

ACARP AND SAFETY

Ray Smith
Commercial Manager
Australian Coal Research Limited

INTRODUCTION

Just in case there are people who still do not know, ACARP is the Australian Coal Association Research Program.

In December, 1992 the Australian Coal Association took over the program of coal related research from the Federal Government, which had been run under the National Energy Research Development and Demonstration Program (NERDDP). Under this scheme approximately A\$167 million dollars was spent from 1978 to 1992, with expenditure largely funded from a levy of 5c/tonne on black coal production. The Australian Coal Association now fully directs the research program, called ACARP and since June 1993 has taken over voluntary collection of the coal research levy.

I am pleased to say that ACARP's charter has recently been extended for another two year period and will now run until at least the year 2000. This good news is a significant vote of confidence in the program from Australian coal producers

ACARP FUNDING 1992-1996

So far under ACARP, approximately A\$41 million dollars of levy funds have been committed to research projects with a total value of about A\$90

million. The additional funds come from ACARP cooperation with other funders of research such as the BHP Special Research Program, the NSW State Energy Research Fund, manufacturers of mining equipment and individual coal mining companies which support specific projects over and above their research levy contribution. The levy of 5c/tonne on black coal production, is currently generating about A\$ 9.6 million per year.

As you can see from this overhead, ACARP has committed funding to 294 projects so far. Of these about 95 have concluded, 170 are in various stages of completion and the rest are under contract negotiation prior to starting. We are in the process of selecting the next round of projects to which a further \$8.5 million is expected to be committed in December.

- Projects to date 294
- ACARP funds committed \$41m
- Total project value \$90m
- 97/98 funds commitment \$8.5m

ACARP ANALYSIS

About two thirds of ACARP's research effort is on mining related activities reflecting the fact that funds are drawn from coal producers which have to remain world competitive in selling price and at the same time cope with increasing production difficulties in terms of deepening pits and increasing safety environmental pressures.

ACARP 1992-96

CATEGORY	No of PROJECTS	ACARP \$ million	OTHER \$ million	TOTAL \$ million	LEVERAGE
Underground	139	15.6	21.5	37.1	2.4X
Open Cut	60	10.7	8.0	18.7	1.75X
Coal Preparation	54	8.5	8.3	16.8	1.98X
Coal Utilisation	41	6.5	11.4	17.9	2.75X
TOTAL	294	41.3	49.2	90.5	2.2X

This table also demonstrates that a useful degree of leveraging continues to be achieved on project funding. In the last round, ACARP's \$9.4 million allowed entry into nearly \$20 million worth of research projects.

ACARP OHS EXPENDITURE ANALYSIS 1992-1996

As you can see from the following overheads, safety has been a very important part of the

research funded by ACARP. In the Underground area alone over \$30m of the research projects funded by ACARP have had a safety focus.

Interestingly enough, one of the biggest criticisms levelled against ACARP is that it does very little on safety. This is a very odd remark given the numbers I have just shown you and seems to arise because many people do not consider work for example, on strata control as being 'Safety Research'. Even less would they consider that the major effort which ACARP has put into in-seam drilling was for safety, in spite of the fact that the

main method of controlling underground gas emissions is through in-seam drilling.

No one here needs to be told that the main risks of being killed in an underground coal mine relate to gas in one way or another, or the need to prevent bits of mother nature falling on people.

Nevertheless I can guarantee that there are people in this audience who when given the opportunity will say that the ACARP projects in Strata Control and In-seam drilling are for production purposes, not 'Safety'. What the industry people who select our projects say is that it is not possible to separate the two.

UNDERGROUND CATEGORY

Major Incident Safety

		ACARP	OTHER	TOTAL
21 Proj	(i) Strata control	2,292,068	3,072,941	5,365,009
17 Proj	(ii) In-seam drilling	1,968,820	3,419,200	5,388,020
13 Proj	(iii) Detection and prevention of fires and explosions	1,918,879	1,297,164	3,216,043
13 Proj	(iv) Gas monitoring, drainage and control	1,096,609	2,383,668	3,480,277
10 Proj	(v) Outbursting	968,971	1,104,600	2,073,571
3 Proj	(vi) Escape and rescue	700,000	120,000	820,000
77		8,945,347	11,397,573	20,342,920

Strata Control

As you can see from the table the biggest area of effort has been in strata control. There is no doubt that the reason for this strong ACARP support is because strata control is not only a safety issue but a key production issue as well. The safety aspects are well demonstrated of course by the Joint Coal Board funded project at the University of NSW on improving pillar design. This work can clearly be shown to have saved lives and reduced serious injuries. As a side comment ACARP is funding the UNSW group to extend this work into understanding the support capacity of irregularly shaped pillars and into soft strata environments and also to improve the design and performance of timber chocks.

ACARP has put considerable effort into trying to understand and implement pretensioning of roof bolts because of the promising results of early work in this area. Seminal work by ACIRL and Ripu Lama has been followed up by Barrett Fuller and Partners in their work on the Flexibolt and by Strata Engineering. Results to date are very encouraging.

The UNSW is also looking, in conjunction with ANI Arnall, at the effect of pretensioning as a means of improving rib support.

For the purist however, to qualify as 'Safety Research' a project has to have the word 'Safety' in its title and probably has to have something to do with Mines Rescue. Nevertheless, our committee members who select the projects have no doubt as to why the projects are being carried out and it as safety projects that we are presenting them today.

The following is a summary of work done in the various categories.

Another consistent strand within ACARP funded work has been to improve monitoring techniques and instruments for strata control since this is a key to early warning of impending trouble. Work with the CSIRO, Strata Control Technologies and Mincad has been very successful in this regard. The safety benefits of some of this work have recently been well demonstrated by Pacific Power in the successful management of their windblast problem. Early warning was the key to removing personnel from danger before windblast events.

You will hear shortly about the recent ACARP funded exchange of data with South Africa. They have some very graphic examples of the danger to life and limb posed by major strata collapses and their experience is a clear reminder of why ACARP supports efforts by every significant strata control group in the country to improve the theory and practice of strata control.

Included in the General OH&S category is the significant effort under ACARP into improving roof bolters. I am sure that I do not need to remind you that roof and rib bolting is one of the most likely activities in underground coal mining to produce a serious injury and that a reduction in injuries can be achieved through improved equipment design. These projects are sometimes

challenged as being for production, not safety. You can make your own judgement.

In-seam drilling

The main technological developments in in-seam drilling since the commencement of ACARP have been made by mine operators and contractors, with assistance from suppliers, to solve current problems in the short term. ACARP funded research has resulted in prototypes which have either been completed or will be completed over the next two years and which will take in-seam drilling technology in to the next generation. This is a very well thought out and coordinated program aimed to lift in-seam drilling to a new level.

Those who doubt the safety classification of these projects should consider whether any South Coast mine unable to demonstrate adequate gas drainage through a well conducted in-seam drilling program, is likely to be allowed by the inspectorate to remain open. They may also do well to visit Dartbrook to see how that pit is coping with its high CO₂ and a number of Central Queensland mines now starting to cope with H₂S.

Unfortunately there is not time to tell you the details of what is being developed but only to say that we expect to have the capacity shortly, to drill holes more rapidly with an accuracy that will guarantee safe drainage and to have the means of gathering information both during and after the drilling which will accurately locate and define any structures which have dangerous outburst potential.

Gas monitoring, drainage and control and Outbursting.

Although these are categorised separately of course they are all of a piece with in-seam drilling as part of improving the industry's ability to safely control gas emissions of whatever type. Two projects in the Outbursting category for example, could just as easily be put into in-seam drilling. One is a project to pressurise boreholes. This device if successful will allow a wider range of geophysical tools to be employed for detecting outburst structures. This class of tools requires a fluid filled hole to be effective. Another is a project to develop a new geophysical tool for the detection of outburst structures in boreholes.

As with strata control, a key area is improved monitoring for early warning of dangerous gas build up or changes in the make up of gases being emitted which could signal danger. Many facets of monitoring are being investigated. We are attempting to improve real time monitoring in working areas, during drilling, in goafs and in return areas. A prototype of a new meter for measuring gas make from drainage holes has been developed and is awaiting testing. And in response

to the Moura Inquiry two different prototype valves for shutting off drainage gas in the event of an explosion have been developed and are also awaiting trial. We have high hopes that these will help prevent the secondary explosions which are the most damaging events after an initial incident.

As with Strata Control the projects actually listed in these categories do not tell the full story of ACARP's efforts. For example we completed a project with KCC which successfully developed and demonstrated equipment for remotely controlled mining under outburst conditions. Much of this work was novel and will undoubtedly have application in a number of safety situations in the future. However in spite of the fact that there was no other reason than safety for the project being undertaken, it is still classed as a 'production' project.

Detection and prevention of fires and explosions

There are four main strands to ACARP work in this area.

The first is electrical safety where we have five projects looking at ways of preventing dangerous ignitions particularly from high voltage electrical equipment underground.

The second is on improving the design and efficiency of dust and water explosion barriers. This work is likely to be added to in this round by the addition of work to improve seals and stoppings. In this regard one of the highlights of the recent ACARP funded exchange of data with South Africa was the revelation of a new and apparently highly effective stone dust barrier, recently developed there.

The third and probably most costly in dollar terms was support for the recent inertisation trials using the GAG jet engine and the Tomlinson Boiler. Feedback to date, has indicated that both these trials were very successful, although to some degree I guess the data from the trials still has to be digested.

The fourth is the understanding and control of spontaneous combustion, which clearly is still a major issue with the industry. From ACARP's point of view it is not only a danger to underground mining but also an environmental problem for open cut mining and a possible hazard in transport and handling. The projects in these other areas reinforce the work done for underground miners. For example, an ACARP project which is attempting to control spontaneous combustion in an open cut spoil pile by the injection of a fly ash slurry, could well be applicable to creating a grout curtain in an underground situation.

Another fifth area where we have one project only, is to develop an improved method of testing and

classifying the flammability of conveyor belting, since underground belt fires are becoming an increasing concern. Related to this, but not categorised as a Safety project, is a device developed under ACARP by Vipac and in the process of being commercialised by them, to rapidly detect, faulty idler bearing rollers prior to failure. The failure of these rollers is a major cause of belt fires.

Escape and rescue

ACARP has not made a major effort in escape and rescue to date. I think there are two reasons for this.

The first is that individual mines see this as a local issue and that statutory responsibilities require them to have specific plans in place for dealing with incidents. This is presumably why in spite of the very high cost involved, that a number of mines have gone ahead with the purchase of oxygen self rescuing equipment with minimal industry wide research to guide their decision on equipment selection. Clearly they felt that the matter was so urgent that it could not wait for the research, which ACARP has underway, to be finalised. The South African experience with oxygen self rescuers, revealed on the recent trip, has been very enlightening in this regard. Not only is it clear that some equipment is better than others, it is also clear that introduction of oxygen self rescuers needs to be in conjunction with a system of monitoring the devices to ensure that they are always in satisfactory working order.

The second reason for there being little ACARP work on Escape and Rescue is probably because of the ambiguous situation the rescue service is currently in. If it is never to be allowed to go underground in situations of danger, then research into better equipment is not a high priority.

ACARP inherited the Numbat from NERDDP and has continued work to both improve its capability and to use it as a test bed for a possible Mine Rescue Vehicle. A decision will be made in this current round on the scope of further work that should be done on the MRV. This is likely to be a very costly exercise however and it is unlikely that ACARP would have the resources to fund more than a fraction of its development.

For completeness I have added in my text, an analysis's of work done under ACARP in Open

Cut and in OH&S General Categories, but since this work is related to general health rather than safety I will not review it today.

CONCLUSION

I have no doubt that the work ACARP is doing, is substantially increasing the safety standards of the coal industry. The great strength of ACARP is that projects are selected by operators to help solve their most pressing problems and they are designed to both practical and innovative. Furthermore they are monitored closely by industry representatives to ensure that goals are being met. In theory projects are also supposed to keep to schedule, but because they are often on the cutting edge, solutions can take longer to find that was originally expected. In addition just finding a solution to a problem is not usually enough, getting it taken up by the industry is often slow since there are many barriers.

It can be difficult to introduce something new to a mine since it often causes disruption at first. People have to be retrained. New safety and maintenance procedures must be learned. Getting equipment certified as IS can be very slow and can add years to the introduction schedule. The Inspectorate is often very reluctant to approve anything new. Unions can be suspicious of new equipment, fearing for example that it will lead to loss of jobs. All this works against the products of a research program being taken up quickly.

In spite of this, many good ideas from ACARP have already been taken up and particularly in the areas of strata control, in-seam drilling and gas drainage, monitoring and control, ACARP projects are working to make the industry safer. Unfortunately because we do not actually do the research there is no product or service actually labelled as 'MADE BY ACARP' or 'SUPPLIED BY ACARP', so there is often no awareness of how ACARP helped a good idea or product to develop. We are optimistic however, that when the considerable number of monitoring products, drilling improvements and logging tools under development start to enter the industry in the next couple of years, that this will change.

In the meantime we rely on an informed industry's good will.

UNDERGROUND CATEGORY**Major Incident Safety****(i) Gas monitoring, drainage and control**

		ACARP	OTHER	TOTAL
3029	Improved technology for maintaining hole integrity during gas drainage	25,000	25,000	50,000
3030	Real time monitoring of gas emissions	150,000	197,000	347,000
3034	Development of a general purpose hydrogen monitor	80,000	0	80,000
3076	Real time return gas monitoring for outburst and gas drainage assessment	91,163	171,164	262,327
3077	Gas detection technique to continuously monitor gas in drill fluid	45,000	15,000	60,000
4033	Stimulation of gas make from horiz in-seam drain holes by hydraulic fracturing	122,535	130,096	252,631
4040	Development of a hydrogen monitor for use in coal mines	139,253	220,000	359,253
5030	Development of a gas flow drainage meter	99,000	0	99,000
5036	Hydrofracture modelling to assess potential improvements to mine gas drainage	24,408	24,408	48,816
6020	Mine gas control	25,000	975,000	1,000,000
6021	Automatic shut-down valve for UG gas drainage lines (under vacuum)	40,000	15,000	55,000
6022	Automatic shut-down valve for UG gas drainage lines (positive pressure)	93,250	20,000	113,250
6031	Maximising coal production in the presence of H ₂ S seam gas	162,000	591,000	753,000
13 Proj	TOTAL	1,096,609	2,383,668	3,480,277

(ii) In-seam drilling

		ACARP	OTHER	TOTAL
3070	In-seam drilling and bit location system	235,000	200,000	435,000
3071	Calliper probe for logging in-seam bore holes	41,680	28,000	69,680
3072	Borehole pressurisation system	135,290	40,000	175,290
3073	Bit, torque, load and RPM sensors	59,620	20,000	79,620
3074	Standards for in-seam drilling equipment	11,130	0	11,130
3075	In-seam drilling project coordinator	40,000	0	40,000
4035	Co-ordination of in-seam drilling research	44,000	0	44,000
4036	In-seam drill monitoring and bit location system stage 2	250,000	230,000	480,000
4037	Sensing and logging for in-seam boreholes	210,000	1,337,000	1,547,000
4038	Electronics for bit torque, load and rpm sensors (bitor electronics)	20,000	0	20,000
4039	Testing of drill rod joints for long hole drilling	90,000	20,000	110,000
5027	Co-ordination of in-seam drilling research	44,000	0	44,000
5028	Water jet assisted drilling	195,000	950,500	1,145,500
5029	Development of a new borehole survey tool	234,100	54,700	288,800
6027	Co-ordination of in-seam drilling research	44,000	0	44,000
6028	Longhole water jet assisted drilling	240,000	484,000	724,000
6029	Development of an intrinsically safe drill monitoring system Stage 3	75,000	55,000	130,000
17 Proj	TOTAL	1,968,820	3,419,200	5,388,020

(iii) **Outbursting**

		ACARP	OTHER	TOTAL
3035	Improved remote control and monitoring of outburst mining equipment	170,000	248,000	418,000
3079	Workshop on management and control of outbursts in underground coal mines	25,000	20,000	45,000
4034	Outbursting scoping study	50,000	0	50,000
5034	Development of a borehole pressurisation tool for outburst assessment	156,850	53,150	210,000
5035	Prediction of outbursts using the occurrence of radon gas	79,500	78,000	157,500
5037	Degassing of methane and carbon dioxide	116,371	165,000	281,371
6023	Intercomparison of 'quick crush' techniques used to measure gas content of coal	76,250	41,200	117,450
6024	Modelling of outburst mechanisms	100,000	266,000	366,000
6025	Detection of gas emission events precursive to outbursting using seismic	65,000	123,250	188,250
6026	Bore hole dielectric probe to detect mylonite zones and other structures	130,000	110,000	240,000
10 Proj	TOTAL	968,971	1,104,600	2,073,571

(iv) **Detection and prevention of fires and explosions.**

		ACARP	OTHER	TOTAL
3022	Reduction in earth fault currents by improved earthing reactor use	54,000	0	54,000
3083	High voltage cable test apparatus	35,000	0	35,000
4030	Design and efficiency of dust and water explosion barriers in modern Australian mines	65,410	0	65,410
4031	Research into the failure of 11kv plugs and adaptors used in underground coal mines	164,000	233,000	397,000
4032	Study of safety aspects of sheet metal IP55 enclosures in high fault level mines	118,000	18,000	136,000
5031	Development of better indicators for spontaneous combustion	166,747	143,920	310,667
5032	Further research into failure of 11KV plugs and adaptors in underground coal mines	75,000	0	75,000
5033	Improved flammability test methods for conveyor belting material	214,150	111,000	325,150
5430	Design and efficiency of dust and water explosion barriers in modern Australian mines	22,535	0	22,535
6001	Improved prediction of spontaneous combustion	172,000	176,144	348,144
6002	Demonstration of sealing and monitoring during low flow goaf inertisation	238,000	100,000	338,000
6018	Design and efficiency of dust and water explosion barriers Stage 2	161,525	0	161,525
6019	Demonstration & evaluation of jet engine inertisation techniques	432,512	515,100	947,612
13 Proj	TOTAL	1,918,879	1,297,164	3,216,043

(v) Strata control

		ACARP	OTHER	TOTAL
3025	Field trials flexible roof bolt project	120,000	0	120,000
3027	Improving reinforcement design	120,000	0	120,000
3032	Improved roof stability through pre-tensioned roofbolting	100,000	0	100,000
3059	Rib mechanics and support systems	70,000	70,000	140,000
3067	Roof and goaf monitoring for strata control in longwall mining	120,500	427,500	548,000
3068	Cost effectiveness of various timber chock constructions for longwall tailgate support	25,000	10,462	35,462
3069	Determination of stress relaxation axes in drill core using laser micrometry	90,000	306,000	396,000
3104	Rib bolting commissioned study	17,400	0	17,400
3105	Underground thick seam rib support	0	60,000	60,000
4024	Testing of roadway roof integrity	90,000	60,000	150,000
4025	Prestressing of strands to improve cable support performance	195,000	0	195,000
4026	Engineered mine design in soft strata environments	292,888	585,091	877,979
4027	Detection of incompetent mine roof (Stage 2)	50,000	18,000	68,000
5021	Post grouting technology to reduce bolting cycle times	163,500	200,000	363,500
5022	Early prediction of catastrophic roof failure	90,000	20,000	110,000
5023	Improved reinforcement techniques for weak roof	165,000	205,000	370,000
5024	Measuring the strength of irregular shaped and rectangular pillars	21,700	17,768	39,468
5025	Improved monitoring system for better roof management	125,000	120,000	245,000
6030	The dynamics of windblasts in UG coal mines	165,000	153,000	318,000
6033	Improving the up-time efficiency of roadway development units by reduced primary bolting densities and routine secondary support	200,000	800,000	1,000,000
6034	Improving safety and performance of chock construction	71,080	20,120	91,200
20 Proj	TOTAL	2,292,068	3,072,941	5,365,009

(vi) Escape and rescue

		ACARP	OTHER	TOTAL
3078	Numbat upgrade approval and demonstration	60,000	110,000	170,000
5039	New self contained self rescuer	110,000	10,000	120,000
5378	Numbat upgrade approval and demonstration	530,000	0	530,000
3 Proj	TOTAL	700,000	120,000	820,000

OH&S GENERAL

		ACARP	OTHER	TOTAL
3 Proj	(i) Improved systems for capturing incidence and causality data particularly in relation to permanent disablement	62,773	47,140	109,913
3 Proj	(ii) Dust control	165,500	650,750	816,250
5 Proj	(iii) Reduced musculo-skeletal injuries	597,350	0	597,350
1 Proj	(iv) Reduced noise induced hearing loss	87,650	45,350	133,000
1 Proj	(v) Reduced injuries due to vibration and jarring	77,820	43,350	121,170
2 Proj	(vii) General	80,000	0	80,000
15		1,071,093	786,590	1,857,683

OH&S General**(i) Improved systems for capturing incidence and causality data particularly in relation to permanent disablement**

		ACARP	OTHER	TOTAL
3046	OH&S commissioned study	27,773	47,140	74913
4044	OH&S commissioned study	15,000	0	15,000
6032	Improved incident reporting and analysis	20,000	0	20,000
3 Proj	TOTAL	62,773	47,140	109,913

(ii) Dust control

		ACARP	OTHER	TOTAL
3082	Reduction of dust in return roadways of longwall faces	42,500	231,500	274,000
4041	Electrostatic enhancement of water sprays for dust suppression	88,000	177,250	265,250
5019	Improved longwall dust suppression	35,000	242,000	277,000
3 Proj	TOTAL	165,500	650,750	816,250

(iii) Reduced musculo-skeletal injuries

		ACARP	OTHER	TOTAL
3031	On-board rib bolting	100,000	0	100,000
3038	Development of a compact semi-automatic roof bolter	208,000	0	208,000
3060	Extension of compact autobolter project	175,000	0	175,000
3066	Application of light alloys and alternate materials in underground coal mines	104,350	0	104,350
5366	Application, risk and benefits of using aluminium in UG coal mines	10,000	0	10,000
5 Proj	TOTAL	597,350	0	597,350

(iv) Reduced noise induced hearing loss

		ACARP	OTHER	TOTAL
4043	Adapting active noise control headsets for the coal mining industry	87,650	45,350	133,000
1 Proj	TOTAL	87,650	45,350	133,000

(v) Reduced injuries due to vibration and jarring

		ACARP	OTHER	TOTAL
5040	Development of test procedure for assessing whole body vibration	77,820	43,350	121,170
1 Proj	TOTAL	77,820	43,350	121,170

(vi) Reduced exposure to diesel exhaust

		ACARP	OTHER	TOTAL
3033	Improved diesel engine performance with lower emissions	317,000	174,000	491,000
3080	Evaluation and control of employee exposure to diesel exhaust emissions	223,000	0	223,000
3081	Effects of diesel fuel quality on exhaust emissions of U/G mining engines	87,000	0	87,000
3 Proj	TOTAL	627,000	174,000	801,000

(vii) General

		ACARP	OTHER	TOTAL
5038	Development of a standard underground approval system	30,000	0	30,000
6058	Exchange of OHS data with South Africa	50,000	0	50,000
2 Proj	TOTAL	80,000	0	80,000

OPEN CUT CATEGORY**(i) Open Cut Vehicle and Equipment**

Projects		ACARP	OTHER	TOTAL
4013	Intelligent dumper and hauler suspension systems	125,000	20,000	145,000
5041	Reflective material for improving night time driving on haul roads	66,000	45,000	111,000
5413	Intelligent dumper and hauler suspension system	29,500	0	29,500
6007	Intelligent dumper and hauler suspension systems (Stage 3)	140,000	77,000	217,000
6008	Development of a whole body vibration dosimeter	96,850	43,650	140,500
5 Proj	TOTAL	457,350	185,650	643,000

(ii) OH&S General

Projects		ACARP	OTHER	TOTAL
4012	Multifactorial back damage intervention study	209,500	0	209,500
4014	Emissions from spoil-pile fires	154,000	25,000	175,000
2 Proj	TOTAL	363,500	25,000	384,500

ACARP OHS EXPENDITURE ANALYSIS, 1992-1996 UNDERGROUND CATEGORY

Major Incident Safety		ACARP	OTHER	TOTAL
20 Proj	(i) Strata control	2,222,068	3,002,941	5,225,009
17 Proj	(ii) In-seam drilling	1,968,820	3,419,200	5,388,020
13 Proj	(iii) Detection and prevention of fires and explosions	1,918,879	1,297,164	3,216,043
13 Proj	(iv) Gas monitoring, drainage and control	1,096,609	2,383,668	3,480,277
10 Proj	(iii) Outbursting	968,971	1,104,600	2,073,571
3 Proj	(vi) Escape and rescue	700,000	120,000	820,000
76		8,875,347	11,327,573	20,202,920

OH&S General		ACARP	OTHER	TOTAL
5 Proj	(i) Reduced musculo-skeletal injuries	597,350	0	597,350
3 Proj	(ii) Dust control	165,500	650,750	816,250
1 Proj	(iii) Reduced noise induced hearing loss	87,650	45,350	133,000
2 Proj	(iv) General	80,000	0	80,000
1 Proj	(v) Reduced injuries due to vibration and jarring	77,820	43,350	121,170
3 Proj	(vi) Improved systems for capturing incidence and causality data particularly in relation to permanent disablement	62,773	47,140	109,913
15		1,071,093	786,590	1,857,683

Total Expenditure (millions)

No of ACARP Projects	NERDDP Carry Over	ACARP	OTHER	TOTAL
91	10.02	9.95	12.11	32.08

NOTE

An additional \$10 million dollars was expended from ACARP funds to complete underground OH&S projects inherited from the Federal Government, which had been begun under the National Energy Research Development and Demonstration Program and which were ongoing at the time of the handover.

ACARP Funding

- Projects to date 285
- ACARP funds committed \$43 million
- Total project value \$95 million
- 96/97 funds commitment \$ 9.5 million