved assessment and evaluation including:
  - Impacts of groundwater on stability and degradation of material and support system properties.
  - Impacts of mining on surface and groundwater including aquifer interaction and interaction with the mining horizon.
  - Impacts of dewatering and degassing on stress and strength resulting from gas drainage and/or production.
- Improved strata support installation safety, equipment and practices.
- Long term pillar stability for mine closure.
- Implications of increased stress and load on strata.

HIGHER PRODUCTIVITY MINING

- Roadway development: Improvements in advance rates and environment conditions leading to an integrated system comprising cutting, strata support, continuous haulage, logistics, and panel advancement.
- Mine logistics: Efficient design of people and material transport and handling systems.
- Remote control and automation: Application of advanced mining processes to increase productivity and reduce operator exposure to hazards.
- Designs of lower seam mining systems.

MINING SYSTEMS AND EQUIPMENT RELIABILITY

- Enhanced safety, output and energy efficiency, particularly targeting alternative power storage and delivery e.g. electric, through improvements in design, operability and maintainability.
- Materials and manufacturing techniques: Reduction in weight, improvement in corrosion protection, fatigue and wear life.
- Advancing the introduction of modern technology, particularly for electrical equipment in hazardous areas.

VENTILATION AND GAS MANAGEMENT

- Improved assessment and evaluation of seam gas reservoir characteristics and potential interaction with the mining horizon.
- Improved understanding and measurement of outburst risk prediction parameters.
- Innovative gas drainage practices: Improved efficiency and effectiveness. Measurement of underground gas drainage system performance. Design of post drainage systems to minimise spontaneous combustion risks.
- Design ventilation systems to minimise generation of VAM.

COAL BURST

- Identification of elevated coal burst risk domains.
- Establishing risk mitigation measures for development and longwall mining in areas that might pose a coal burst hazard.

OPEN CUT

These are the significant and urgent issues for open cut research:

- **Lowering / removing emissions generation activities.**
- **Alternative land use post mining that includes innovative business opportunities beyond the traditional vegetation replacement, especially if they promote overall GHG emissions reductions or transition from coal mining to land uses that support local communities.**
- **Water contamination, use and efficiency management.**
- **Tailings management alternatives.**
- **Improved collection and utilisation of data to generate understanding of geological conditions in mine planning.**

Proposals that address the KEY strategic direction (see page 2) will be given priority.

Open cut proposals are also sought in, but not limited to, the following complementary areas:

INITIATIVES TO IMPROVE THE VALUE TO MINING OPERATIONS

Mining Processes and Operational Efficiency

- Improved productivity of equipment, including trucks, excavators, draglines, and dozer push operations.
- Improved continuous mining technology, such as cutting technology for overburden and coal removal without requiring drill and blast.
- Improved equipment efficiency, reliability, and extended component life (eg, tyres and key machinery).
- Advanced methods for predicting and reducing catastrophic equipment failures and extending asset life.
- Development of selective mining techniques, including thin seam mining and steep-dip (20–90°) extraction.
- Enhanced application of automation and semi-automation to increase productivity, reduce maintenance requirements, and improve diagnostics.
- Development of strata recognition technology for production drill rigs.

Resource Recovery and Quality Improvement

- Improved collection and utilisation of data to generate understanding of geological conditions in mine planning:
  - Integration of geophysical and geotechnical data into mine planning models.
  - Predictive algorithms for interpreting geological structures in real time.
  - Machine learning to synthesise geological and production data.
  - Linking geological data with operational processes to maximise recovery and minimise waste.
- Alternative processes for the disposal and management of tailings and rejects.
- Investigation into precious metals extraction from mining, beneficiation processes, and tailings/reject streams.
- Processes for deriving additional value from downhole geophysical surveys through:
  - Automated intelligent interpretation.
  - Identification and evaluation of discontinuities.
  - Improved rock mass characterisation.
  - Credible coal quality estimates using non-destructive processes (e.g., geophysical logs, CT scans).
- Improved methods of fragmentation, coal recovery, and dilution rejection in-pit, supported by advanced sensing technology to detect coal seam quality variations.

Environmental Sustainability, Rehabilitation and Energy Efficiency

- Implementation of systems or processes that lower or remove emissions generation activities.
- Practical alternatives for post mining land use beyond traditional vegetation replacement.
- Improved techniques for efficient raw water usage, innovative reuse of mine impacted water, and management of treatment by-products such as brine.
- Cost effective strategies for mine rehabilitation, focusing on dumps, drainage, and long term stability of tailings facilities.
- Develop technologies to improve energy efficiency across operations (fuel, electricity, gas, battery capture).
- Reduce environmental pollutants from operational and maintenance activities.
- Advance hydrogeological assessments to better evaluate groundwater impacts from mining activities.

Data, Modelling, and Predictive Technologies

- Faster and more cost effective methods to improve understanding of mining conditions, including:
  - Reconciliation of structure, stratigraphy, and coal quality trends.
  - Insights into problematic overburden, groundwater, and spontaneous combustion risks.
- Practical approaches for increasing confidence in resource and reserve estimation and classification.
- Methods to automate spoil classification in real time to create as-dumped strength models for integration with autonomy and slope stability modelling.

ENHANCE CONTROL EFFECTIVENESS TO ENSURE PERSONNEL SAFETY

Human Health, Operator Interfaces, and Hazard Prevention

- Develop evidence based insights into the impacts of coal mining activities on human health, including mental health, drug and alcohol use, return-to-work processes, and fatigue management.
- Improve operator interfaces to support remote control operations, enhance interoperability of technical systems on mobile equipment, and reduce clutter in operator cabins.
- Enhance methods for protecting and removing personnel from hazardous situations.
- Improve maintenance operations through enhanced manual handling aids and the development of automated technologies.

Human Cognition and Behaviour

- Develop cognitive recognition methods to address the subconscious normalisation of environmental changes that can lead to adverse outcomes.
- Improve communication strategies to ensure better retention of safety information by employees and contractors.

Geotechnical and Slope Stability

- Innovative methods for acquiring, capturing, and modelling data to enable integration into autonomous mining systems and geological modelling, including cost effective real time monitoring of pit slopes.
- Improve methods for geotechnical mapping, deformation monitoring, and rock mass classification (including derived strength models).
- Minimise geotechnical risk and uncertainty, particularly for deeper excavations, strata failure causes, interactions with previous underground workings, and higher spoil dumps.
- Develop systems to monitor slope deformation in real time across entire sites, including highwall and lowwall slopes and critical infrastructure. Ensure these systems identify underlying mechanisms of instability and provide real time feedback into stability calculations.
- Enhance understanding of hydrogeological impacts on slope stability, focusing on material degradation in pits used as water storages and broader aquifer interactions.

ENVIRONMENT AND COMMUNITY

Australia's coal producers are calling for research to further enhance the industry's ability to manage environmental and community issues. Research is needed to fill knowledge gaps and identify future issues to give stakeholders confidence in the industry's ability to manage and reduce its impacts.

Proposals are being sought relating to the coal mining industry's license to operate, water management and effective mine site closure and lease/property relinquishment.

Proposals that address the KEY strategic direction (see page 2) will be given priority.

Environment and community proposals are sought in, but not limited to, the following areas:

WATER

- Improved management of the potential impacts of mining on surface waters, groundwater and the local and/or regional ecosystems supported by these resources.
- Improved techniques to achieve efficient use of raw water, innovative re-use of mine impacted water and effective management of treatment by-products including brine.

NOISE AND AIR

- Improved methods for the prediction and management of the impact of dust, overpressure, vibration, fumes and noise on the environment and community health, and that are conducive to informing the development of local and regional air quality criteria.

REHABILITATION AND CLOSURE

- Improved understanding and management of land use conflicts across the mining life cycle, including the early identification of strategies that benefit multiple stakeholders and encourage consensus among competing interests.
- Sustainable coal washery by-product management with a focus on beneficial use.
- Sustainability of mine rehabilitation including landform design and evolution, subsidence, performance assessment, biodiversity enhancement, re-establishment of agricultural land uses, landscape function and alternative post mining land uses.
- Revegetation including species selection and improved methods for the introduction of recalcitrant and/or high interest native species in mine rehabilitation.
- Optimising rehabilitation planning and management of problematic overburden such as dispersive, saline and sodic materials.
- Innovative ways of assessing and determining biodiversity offset value.
- Investigation of effective mine closure including:
  - Tenure and property relinquishment and the improvement of policy frameworks and options for relinquishment.
  - Sustainable land use and the integration of post mining land use with neighbouring/regional land use.
  - Final voids and the stability of highwall/lowwalls in perpetuity.
  - Potential long term impacts of post mining surface water and groundwater.
  - The management of residual risk.

Proposals in this category will be considered by the Underground, Open Cut or Coal Preparation committees, as appropriate.

COAL PREPARATION

The industry faces a range of existing and emerging challenges. These challenges translate to opportunities in coal preparation research, the broad areas of focus being:

- **Optimal tailings management and closure practices.**
- **Energy and water efficiency.**
- **Remote and autonomous development technologies on stockpiles.**
- **Asset utilisation, maintainability and reliability.**

Proposals that address the KEY strategic direction (see page 2) will be given priority.

Proposals offering practical and commercially viable outcomes that can be implemented relatively quickly are especially encouraged. Consideration will also be given to projects addressing the traditional areas of coal preparation improvement, such as efficiency optimisation, moisture and cost reduction.

Coal preparation proposals are also sought in, but not limited to, the following complementary areas:

BENEFICIATION

Proposals are sought to deliver safer, lower cost, higher efficiency, or higher throughput from existing operations. This includes step change technologies that could materially change the plant and/or markets for future coal utilisation, or utilisation of waste streams.

- Enhancing performance of existing technologies related to dry tailings disposal.
- Enhancing mechanical and electrical systems to support energy reduction (e.g. pumping and conveying).
- Improved OEM equipment designs that support maintenance practices reducing risk to maintenance personnel and prevent downtime.
- Improved prediction of total cost of ownership, including better definition of the drivers behind different maintenance strategies for the development of new, and management of existing infrastructure (e.g. to ensure structural integrity).
- Developing leading practice operations and maintenance handbooks focussing on energy and water efficiency and dry tailings disposal.
- Encourage industry uptake and commercialisation of high definition analysis techniques as alternatives to heavy liquids.
- Improved start-up/shutdown sequences to minimise downtime.
- Development of data analytical tools including AI, machine learning, digital twins etc.
- Automation of dozers on stockpiles.
- Development of high capacity dry processing techniques that are less sensitive to feed size and investigate placing processing plant closer to pits, for example to enable product only being transported from pit.
- Improving the mechanical dewatering and handling of fine product and reject streams.

SUSTAINABILITY

It is imperative to continue to improve health, safety and community outcomes and reduce the environmental impacts of the coal preparation plant process. This may include:

- Developing tailings disposal processes to reduce cost, improve environmental outcomes and support effective closure outcomes.
- Developing secondary dewatering techniques at the point of deposition.
- Reducing noise and dust generation at each part of the coal chain from the point of extraction through to the port.
- Maximising water recovery and recycling.
- Developing improved tailings reprocessing methodologies.
- Processing coal without the production of wet tailings.
- Utilisation, recycling or repurposing of waste streams from the beneficiation process.

TECHNICAL MARKET SUPPORT

Technical Market Support research priorities have been set recognising the importance of ensuring the long term viability of Australian metallurgical and thermal coals in a carbon-constrained world.

Through funding of research, the industry seeks to support development of a talented and diverse pool of researchers.

Proposals that address the KEY strategic direction (see page 2) will be given priority.

Technical Market Support proposals are sought in, but not limited to, the following areas:

- Research projects leveraging the pilot scale HELE testing facility, together with complementary techniques focused on:
  - Managing fouling.
  - Reducing fine particulate emissions particularly associated with co firing of biomass.
  - Coal quality requirements for co firing hydrogen and ammonia and for oxygen enrichment.
- Development of metallurgical coke and PCI to support low-carbon blast furnace ironmaking through understanding:
  - The impact on coking coal quality requirements and steelmaking emissions through step change additions of coal blend additives such as biomass and waste materials.
  - Impact of alternative reductant co-injection on BF performance and metallurgical coke quality.
- Integrated understanding of coal to coke conversion and coke performance linked back to:
  - Properties of coal which support technical marketing of Australian coking coals.
  - Interactions of coal types occurring during coal blending.
  - Impacts of coal-bed densification techniques.
- Laboratory scale demonstration of potential new large scale products from coal and waste products.

MINE SITE GREENHOUSE GAS MITIGATION

Fugitive gases are the largest source of greenhouse gas emissions from coal mining operations and as such are a primary focus of the Mine Site Greenhouse Gas Mitigation Committee.

The industry seeks innovative means for safe mitigation and accurate measurement of fugitive mine site gas emissions.

Mine Site Greenhouse Gas Mitigation proposals are sought in, but not limited to, the following areas:

MEASUREMENT OF EMISSIONS

The industry is interested in innovative fugitive emissions measurement methods with potential to supplement/ complement established approaches, with a particular focus on open cut mining.

CAPTURE OF MINE GAS

ACARP is interested in proposals with potential to reduce gas drainage costs, maximise gas recovery and improve the quality and consistency of mine gas production. In particular, the Mine Site Greenhouse Gas Mitigation Committee welcomes projects examining the integration of gas drainage with open cut mining operations, including the implications for mine design, economics and environmental approvals.

UTILISATION OR DESTRUCTION OF MINE GAS

Dilute sources of seam gas such as mine ventilation air are a significant challenge. Proposals aimed at combusting or utilising dilute gas (0.5% or less methane) or increasing the methane concentration to usable levels, in a safe and cost-effective manner without the need for a supplementary fuel, are encouraged.

Before submitting a proposal in this area, it should be noted that:

- **Demonstration and large scale test work is beyond the financial capability of ACARP.**
- **The committee will only consider proposals addressing greenhouse gas emissions resulting from the production of coal, not due to the utilisation of coal.**
- **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.**