

The Australian National University Memorandum

From Deputy Vice-Chancellor's Office
To Dr B Martin RSPacS
Reference 14.4.4.32 DHF:ml
Date 20 November 1985

NERDD Program Research Support

I regret to inform you that your application to the Department of Resources and Energy for support within the National Energy Research, Development and Demonstration Program of your project entitled "Security of the Australian energy systems against major disruptions" was not successful.

... A copy of the Department's letter to the Registrar is enclosed for your information.



D H Fraser
Graduate Assistant



DEPARTMENT OF RESOURCES AND ENERGY

Jollmont Centre, Northbourne Ave., Canberra City, 2601
Postal Address: GPO Box 858, Canberra, A.C.T. 2601
TEL.: (062) 45 8211. TELEX: 62101

Reference: 85/2854

MR G E DICKER
REGISTRAR
AUSTRALIAN NATIONAL UNIVERSITY
GPO Box 4
CANBERRA
ACT 2601

RECEIVED
A.N.U.
RECORDS SECT
NOV 15 4 33 PM '85

Dear MR DICKER

Johns. 219, 220

NATIONAL ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION PROGRAM

I refer to your organisation's response to the National Energy Research, Development and Demonstration Council's advertisement of 1 and 2 March inviting applications for energy research, development and demonstration grants.

I regret to advise that those applications submitted by your organisation which are listed on the attached schedule were unsuccessful.

As in previous years, the assessment process was quite competitive and less than one-third of applications received were awarded grants. Thank you for your interest in the Program. Applications for grants under the Program in 1986 are expected to be invited next March.

Yours sincerely

LHF

J. Fielding
Acting Assistant Secretary
Research Policy and Programs
Branch

14 NOV 1985

Department of Mathematics,
Faculty of Science

11 July 1985

Barry P. Jones
Executive Member/Secretary
NERDDC TSC7
Department of Resources and Energy
GPO Box 858
Canberra ACT 2601

Dear Mr Jones,

Concerning your letter of 21 June (reference 85/5219), I enclosed 10 copies of replacement pages for my NERDDC application "Security of the Australian energy system against major disruptions". The pages replace pages 10 to 12 of the original application. I hope this provides sufficient information for your requirements. If not, please let me know (note however that I will be out of Canberra until 2 August).

Yours,

Brian Martin

Brian Martin

12-8-85

~~Barry Jones~~ : from DRE

TSC7 : Oil cutoff

want to
restrict study to

} terrorist attack
strike action major equipment malfunction



DEPARTMENT OF RESOURCES AND ENERGY

Jolimont Centre, Northbourne Ave., Canberra City, 2601
Postal Address: GPO Box 858, Canberra, A.C.T. 2601
TEL: (062) 45 8211 TELEX: 62101

Reference: 85/5219

Dr B. Martin
Research Fellow
Strategic and Defence Studies Centre
ANU
GPO Box 4
CANBERRA ACT 2601

Dear Dr Martin

I refer to your 1985 NERDDC application "Security of the Australian Energy System Against Major Disruptions". The application has been referred to Technical Standing Committee number 7 (TSC7) for assessment.

To aid in its assessment, the Committee requests that you provide further information on the proposed methodology and work program, and on your awareness and knowledge of related research in this field in Australia and overseas.

TSC7 will be meeting next on 19 July 1985, and I would be grateful if you could provide the information by that date. I can be contacted on (062) 458424 if you have any queries about the above matter.

Yours sincerely

Barry P. Jones
Executive Member/Secretary
NERDDC TSC7

21 JUN 1985



APPLICATION TO AN OUTSIDE ORGANISATION FOR FUNDS
(for University use only)

FROM Dr B. Martin
 Title Prof/Dr/Mr etc. Name(s) of Principal Investigator(s) or Applicant(s)
 OF Strategic and Defence Studies Centre, RSPacS
Department/Centre Security of the Australian Energy System against Faculty/ School
 TITLE OF PROPOSAL or purpose major disruptions
 for which funds are sought Security of the Australian Energy System against
 TO BE FORWARDED TO National Energy Research, Development and Demonstration Council,
GPO Box 858, Canberra ACT 2601 Name and Address of Outside Organisation

PERIOD FOR WHICH SUPPORT IS BEING REQUESTED 1/12 1985 to 31/12 1987
 TOTAL AMOUNT REQUESTED \$ 80,441

APPLICATION IS Initial/ Renewal/ Supplementary
 IF RENEWAL OR SUPPLEMENTARY, DATE OF ORIGINAL GRANT 19

OUTSIDE ORGANISATION REQUIRES ORIGINAL PLUS 9 copies
 (number)

CLOSING DATE FOR APPLICATIONS WITH OUTSIDE ORGANISATION IS 10/5 1985
 (N.B. Required in Chancery one week earlier)

If the answer to any of the following questions is YES, USE PAGE 2 TO EXPLAIN	YES	NO
1. Does the applicant's appointment in the University, during the period for which support is being sought, require confirmation or further decision?	X	
2. Does the proposal include appointment of academic/technical/other staff?	X	
3. Is any part of the grant intended to provide salary for the applicant?	X	
4. Does the proposal seek funds to provide temporary replacement of the applicant?		X
5. Are carcinogens, mutagens, hazardous recombinant DNA material, radioactive nuclides or other hazardous waste involved?		X
6. Are HUMAN BEINGS or ANIMALS involved as experimental subjects? N.B. On page 2 cite the authority which has been approached for approval and state whether approval has been granted and register number.		X
7. Does the granting body propose any restriction on publication of results from the work to be supported?		X
8. Are there any conditions relating to patents laid down by the outside organisation?		X
9. Will a central service facility be utilised? Computer Centre/IRU/Other?		X
10. Does the proposal commit the University to matching funds or project continuation?		X
11. Are commitments likely to arise initially or in the future for space or accommodation needs by way of alterations or additions to existing buildings?		X
12. Are there any commitments arising out of the project for which provision is not made in the budget?		X
13. Is the same support being sought from other sources?		X

	SUMMARY OF SUPPORT REQUESTED	
	\$ 1st year	\$ Total
Personnel	35,177	78,264
Equipment		
Maintenance		
Travel	2,000	5,165
Other		
Admin. costs		
Total costs	37,177	83,429

SIGNATURES
 Proposed by Brian Martin 2-5-85
 Applicant(s) Date
 Recommended by _____
 Head of Department/ Date
 Unit/Section
 Recommended by _____
 Dean/Director/Head Date
 of Centre
 Checked by _____
 In Chancery Date
 Approved by _____
 Bursar Date
 Application dispatched/returned to proposer

Do salaries include adequate provision for any likely increase? yes/no
 Is provision made for inflation? yes/no
 Budget has been checked and approved
 (Signature) _____ Date _____
 Business or Laboratory Manager

Signature _____ Date _____

Central Records
 File No. _____

APPLICATION TO AN OUTSIDE ORGANISATION FOR FUNDS (cont.)

Explanations related to YES answers on page 1. Please identify each answer by the corresponding question number.

1, 2 and 3: It is intended that the grant provide the full-time salary of the principal project supervisor to be taken up as a Research Fellow in the Strategic and Defence Studies Centre, RSPacS.

Abstract of proposed work. The summary should express the purpose and essential elements of the proposed activity, but should be written in terms that can be understood by the non-specialist.

The basic idea behind the project is to look at threats to the Australian energy system in a broad framework in order to determine the most effective social and economic measures for reducing either the threats or the impacts.

The first stage will be to identify and categorise threats to the Australian energy system (such as interruption of Middle East oil, terrorist attack and extended strike action) through studying relevant data and consulting with experts.

The second stage will be to determine the vulnerability of different parts of the Australian energy system, and to highlight those vulnerabilities which could be readily reduced by simple measures such as the provision of spare parts.

The final stage will be to identify, assess and compare the economic and social costs and benefits of specific measures to reduce the likelihood or impact of the most severe threats.

Brian Martin

Signature

2-5-85

Date

**THE AUSTRALIAN NATIONAL UNIVERSITY
RESEARCH SCHOOLS OF SOCIAL SCIENCES AND PACIFIC STUDIES**

APPLICATION FOR OUTSIDE GRANTS

To: Business Manager

It is proposed to approach National Energy Research, Development and Demonstration
(Name of Organisation)
Council, GPO Box 858, Canberra ACT 2601
(Address of Organisation)

for a grant to assist with research associated with the following project:

Security of the Australian energy supply against major disruptions

A summary of the budget is as follows:

Salaries	\$ 60,792
Salary Related Expenditure	\$ 17,472
Equipment	\$
Expendable Research Materials	\$
Computer Rental	\$
Other Expenses	\$
Travel	\$ 5,165
Conferences	\$
Publications	\$
Field and Survey	\$
	Sub Total \$
Overhead Component (1)	\$
	TOTAL \$ <u>83,429</u>

(1) Please indicate basis of calculating the Overhead Component, i.e. per centage or alternative method used.

Details of the budget are contained in Appendix I attached.

I certify that if approved the grant will:—

- (a) be spent in accordance with the University's rules and procedures,
- (b) not obligate the University to any long term commitment.
- (c) not impinge on the University's autonomy.

Proponents signature . . . Brian Martin

I support/do not support this application.

.....
 Signature of Head of Department/Unit/Centre

To: Director

I have examined the detailed budget incorporated in this application and certify that:

the preparation is consistent with our normal practice.

some variations have been included to satisfy our normal practice.

Business Manager
/ /19

To: Deputy Vice Chancellor

I recommend for your approval that if approved this outside grant be administered as a restricted fund under the aegis of the Research School of

.....

Director
/ /19

Approval of Deputy Vice Chancellor

I approve the administration of this outside grant as a restricted fund under the aegis of the Research School of

Deputy Vice Chancellor
/ /19

NATIONAL ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION COUNCIL
**Energy Research, Development and
Demonstration Projects**

**1985
APPLICATION
FOR
SUPPORT GRANT**

Project Title SECURITY OF THE AUSTRALIAN ENERGY SYSTEM AGAINST MAJOR DISRUPTIONS
.....
.....

Applicant Organisation AUSTRALIAN NATIONAL UNIVERSITY
.....

Applications should be lodged with:

**The Assistant Secretary
Research Policy and Programs Branch
Department of Resources and Energy
G.P.O. Box 858
CANBERRA ACT 2601**

IMPORTANT

- *Original plus 9 copies of each proposal and supporting documentation are required.*
- *If space on this form is insufficient, supply details on separate pages.*

**CLOSING DATE FOR APPLICATIONS
IS 10 MAY 1985. LATE APPLICATIONS
WILL NOT BE CONSIDERED.**

OFFICE USE ONLY
Date received
Application No.

CERTIFICATE OF PUBLIC OFFICER/HEAD* OF ORGANISATION

I, being the duly appointed Public Officer/Head* of the organisation, declare that

- (a) the information given in this application, including any attachments hereto, is true and correct in every particular;
- (b) the organisation has the basic facilities required for the project and, subject to being awarded a grant, it will adhere to the program of activities set out in this application; and
- (c) the salaries quoted for personnel are in accordance with the practice of this organisation.

** Delete whichever is not applicable. In the case of Universities and Colleges of Advanced Education the application needs to be signed by a senior officer of the central administration.*

FULL NAME

SIGNATURE

DESIGNATION DATE/...../.....

PART A: PROJECT AND BACKGROUND INFORMATION

1. PROJECT		Security of the Australian energy system against major	
a. Project Title		disruptions	
b. CONTINUATION APPLICATIONS ONLY If this application seeks continuation funding of a project currently supported under the NERD&D Program, specify the current project number.			
2. ORGANISATION		Australian National University	
a. Applicant organisation Other organisations involved should be listed as sub-contractors under Item 13.			
b. Postal Address		GPO Box 4	
(i) Street or P.O. Box			
(ii) Suburb or City		Canberra	
(iii) State and Postcode		ACT 2601	
c. Person in CENTRAL ADMINISTRATION to whom correspondence should be directed		Miss P. M.	White
		Title & initials	Surname
d. Designation of person specified in 2c.		Acting Registrar	
e. Administration Telephone No.		492621	Area Code 062
3. PROJECT SUPERVISOR		Martin	Dr B
a. Principal Project Supervisor		Surname	Title & Initials
b. Division or Department of Organisation in which Principal Project Supervisor works		Strategic and Defence Studies Centre, Research School of Pacific Studies	
4. PROJECT LOCATION		Canberra	
a. Specify the location at which the majority of the work for which support is sought will be undertaken			
b. Specify State/Territory of 4a.		ACT	
5. SUMMARY OF REQUESTED FUNDS			
a. From date of approval to 31.12.86 (Refer paragraph 12 page 1 of Background Information Notes)	\$40,165	These amounts should be the same as the totals of funds sought shown under Item 15 on p.9	
b. 1987	\$43,264		
c. 1988			
d. TOTAL	\$83,429		
6. NERD&D PROGRAM CLASSIFICATION			
Select from the list on the reverse side of this page the classification which best describes the technology area of the project.		0 7 0 1	

7. WORK DESCRIPTION AND OBJECTIVES

Details given below should relate only to those aspects of work for which funds are being sought in this application.

(a) Work Description (Brief summary of specific work which would be undertaken)

* Identify and categorise threats to the Australian energy system through studying relevant data and consulting with experts.

* Determine the vulnerability of different parts of the Australian energy system through studying information and through surveying and interviewing key people.

* Identify and assess the economic and social costs and benefits of specific measures to reduce the likelihood or impact of particular threats.

(b) Objectives (List those to be accomplished with the grant sought)

* To assess the severity of major possible threats to the Australian energy system (such as interruption of Middle East oil, terrorist attack and extended strike action).

* To assess the vulnerability of different parts of the Australian energy system to specific threats, and in particular to highlight those vulnerabilities which could be readily reduced by simple measures such as the provision of spare parts.

* To analyse policy options for mitigating the likelihood or impact of the most damaging threats, and to compare options in terms of social and economic benefits and costs.

9. PROJECT SUPERVISOR(S)	PRINCIPAL SUPERVISOR	OTHER SUPERVISORS	
	Use supervisor's name given at 3(a)	(2)	(3)
Name:	Dr B. Martin		
Qualifications:	B.A. (physics) (Rice), Ph.D. (Sydney)		
Designation:	Research Fellow		
Business Address:	Strategic and Defence Studies Centre, ANU GPO Box 4, Canberra ACT 2601		
Telephone No.:	494445		
How much time in working days per month as an average will the project supervisor devote to this project?	Full time		
Are any prolonged absences envisaged during the currency of this project which will affect its conduct?	No		
Briefly outline relevant experience and any other major research projects being undertaken and/or closely supervised by the project supervisor and their time demand. (Insert prefixes (2) and (3) and details if more than one project supervisor)	<p>For the past decade I have studied a wide range of issues relating to energy systems, in particular focusing on social aspects of energy use such as the resilience of energy systems. In addition, since 1979 I have worked on mathematical models of electricity grid systems in Australia; this work has included considerable emphasis on economic optimisation.</p> <p>In regard to the study of threats, my studies of war have included assessment of the likely physical threats to Australia in the event of nuclear war as well as interviews with a wide range of people about responding to invasion threats.</p> <p>This unusual combination of research in these disparate areas provides, I believe, a background and experience especially suited for carrying out the proposed project.</p>		

10. OTHER SUPPORT (directly associated with this project if grant approved)

Give details of planned expenditure by the applicant organisation and expenditure from approved or expected external sources of funds for work directly associated with the project.

Do not include any funds expected as a result of this application. Provide additional details under Item 22(a).

Organisation providing support	Nature of support	\$ (estimated)		
		1986	1987	1988

PART B: ESTIMATED PROJECT EXPENDITURE REQUESTED AS A GRANT

Council will consider all identifiable direct costs if it can be demonstrated that they are essential to the project. Overheads, including administrative and any other costs which

can only be nominally allocated to the project on a proportional basis, may only be included in the case of non-profit fee-for-service organisations or consultants.

11. SALARY AND RELATED EXPENDITURE Salary expenditure will be considered provided that it is not already paid by a public authority or by an organisation using Commonwealth or State funds. Support requested for project staff should not exceed the salary scales or conditions of the agency requesting the funds and should show the official designation of the position (Engineer, Chemist, Technician, Laboratory Assistant, etc.). Exclude employees engaged solely on fabrication of plant and equipment (costs of these should be included under Item 12).				
Show project employment on a full-time equivalent staff-months basis for each position. Include any anticipated leave. General administrative overheads, where allowable and appointment expenses should be specified under Item 14 — "Travel, Computing and Other Expenditure".				
(a) Project Staff				
Designation (Names not necessary)	Full-time annual salary (\$)	Period to be employed on project	Full-time staff-months equivalent on project (incl. leave)	Estimated cost (\$)
Research Fellow	27,324*	1 12 85 31 12 86 to	13	29,645
	31,147**	1 1 86 31 12 87 to	12	31,147
* current rate of \$24,840 plus 10% for salary escalation		to		
** current rate of \$25,956 plus 20% for salary escalation		to		
		to		
		to		
Total salary expenditure (Excluding on-costs) \$				60,792
(b) On-Costs				
Items	Percentage of annual salary			
(i) Payroll Tax	5.00			
(ii) Workers' Compensation Insurance	1.12			
(iii) Employers' Superannuation Contribution	20.00			
(iv) Holiday Pay Loading	-			
(v) Long Service Leave Allowance	2.62			
(vi) Others (specify)				
TOTAL PERCENTAGE OF SALARY	28.74	Total on-costs		\$ 17,472
ESTIMATED TOTAL ADDITIONAL SALARY EXPENDITURE \$				78,264

12. PLANT, EQUIPMENT AND MATERIALS Applicants are expected to have access to the basic facilities, including computers, where the proposed research is to be undertaken; provision for special facilities specific to the project may be included in the application. Individual Plant, Equipment and Material Items costing more than \$1000 should be specified in the table. Items of Plant and Equipment costing more than \$5000 become the property of the Commonwealth. Any installation costs should be included. In the case of equipment proposed for purchase, the cost of the equipment and installation should not be estimated but should be based on the latest prices which can be obtained from the supplier. Estimates for imported items of plant and equipment should be based on quoted prices including customs duty where applicable.		
Support may also be requested to cover depreciation on items of plant and equipment purchased for the project with the grantee's own funds. Depreciation rates shall be the same as those applying for taxation purposes. Provide details as an attachment under Item 22(b) of Part C — "Supporting Details". Maintenance of plant and equipment used on the project will only be supported where it is an identifiable direct cost. Include insurance costs, if applicable, under Item 14 — "Travel, Computing and Other Expenditure".		
(a) Description of plant, equipment and materials for project costing more than \$1000	Estimated date of purchase	Estimated cost (incl. installation costs) \$
(i) Items to be purchased		
(Continued next page)		

12. PLANT, EQUIPMENT AND MATERIALS (Continued)	Estimated date of purchase	Estimated cost (incl. installation costs) \$
(a) Description of plant, equipment and materials for project costing more than \$1000		
(i) Items to be purchased (continued)		
.....		
.....		
.....		
.....		
.....		
.....		
(ii) Items to be fabricated in-house (include cost of materials and labour)		
.....		
.....		
.....		
.....		
(b) Items costing less than \$1000		
(c) Maintenance*		
(d) Depreciation on plant and equipment purchased for project by grantee with own funds*		
ESTIMATED TOTAL EXPENDITURE ON PLANT, EQUIPMENT AND MATERIALS		\$

*Please supply details as an attachment under Item 22(b) of Part C.

13. CONTRACTED RESEARCH AND DEVELOPMENT EXPENDITURE																											
<p>The grantee is responsible for all work carried out on the project. Where sub-contracts are proposed it is preferable if the organisation which will incur the major expenditure under the proposed grant is the grantee. If this is not considered practicable, supporting reasons must be given for the arrangements put forward and the grantee will be required to ensure that the Commonwealth's interests are protected by placing conditions on the sub-contractor similar to those which the grantee accepts.</p>		<p>Detail any tasks essential to the project which it is proposed to sub-contract, providing sufficient details to enable Council to evaluate the sub-contracted tasks. Such details should be included as an attachment under Item 22(c) of Part C — "Supporting Details".</p>																									
		<table border="1"> <thead> <tr> <th data-bbox="41 1339 493 1402">Name of contractor and period of contract</th> <th data-bbox="493 1339 1086 1402">Brief description of tasks to be contracted out*</th> <th data-bbox="1086 1339 1520 1402">Estimated cost \$</th> </tr> </thead> <tbody> <tr> <td data-bbox="41 1402 493 1447">.....</td> <td data-bbox="493 1402 1086 1447">.....</td> <td data-bbox="1086 1402 1520 1447">.....</td> </tr> <tr> <td data-bbox="41 1447 493 1491">.....</td> <td data-bbox="493 1447 1086 1491">.....</td> <td data-bbox="1086 1447 1520 1491">.....</td> </tr> <tr> <td data-bbox="41 1491 493 1536">.....</td> <td data-bbox="493 1491 1086 1536">.....</td> <td data-bbox="1086 1491 1520 1536">.....</td> </tr> <tr> <td data-bbox="41 1536 493 1581">.....</td> <td data-bbox="493 1536 1086 1581">.....</td> <td data-bbox="1086 1536 1520 1581">.....</td> </tr> <tr> <td data-bbox="41 1581 493 1626">.....</td> <td data-bbox="493 1581 1086 1626">.....</td> <td data-bbox="1086 1581 1520 1626">.....</td> </tr> <tr> <td data-bbox="41 1626 493 1671">.....</td> <td data-bbox="493 1626 1086 1671">.....</td> <td data-bbox="1086 1626 1520 1671">.....</td> </tr> <tr> <td data-bbox="41 1671 493 1715">.....</td> <td data-bbox="493 1671 1086 1715">.....</td> <td data-bbox="1086 1671 1520 1715">.....</td> </tr> <tr> <td data-bbox="41 1715 493 1753">.....</td> <td data-bbox="493 1715 1086 1753">.....</td> <td data-bbox="1086 1715 1520 1753">.....</td> </tr> </tbody> </table>	Name of contractor and period of contract	Brief description of tasks to be contracted out*	Estimated cost \$
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ESTIMATED TOTAL CONTRACT EXPENDITURE		\$																									

14. TRAVEL, COMPUTING AND OTHER EXPENDITURE	
<p>a) Travel — Travel will only be supported if directly associated with the project including travel costs for staff engaged on the project incurred in using facilities at other centres. Standards of travel and accommodation shall not exceed those of the agency requesting the funds. The Council will not support travel to conferences as a component of a proposal. Requests for overseas travel will not be considered unless the applicant has demonstrated that the travel is an integral and essential component of the project. Visits to seek general information (state-of-the-art visits) will not be supported.</p> <p>b) Computing Charges — Requests for funds to meet computing costs will only be considered where the costs are charged directly to the project. Funds requested for the employment of additional computing personnel or for the</p>	<p>purchase of additional computing equipment should be included in expenditure Items 11 and 12 respectively.</p> <p>c) Other:</p> <ul style="list-style-type: none"> — appointment expenses: these will be considered for additional staff shown in Item 11. Wherever practicable personnel should be recruited from within Australia. If it is proposed to appoint staff from overseas, applicants will need to demonstrate why it is not possible to recruit suitable Australian personnel. In such cases travel and removal expenses to Australia only will be considered. — overheads: may only be included in the case of non-profit fee-for-service organisations or consultants.

14. TRAVEL, COMPUTING AND OTHER EXPENDITURE (Continued) Supply details as an attachment under Items 22(d)(e) and (f)	\$
a. TRAVEL	5,165
b. COMPUTING CHARGES	
c. OTHER (SPECIFY)	
ESTIMATED TOTAL OTHER EXPENDITURE	\$ 5,165

15. TOTAL ESTIMATED PROJECT EXPENDITURE REQUESTED AS A GRANT							
CALENDAR YEAR	1986		1987		1988		Total \$
COST ITEM	Date of Approval to 30.6.86	DISTRIBUTION BY SIX MONTHS BEGINNING					
		1.7.86	1.1.87	1.7.87	1.1.88	1.7.88	
SALARY AND RELATED EXPENDITURE (ITEM 11)	20,576	17,589	20,049	20,050			78,264
PLANT, EQUIPMENT AND MATERIALS (ITEM 12)							
CONTRACTED R & D EXPENDITURE (ITEM 13)							
TRAVEL, COMPUTING AND OTHER EXPENDITURE (ITEM 14)		2,000	3,165				5,165
TOTAL	20,576	19,589	23,214	20,050			83,429

PART C: SUPPORTING DETAILS

Applicants are requested to follow closely the seven headings listed below in providing comprehensive statements in support of their applications. Pages of the same size as this form (A4) should be attached as required and numbered consecutively.

16. Progress achieved on any previous grant(s)

If this application seeks to continue an existing grant provide the following information concerning the grant:

- expected total expenditure by scheduled completion date;
- summary of main project findings to date;
- extent to which original objectives have been achieved so far;
- difficulties encountered; and
- reasons why further support is considered necessary.

17. Concept, proposed methodology and major problems

Provide an outline of the concept, proposed methodology and major problems to be solved.

18. Major stages of the project

Describe the major stages and show the estimated completion date for each. Include a description of the relationship between stages and the budget items requested and show any particular objective(s) associated with the completion of each stage.

Where the work to be undertaken is part of a larger program of work its relationship to the total program should be set out.

19. Implementation of technology transfer to industry

Outline, if appropriate, the proposed methods for technology transfer. These could include some, or all, of the following:

- Publication of articles
- Brochures describing benefits of results
- Workshops, seminars or demonstrations
- Films or audio-visual packages
- Patents and licensing.

Where it is proposed to undertake a technology transfer program to industry as part of the project, details should be provided in this section. Costs of the program should be identified here and

included as part of the grant sought in Items 11–15 of Part B of the application form. Provision of funds for any technology transfer program will be subject to satisfactory completion of the project work and approval to proceed with the technology transfer component.

20. Awareness of related research in Australia and overseas
Indicate your knowledge of related research work done in Australia and overseas.

21. Facilities within the organisation available to the project
Provide a detailed list.

22. Additional justification for expenditure pursuant to Items 10–14 of Part B

- Other support (refer Item 10 in Part A) — include here details of applications for support made to other granting schemes.
- Plant, equipment and materials (refer Item 12 of Part B) — include as appropriate details of maintenance expenditure and depreciation costs intended as a direct charge to the grant, including method by which depreciation was calculated.
- Contracted research and development (refer Item 13 of Part B) — give details where possible of breakdown of contract costs.
- Travel (refer Item 14(a) of Part B) — give details of travel involved and basis upon which estimates were made.
- Computing charges (refer Item 14(b) of Part B) — give details of nature of services involved and basis upon which estimates were made.
- Other expenditure (refer Item 14(c) of Part B) — give details of funds sought.

17. Concept, proposed methodology and major problems

The basic idea behind the project is to look at threats to the Australian energy system in a broad comparative framework in order to determine the most effective measures for reducing either the threats or the impacts.

Some of the possible threats which would be examined are:

- * political or military contingencies in the Middle East leading to cutting off of Middle East oil;
- * world economic collapse, leading to the cutoff of many imports to Australia;
- * an economic blockade of Australia by a major power;
- * terrorist attack on Australian energy facilities such as electricity generating plants or oil refineries;
- * major natural disasters;
- * strike action paralysing the energy sector;
- * nuclear war in the northern hemisphere leading to cutoff of oil imports and spare parts;
- * foreign military attack on Australian energy facilities.

The specific vulnerabilities of the Australian energy system to these and other threats would form one facet of the study.

There are various ways in which the Australian energy system could be made more secure against such threats. Some of them are:

- * stockpiling oil and other fuels;
- * diversifying the types and sources of supply, so that interruption of one would not be catastrophic;
- * increasing security against terrorist or criminal attacks;
- * stockpiling spare parts;
- * training Australian engineers and tradespeople to be able to fix current equipment should foreign technical support be cut off;
- * preparing contingency plans for rationing fuels and reducing energy demand;
- * pursuing policies to reduce energy demand, particularly of types of energy which are susceptible to disruption;
- * developing Australian manufacturing capability in the area of energy systems.

At the moment, there are various measures being taken by different groups to guard against particular threats, such as the provision of petroleum stockpiles. But there is no overall perspective on what are the most effective measures -- using 'effective' in the wide sense of including both economic and social costs and benefits -- to be taken in a context in which any of a large number of contingencies are possible. The aim of the project is to provide such a perspective, and to use it to suggest particular measures as especially worthy of attention.

For example, one possible threat would be either major war or economic collapse in the northern hemisphere resulting in a cutoff of imports of vital components for energy generation or distribution equipment, which could result in major avoidable disruptions in energy supply. The possible options for preventing this disruption would include having a greater reserve of spare parts, having local manufacturing capacity, or using different equipment. The project would aim at assessing such options in the light of their economic and social costs and benefits, considering the specific threats to and vulnerabilities of the energy system.

The threats to the energy system would not be treated as 'givens', especially since the likelihood and seriousness of many threats, such as terrorism or long-term strike action, depend sensitively on the specific vulnerabilities of the system and its reserve capacities. For example, the feasibility of a foreign power organising an economic blockade affecting the Australian energy system would depend sensitively on such factors as spare parts, local manufacturing capacity, stockpiles of fuel and the existence of alternative supplies.

The project would look both at short-term and long-term policy options for preventing or overcoming specific threats. It is likely that many of the most cost-effective options could be implemented very quickly at low cost, such as increasing the number of certain spare parts.

Stockpiling of petroleum to guard against a cutoff of foreign supplies naturally would be an important option to be considered. But going beyond this, the likely costs and benefits of stockpiling at different levels would be compared to entirely different options to protect energy delivery, such as guarding against attacks on oil refineries. The project thus is one of **comparative** assessment of options, without a priori assumptions about likely threats or preferred responses.

The method to be used is identification of threats, vulnerabilities and options, study of available evidence through the literature, gaining information through questionnaires and personal contact, and use of standard techniques for comparing social and economic impacts and policy options in a situation of uncertainty.

An initial part of the project would involve a study of major threats to Australian energy supplies, focussing especially on the severity of their effects. This would involve a identification and categorisation of threats, a survey of the relevant literature and discussions with experts in the various fields involved (such as military stability in the Middle East).

A vital part of the project would involve a determination of the vulnerability of different parts of the Australian energy system to various threats. As well as studying the relevant literature on energy technologies, suppliers, operation and maintenance, a request for information and a general questionnaire would be sent to key people and institutions in the energy system. This would be followed up by personal interviews, for example with refinery and power plant engineers, to determine the vulnerability of specific parts of the energy system. The result would be specific information on which technologies, personnel or facilities would be most vulnerable to particular threats. For example, if sea transport of petroleum were interrupted, the results would point to the likely bottlenecks in transport by pipeline, rail and road, both in terms of the physical transport systems and their personnel.

Amalgamating the information and conclusions regarding both threats and vulnerabilities, the work would then involve assessing the likely economic and social costs of specific disruptions to the energy system, and the uncertainties in these costs. Then a large range of policy options would be considered, and their feasibility and costs considered in the light to the potential benefits.

How would the policy options be compared? Initially, a traditional cost-benefit comparison would be used, assigning subjective probabilities

to threats and costs. The limitations of this approach are well known. To show the value judgements involved in different options more clearly, a simple summary table of options, costs and benefits (both economic and social) and ease or difficulty of implementation would be prepared. Part of the project would involve investigation of other methods for comparing options in situations where the chance of a disaster is small but the consequences are very large.

The major problems to be solved are:

(a) What are the most serious threats to Australian energy supplies? How can these threats be assessed when the probabilities are very low and there is little relevant evidence?

(b) What are the specific vulnerabilities of the Australian energy system to major disruption?

(c) What are the relevant policy options for reducing the likelihood or impact of the major threats? How can these options be compared given the low level of quantifiability?

18. Major stages of the project

(1) Assessment of major threats to the Australian energy system. To identify the major threats, a search of the relevant literature will be made, plus consultation with experts in the different fields involved. It may also be valuable to use brainstorming techniques with some of these experts. The end result of this process will be a comprehensive list of threats. Also involved here will be a detailed specification of the threats in terms of parameters such as duration, extent and source.

After identifying and specifying the possible threats, the main effort will be to determine their seriousness. This will be done by spelling out the economic and social consequences of the different disruptions to the energy system. For example, in the case of an economic collapse, the consequences will be the component of overall disruption due to induced breakdowns or shortfalls in the energy system. In the case of the cutoff of Middle East oil, the consequences will derive more specifically from disruption of the energy system and consequent disruption industrial production and the like. In determining the seriousness of the threats, once again a study of relevant literature and consultation with experts will be the main source of information.

Most of this stage should be completed in the first 6 months of the project, though the assessed seriousness of the threats might be modified later by the findings in stage 2.

(2) Assessment of specific vulnerabilities in the Australian energy system. This stage involves looking at detailed aspects of the Australian energy system, such as the dependence of specific facilities on overseas spare parts or their vulnerability to strikes by particular workers or specific types of terrorist attack. Part of the work on this stage will be done by reading the relevant literature dealing with energy facilities, fuels, imports and skilled labour. But a major source of information will be knowledgeable practitioners, such as engineers in the oil industry and in the electricity commissions. To tap this source of information, questionnaires will be sent out to relevant organisations and individuals to obtain information about vulnerabilities. On the basis of information received, and also after following up various contacts personally, I would

then proceed to interview key people around Australia. Through this personal contact, I also anticipate being able to obtain further written material. The people interviewed are also likely to be able to comment on the threats and options in stages 1 and 3.

Preliminary study on this stage, and sending of questionnaires to relevant individuals and groups, would be done during the early months of the project. The more detailed study and interviews with knowledgeable practitioners in the energy supply and distribution system would mainly take place during months 7 to 12 of the project, with followups during months 13 to 19 depending on the findings in stage 3.

(3) Assessment of policy options. To develop an initial list of possible policy options, the same method would be used as in stage 1: reading the relevant literature, consulting experts, and possibly using brainstorming techniques. Once an initial list is obtained, the different options would be tested on many of the people interviewed in stage 2 to ensure their feasibility and to make sure that unsuspected costs or advantages were not being overlooked. To proceed in the assessment, the different policy options would be matched against the specific vulnerabilities found in stage 2. For example, some options (such as stockpiling particular spare parts) might only ameliorate one particular threat, while others (such as reducing demand) would help against a range of threats.

This stage would also involve using one or more methods to compare policy options. One method would be to use traditional cost-benefit analysis. Another method would be to interview different people whose value positions concerning options were quite different, and to use their subjective assessments of social costs and benefits versus vulnerabilities to illustrate the sensitivity of the results to personal judgements.

Work on this stage could begin as soon as initial findings from stages 1 and 2 were available. Specifically, possible policy options would be identified in the early months of the project. However, the main work on assessing and comparing options would likely be done during months 13 to 19, extending to the end of the project.

(4) Writing up of findings. This would mainly take place during months 20 to 25.

The three main objectives of the project clearly are associated with the three stages listed above. The travel component of the grant would be mainly used during months 7 to 19.

20. Awareness of related research in Australia and overseas

Through talking with quite a number of people and looking at the studies which have some relevance, I have found that there is much literature which can be used as a resource for carrying out the project, but almost none which has involved the sort of comparative analysis which is central to the project itself. In other words, there seems to be sufficient material to carry out the project, but such a project does not seem to have been undertaken previously, and certainly not in Australia.

Among the people who I have consulted are:

Dr Ross Babbage, Department of Defence;

Dr Desmond Ball, Strategic and Defence Studies Centre, ANU;

Commander Simon Harrington, Royal Australian Navy;

Colonel J. O. Langtry, Strategic and Defence Studies Centre, ANU;

Mr Andrew Mack, Strategic and Defence Studies Centre, ANU.

I also have talked with some people in the Department of Resources and Energy.

These people have confirmed my impression that there has been much work done on specific threats (such as terrorism) and on specific responses (such as oil stockpiling) but hardly any work of a comparative sort dealing with the spectrum of threats and responses. Commander Harrington for example told me that he knew of nothing done similar to my proposed project and that he thought it would be a very valuable study.

The remaining comments here are meant to illustrate the above conclusion.

Most of the unclassified Australian research related to this project deals with limited areas. For example, most threat analyses deal with military threats or terrorist threats. These sometimes look at the energy system as a particular focus -- for example, I. M. Speedy, Oil and Australia's Security (Canberra: Strategic and Defence Studies Centre, ANU, 1982) -- but seldom as an integrated problem. Similarly, there are some treatments of vulnerabilities of the energy system, in particular the vulnerability of off-shore oil rigs to military attack, but once again these fall far short of providing an integrated picture of energy system vulnerabilities.

There are also some Australian studies which deal with general strategic vulnerabilities. An example is W. S. G. Bateman, Australia's Overseas Trade: Strategic Considerations (Canberra: Strategic and Defence Studies Centre, ANU, 1984), but this makes only passing reference to the energy sector.

The Australian work most relevant to the project has been done in relation to interruption of overseas petroleum and related shocks, which are concerns of the National Petroleum Advisory Committee. Studies of policy options mainly deal with a limited range of responses, with a particular focus on building up stockpiles of oil to overcome possible disruptions (for example, National Energy Advisory Committee, Liquid Fuels: Longer Term Needs, Prospects and Issues (Canberra: AGPS, 1980); Norman Dudley, Towards Optimal Decisions on Oil Stockpiling in Australia (Sydney: University of New South Wales, 1981)). These policy options are almost never treated in an overall comparative framework which deals with economic and social costs and benefits in the light of a diverse range of threats and vulnerabilities.

Overseas work of a comparative sort seems just as scarce. There are quite a lot of studies which relate tangentially to the project. For example, there are studies of the military vulnerability of energy facilities (e.g. Arthur M. Katz, Life after Nuclear War: The Economic and Social Impacts of Nuclear Attacks on the United States (Cambridge, Mass.: Ballinger, 1982)). There are many works which deal with interruption of oil supplies and related security questions (e.g. David A. Deese and Joseph S. Nye (eds), Energy and Security (Cambridge, Mass.: Ballinger, 1981); James L. Plummer (ed.), Energy Vulnerability (Cambridge, Mass.: Ballinger, 1982)). There are also a host of general treatments of the 'energy problem' (e.g. Science Council of Canada, Roads to Energy Self-Reliance: The Necessary National Demonstration (Ottawa: SCC, 1979); Royal United Services Institute for Defence Studies, Will the Wells Run Dry? (London:

RUSIDS, 1979); Herschel Specter, Getting the West Out of the Oil Dilemma: An Energy Family Approach (Washington DC: Atlantic Council of the US, 1979)). In carrying out the project, such overseas material will be studied to gain insights into threats, vulnerabilities, options and methods of analysis.

One of the necessary tasks in carrying out this project will be to utilise the diverse and scattered literature to develop a more comprehensive and useful picture of policy options for dealing with threats to the energy system.

21. Facilities within the organisation available to the project

- * Computing facilities.
- * Libraries and inter-library loan facilities.
- * Secretarial support.
- * Post and telephone.
- * Expert advice, specifically in the areas of political science and energy systems.

22(d) Additional justification for travel expenditure

An essential part of the project is carrying out personal interviews with experts and practitioners in the energy sector. In many cases this will entail travelling to different parts of the country to discuss matters with executives and engineers, for example in the oil industry and the electricity industry. Until the initial analysis of threats and the mail questionnaire are carried out, it is difficult to know where and how much travel will be needed. Because most of the state electricity systems are independent, at least one trip is likely to be needed to each capital city.

The travel expenditure is based on the following trips:

- Canberra-Sydney-Newcastle-Canberra, 5 days;
- Canberra-Brisbane-Sydney-Canberra, 5 days;
- Canberra-Melbourne-Hobart-Canberra, 8 days;
- Canberra-Melbourne-Adelaide-Perth-Canberra, 10 days.

The total for the travel expenditure is the sum of economy class air fares for these journeys, plus the relevant ANU allowance (\$100 per day) for food and lodging, all increased by 10% for cost escalation.