

**ENERGY RESEARCH & DEVELOPMENT FACT SHEET (Continued)**

**B. DETAIL OF FUNDING REQUIREMENTS—Federal Government Only (in millions of dollars)**

**B. CONSTRUCTION**

ITEM	(1) FY 1974 (Non-Add)		(2) FY 1975		(3) FY 1976		Ot						
	Obis.	Outlays	Obis.	Outlays	Obis.	Outlays							
<b>TOTAL (Carry forward to summary sheet)</b>	0	0	0	0	0	0							
<p><b>Title of project, Location (State and County) and Total Estimated Cost (TEC) (number each item consecutively). Every project costing one million dollars or more should be separately identified with a brief statement of why it is required.</b></p> <p><b>TITLE OF PROJECT (Not to exceed 30 characters and spaces.)</b> ( )</p> <table border="1"> <tr> <td>State</td> <td>County</td> <td>TEC (in millions)</td> </tr> <tr> <td colspan="3">                     Statements:                       No construction of facilities or large power plants contemplated in this time period.                 </td> </tr> </table>	State	County	TEC (in millions)	Statements:  No construction of facilities or large power plants contemplated in this time period.									
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Statements:  No construction of facilities or large power plants contemplated in this time period.													
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Statements:													
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State	County	TEC (in millions)											
Statements:													

*(Continue on*



**ENERGY RESEARCH & DEVELOPMENT FACT SHEET (Continued)**

DETAIL OF FUNDING REQUIREMENTS—Federal Government Only (in millions of dollars)

**1. EQUIPMENT**

ITEM <i>(Each item not to exceed 60 characters and spaces)</i>	(1) FY 1974 (Non-Add)		(2) FY 1975		(3) FY 1976		(4) FY 1977
	Obis.	Outlays	Obis.	Outlays	Obis.	Outlays	Obis.
	<i>(Each major performing organization, total equipment funds, with a separate allocation of each item of equipment not exceeding one million dollars or more.)</i>						
<b>TOTAL (Carry forward to summary sheet) ▶</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>	<b>0.1</b>
CO <sub>2</sub> Cycle	.04	.04	.05	.05	.05	.05	.05
Thermionics	.03	.03	.03	.03	.03	.03	.03
Thermoelectric Materials	.02	.02	.02	.02	.02	.02	.02
Other	.01	.01	0	0	0	0	0

*(Continue on Separate Sheet)*

Level of Effort:

- MAXIMUM
- ORDERLY
- MINIMUM

IDENTIFICATION NUMBER

0609550710550302

	(4) FY 1977		(5) FY 1978		(6) FY 1979		(7) SUBTOTAL FY 1975-79		(8) BALANCE TO COMPLETE		(9) TOTAL EXCLUDING FY 1974 (Col. 7 & 8)	
	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays
1	0.1	0.1	0.1	0.1	0.1	0.1	0.50	0.50	0	0	0.50	0.50
05	.05	.05	.05	.05	.05	.05	0.25	0.25	0	0	0.25	0.25
03	.03	.03	.03	.03	.03	.03	0.15	0.15	0	0	0.15	0.15
02	.02	.02	.02	.02	.02	.02	0.10	0.10	0	0	0.10	0.10
0	0	0	0	0	0	0	0	0	0	0	0	0

(See on Separate Sheet)

Page of

2

MAXIMUM  
 ORDINARY  
 SPECIAL

1. IDENTIFICATION NUMBER  
0609550710550302

a. PROGRAM	CONVERSION TECHNIQUES
b. SUBPROGRAM	ADVANCED CONCEPTS
c. PROPONENT AGENCY	DOE, NASA, DOD, AEC
d. SUBUNIT	VARIES
CONTRACTOR AND SITE <i>(No more than 42 characters and spaces for name of contractor; use standard abbreviation for state up to 16 characters and spaces for county.)</i>	NAME OF CONTRACTOR: VARIES
	Site where work will be performed ▶ State: County:
	NAME OF CONTRACTOR:
	Site where work will be performed ▶ State: County:
	NAME OF CONTRACTOR:
	Site where work will be performed ▶ State: County:
	NAME OF CONTRACTOR:
	Site where work will be performed ▶ State: County:
	NAME OF CONTRACTOR:
	Site where work will be performed ▶ State: County:
	NAME OF CONTRACTOR:
	Site where work will be performed ▶ State: County:
BRIEF DESCRIPTION OF PROPOSAL <i>(No more than 24 lines of text and no more than 70 characters and spaces per line)</i> Briefly outline nature and scope of work to be undertaken, including any new facilities which may have to be acquired or constructed.	A five year analytical and experimental program to conduct basic research and development on a number of advanced energy conversion methods for eventual use in high efficiency central station, decentralized and small power plants.

6. JUSTIFICATION (Use a separate sheet). See Item 6. on Instruction Sheet.)

7. MAJOR RESOURCE REQUIREMENTS						
RESOURCE ▼	FISCAL YEAR ▶	1975	1976	1977	1978	19
a. MANPOWER <i>(In man years)</i>	(1) Scientific	100	100	100	100	100
	(2) Technical	40	40	40	40	40
	(3) Support	20	20	20	20	20
	(4) Other					
b. RAW MATERIALS <i>(List materials and units of measure below, such as tons of coal, barrels of oil, kilograms of uranium, etc. Show amount of each in columns at right.)</i>		N/A	N/A	N/A	N/A	N/A
c. LAND AREA REQUIRED <i>(In acres)</i>	(1) Govt-owned					
	(2) Govt-leased					
	(3) Privately-owned	N/A	N/A	N/A	N/A	N/A
	(4) Other					
d. OTHER RESOURCES NEEDED						

ACI 1000

MAXIMUM  
 ORDINARY  
 MINIMUM

1. IDENTIFICATION NUMBER  
 0609550710550302

NAME: CONVERSION TECHNIQUES  
 ADVANCED CONCEPTS  
 AGENCY: DOI, NASA, UOD, AEC  
 LOCATION: VARIES

WARD SITE: NAME OF CONTRACTOR: VARIES  
 3 characters and of contractor: Site where work will be performed  State: County:  
 10 characters for state: NAME OF CONTRACTOR: Site where work will be performed  State: County:  
 10 characters for state: NAME OF CONTRACTOR: Site where work will be performed  State: County:  
 10 characters for state: NAME OF CONTRACTOR: Site where work will be performed  State: County:  
 10 characters for state: NAME OF CONTRACTOR: Site where work will be performed  State: County:

DESCRIPTION OF

2-4 lines of text  
 on 70 characters  
 (line)

nature and scope  
 undertaken,  
 by facilities  
 to be acquired

A five year analytical and experimental program to conduct basic research and development on a number of advanced energy conversion methods for eventual use in high efficiency central station, decentralized and small power plants.

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ON (Use a separate sheet(s). See Item 6. on Instruction Sheet.)

7. MAJOR RESOURCE REQUIREMENTS

FISCAL YEAR ▶	1975	1976	1977	1978	1979
(1) Scientific	100	100	100	100	100
(2) Technical	40	40	40	40	40
(3) Support	20	20	20	20	20
(4) Other					
TOTALS and units of such as tons of oil, Kilograms of low amount of at right.)	N/A	N/A	N/A	N/A	N/A
(1) Govt-owned					
(2) Govt-leased					
(3) Privately-owned	N/A	N/A	N/A	N/A	N/A
(4) Other					

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NAME OF CONTRACTOR:		
Site where work will be performed	State:	County:
NAME OF CONTRACTOR:		
Site where work will be performed	State:	County:

**BRIEF DESCRIPTION OF PROPOSAL**

*(No more than 24 lines of text and no more than 70 characters and spaces per line)*

Briefly outline nature and scope of work to be undertaken, including any new facilities which may have to be acquired or constructed.

A five year analytical and experimental program to conduct basic research and development on a number of advanced energy conversion methods for eventual use in high efficiency central station, decentralized and small power plants.

**6. JUSTIFICATION (Use a separate sheet(s). See Item 6. on Instruction Sheet.)**

**7. MAJOR RESOURCE REQUIREMENTS**

RESOURCE	FISCAL YEAR	1975	1976	1977	1978	1979
a. MANPOWER <i>(In man years)</i>	(1) Scientific	100	100	100	100	100
	(2) Technical	40	40	40	40	40
	(3) Support	20	20	20	20	20
	(4) Other					
b. RAW MATERIALS <i>(List materials and units of measure below, such as tons of coal, barrels of oil, kilograms of uranium, etc. Show amount of each in columns at right.)</i>		N/A	N/A	N/A	N/A	N/A
c. LAND AREA REQUIRED <i>(In acres)</i>	(1) Govt-owned					
	(2) Govt-leased					
	(3) Privately-owned	N/A	N/A	N/A	N/A	N/A
	(4) Other					
d. OTHER RESOURCES NEEDED <i>(Specify item and unit of measure below. Show quantity of each in columns at right.)</i>	(1)	None	None	None	None	None

**3**



**BLANK PAGE**

NAME OF CONTRACTOR:		
Site where work will be performed	State:	County:
NAME OF CONTRACTOR:		
Site where work will be performed	State:	County:

text  
letters  
scope  
s  
uired

A five year analytical and experimental program to conduct basic research and development on a number of advanced energy conversion methods for eventual use in high efficiency central station, decentralized and small power plants.

(separate sheet(s). See Item 6. on Instruction Sheet.)

7. MAJOR RESOURCE REQUIREMENTS

YEAR	1975	1976	1977	1978	1979
Manpower	100	100	100	100	100
Material	40	40	40	40	40
Equipment	20	20	20	20	20
Other resources	N/A	N/A	N/A	N/A	N/A
Government-owned					
Contractor-owned	N/A	N/A	N/A	N/A	N/A
Quantity (if needed)	(1) None	None	None	None	None

4

CLASSIFICATION  
 MAXIMUM  
 ORDINARY  
 MINIMUM

IDENTIFICATION NUMBER

0609580710550302

6. **JUSTIFICATION** - State the specific energy problem or objective, and specify how the proposal will contribute to the solution of the problem or attainment of the objective. Include reasons for selecting the recommended approach over other alternatives. Also include the benefits expected to be derived from meeting the objectives or solving the problem for which the project is proposed. Outline the risks/uncertainties (R/U), plans to minimize R/U, and basis for proceeding in face of R/U. Quantitative data should be used to the fullest extent.

The objective of this subprogram is to increase the efficiency of energy conversion from heat to electricity in central station, decentralized and small special application power plants. There are a number of advanced energy conversion devices and concepts that have the potential for higher conversion efficiencies over existing systems. These conversion systems include the Feher (CO<sub>2</sub>) cycle, Thermionics, Thermal Oscillators, Thermogalvanic Cells and Advanced Thermoelectric Materials. The Feher (CO<sub>2</sub>) cycle and Thermionic conversion receive the highest priority under this subprogram because of their potential impact on large power systems. The CO<sub>2</sub> cycle system appears to offer efficiencies in the 40 percent to 50 percent range for temperatures about 1200°F, Thermionic topping cycles have the indicated potential of increasing the conversion efficiencies of conventional plants from present values of 30 to 40 percent to the range of 40 to 50 percent. Because of the modularity of a thermionic system the efficiency of a thermionic conversion system is relatively independent of power level, thus thermionics may be applied to various types of decentralized power conversion.

Other conversion techniques such as thermal oscillators, thermogalvanic cells and advanced thermoelectric materials have the potential of increasing the efficiencies of small power plants.

All of these conversion techniques have technical uncertainties involving materials and/or engineering fixes. This program does not involve large pilot or demonstration plants, but rather research-oriented tasks, and, therefore, the risks are minimal compared to the potential return.

**ENERGY RESEARCH AND DEVELOPMENT FACT SHEET (Continued)**

**SCHEDULE** *(Include major facilities and major equipment. Indicate dates by Fiscal Year and Quarter).*

**a. DEVELOPMENT MILESTONES** *(number each consecutively)*

*(Limit Title of Milestone to 60 characters and spaces)*

**D. DATES**

Start		Complete	
FY	Q	FY	Q

The diverse nature of this subprogram precludes specific development milestones.

The program would consist of analysis, design studies, and experimental programs to investigate key issues of feasibility.

Submit Program Plan for different areas of investigation

75 1

*(Continue to next column)*

- Level of Effort:
- MAXIMUM
  - ORDERLY
  - MINIMUM

IDENTIFICATION NUMBER

06095507106E0302

B. DEVELOPMENT MILESTONES (continued)

(Limit Title of Milestone to 60 characters and spaces)

D DATES	
Start	Complete
FR	BY

2

(Continue on separate sheet)

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9 SUMMARY OF FUNDING REQUIREMENTS—Federal Government Only (in millions of dollars)

Requirement	(1)		(2)		(3)		(4)		FY
	FY 1974 (Non-Add)		FY 1975		FY 1976		FY 1977		
	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	
a. OPERATING (See p. for detail) Total Operating Requirements (from Detail Sheet)	1.9	1.9	9.5	9.5	9.5	9.5	9.5	9.5	9.5
b. CONSTRUCTION (See p. for detail) Total Construction Requirements (from Detail Sheet)	0	0	0	0	0	0	0	0	0
c. EQUIPMENT (See p. for detail) Total Equipment Requirements (from Detail Sheet)	0.1	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5
d. GRAND TOTAL—OBLIGATIONS	2.0		10.0		10.0		10.0		10.0
e. GRAND TOTAL—OUTLAYS		2.0		10.0		10.0		10.0	

NOTE: If cooperative programs are proposed, indicate the amount by year of both private and Federal government funding. A brief description of the

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Level of Effort:

- MAXIMUM
- ORDERLY
- MINIMUM

IDENTIFICATION NUMBER  
0609550710550302

(3) 1978	(4) FY 1977		(5) FY 1978		(6) FY 1979		(7) Subtotal FY 1975-79		(8) Balance To Complete		(9) Total Excluding FY 1974 (Col. 7 & 8)	
	Outlays	Obis.	Outlays	Obis.	Outlays	Obis.	Outlays	Obis.	Outlays	Obis.	Outlays	Obis.
9.5	9.5	9.5	9.5	9.5	9.5	9.5	47.5	47.5	0	0	47.5	47.5
0	0	0	0	0	0	0	0	0	0	0	0	0
0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.5	2.5	0	0	2.5	2.5
	10.0		10.0		10.0		50.0		0		50.0	
10.0		10.0		10.0		10.0	50.0		0		50.0	

ment funding. A brief description of the Cooperative programs and the rationale for the division of funding

2

0609550710550302



**ENERGY RESEARCH AND DEVELOPMENT FACT SHEET (Continued)**

**3. DETAIL OF FUNDING REQUIREMENTS—Federal Government Only (In millions of dollars)**

**OPERATING**

ITEM	(1)		(2)		(3)		
	FY 1974 (Non-Add)		FY 1975		FY 1976		
	Obis.	Outlays	Obis.	Outlays	Obis.	Outlays	Obis.
<b>TOTAL (Carry forward to summary sheet)</b>	<b>2.0</b>	<b>2.0</b>	<b>10.0</b>	<b>10.0</b>	<b>10.0</b>	<b>10.0</b>	<b>10.0</b>
<b>Name of Performing Organization:</b>							
<b>CO Cycle</b>							
<b>2</b>							
<b>MANPOWER</b>							
<b>MATERIALS</b>							
<b>MAJOR PROCUREMENTS</b>							
<b>ALL OTHER</b>							
<b>TOTAL FOR THIS PERFORMING ORGANIZATION</b>	<b>0.5</b>	<b>0.5</b>	<b>4.0</b>	<b>4.0</b>	<b>4.0</b>	<b>4.0</b>	<b>4.0</b>
<b>Name of Performing Organization:</b>							
<b>Thermionics</b>							
<b>MANPOWER</b>							
<b>MATERIALS</b>							
<b>MAJOR PROCUREMENTS</b>							
<b>ALL OTHER</b>							
<b>TOTAL FOR THIS PERFORMING ORGANIZATION</b>	<b>0.7</b>	<b>0.7</b>	<b>2.0</b>	<b>2.0</b>	<b>2.0</b>	<b>2.0</b>	<b>2.0</b>
<b>Name of Performing Organization:</b>							
<b>Thermoelectric Materials</b>							
<b>MANPOWER</b>							
<b>MATERIALS</b>							
<b>MAJOR PROCUREMENTS</b>							
<b>ALL OTHER</b>							
<b>TOTAL FOR THIS PERFORMING ORGANIZATION</b>	<b>0.4</b>	<b>0.4</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>
<b>Name of Performing Organization:</b>							
<b>Other</b>							
<b>MANPOWER</b>							
<b>MATERIALS</b>							
<b>MAJOR PROCUREMENTS</b>							
<b>ALL OTHER</b>							
<b>TOTAL FOR THIS PERFORMING ORGANIZATION</b>	<b>0.4</b>	<b>0.4</b>	<b>3.0</b>	<b>3.0</b>	<b>3.0</b>	<b>3.0</b>	<b>3.0</b>

*(Continue)*

Level of Effort:

- MAXIMUM
- ORDERLY
- MINIMUM

IDENTIFICATION NUMBER

0609550710550302

Outlays	(4) FY 1977		(5) FY 1978		(6) FY 1979		(7) SUBTOTAL FY 1975-79		(8) BALANCE TO COMPLETE		(9) TOTAL EXCLUDING FY 1974 (Cols. 7 & 8)	
	Obs.	Outlays	Obs.	Outlays	Obs.	Outlays	Obs.	Outlays	Obs.	Outlays	Obs.	Outlays
0.0	10.0	10.0	10.0	10.0	10.0	10.0	50.0	50.0	0	0	50.0	50.0
0	4.0	4.0	4.0	4.0	4.0	4.0	20.0	20.0	0	0	20.0	20.0
0	2.0	2.0	2.0	2.0	2.0	2.0	10.0	10.0	0	0	10.0	10.0
	1.0	1.0	1.0	1.0	1.0	1.0	5.0	5.0	0	0	5.0	5.0
	3.0	3.0	3.0	3.0	3.0	3.0	15.0	15.0	0	0	15.0	15.0

(Continue on Separate Sheet)

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DETAIL OF FUNDING REQUIREMENTS - Federal Government Only (in millions of dollars)

b. CONSTRUCTION

ITEM	(1) FY 1974 (Non-Add)		(2) FY 1975		(3) FY 1976		(4) FY 1977				
	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	C			
<b>TOTAL (Carry forward to summary sheet)</b>	0	0	0	0	0	0	0				
<p>Item No. ( )</p> <p>Title of project, Location (State and County) and Total Estimated Cost (TEC) (number each item consecutively). Every project costing one million dollars or more should be separately identified with a brief statement of why it is required.</p> <p><b>TITLE OF PROJECT (Not to exceed 30 characters and spaces.)</b> ( )</p> <table border="1"> <tr> <td>State</td> <td>County</td> <td>TEC (in millions)</td> </tr> </table> <p>Statement:</p> <p>No construction of facility or large power plants contemplated in this time period.</p>	State	County	TEC (in millions)								
State	County	TEC (in millions)									
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State	County	TEC (in millions)									
<p><b>TITLE OF PROJECT (Not to exceed characters and spaces.)</b> ( )</p> <table border="1"> <tr> <td>State</td> <td>County</td> <td>TEC (in millions)</td> </tr> </table> <p>Statement:</p>	State	County	TEC (in millions)								
State	County	TEC (in millions)									

(Continue on Separate

ACCOUNT NUMBER  
 0609550710550302

- MAXIMUM
- ORDERLY
- MINIMUM

ays	(4) FY 1977		(5) FY 1978		(6) FY 1979		(7) SUBTOTAL FY 1975-79		(8) BALANCE TO COMPLETE		(9) * TOTAL EXCLUDING FY 1974 (Col. 7 & 8)	
	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays
	0	0	0	0	0	0	0	0	0	0	0	0

(See on Separate Sheet)

Page of

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**ENERGY RESEARCH & DEVELOPMENT FACT SHEET (Continued)**

DETAIL OF FUNDING REQUIREMENTS—Federal Government Only (In millions of dollars)

EQUIPMENT

ITEM <i>(Each item not to exceed 60 characters and spaces)</i>	(1) FY 1974 (Non-Add)		(2) FY 1975		(3) FY 1976		(4) FY 1977	
	Obis.	Outlays	Obis.	Outlays	Obis.	Outlays	Obis.	Outlays
	<b>TOTAL (Carry forward to summary sheet) ▶</b>	<b>0.0</b>	<b>0.1</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>
major performing organization, at equipment funds, with a separate tion of each item of equipment be half million dollars or more.								
CO <sub>2</sub> Cycle	.04	.04	0.2	0.2	0.2	0.2	0.2	0.2
Thermionics	.03	.03	0.1	0.1	0.1	0.1	0.1	0.
Thermoelectric Materials	.02	.02	0.1	0.1	0.1	0.1	0.1	0.
Other	.01	.01	0.1	0.1	0.1	0.1	0.1	0.

*(Continue on Separate SA)*

Level of Effort:  
 MAXIMUM  
 ORDERLY  
 MINIMUM

IDENTIFICATION NUMBER  
 0609550710550392

(4) FY 1977		(5) FY 1978		(6) FY 1979		(7) SUBTOTAL FY 1975-79		(8) BALANCE TO COMPLETE		(9) TOTAL EXCLUDING FY 1978 (Cols. 7 & 8)	
Obfs.	Outlays	Obfs.	Outlays	Obfs.	Outlays	Obfs.	Outlays	Obfs.	Outlays	Obfs.	Outlays
0.5	0.5	0.5	0.5	0.5	0.5	2.5	2.5	0	0	2.5	2.5
0.2	0.2	0.2	0.2	0.2	0.2	1.0	1.0	0	0	1.0	1.0
0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0	0	0.5	0.5
0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0	0	0.5	0.5
0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0	0	0.5	0.5

2

TABLE SHEET

1. IDENTIFICATION NUMBER

**a. PROPOSAL**

**b. SUBMITTER**

**c. PROJECT TITLE AND AGENCY**

**d. SUBJECT**

**CONTRACTOR ADDRESS**

(No more than 42 characters and spaces for name of contractor; use standard abbreviations for state up to 16 characters and spaces for county).

NAME OF CONTRACTOR: \_\_\_\_\_

Site where work will be performed: State: \_\_\_\_\_ County: \_\_\_\_\_

NAME OF CONTRACTOR: \_\_\_\_\_

Site where work will be performed: State: \_\_\_\_\_ County: \_\_\_\_\_

NAME OF CONTRACTOR: \_\_\_\_\_

Site where work will be performed: State: \_\_\_\_\_ County: \_\_\_\_\_

NAME OF CONTRACTOR: \_\_\_\_\_

Site where work will be performed: State: \_\_\_\_\_ County: \_\_\_\_\_

**BRIEF DESCRIPTION OF PROPOSAL**

(No more than 24 lines of text and no more than 70 characters and spaces per line)

Briefly outline nature and scope of work to be undertaken, including any raw facilities which may have to be acquired or constructed.

A five year analytical and experimental program to conduct basic research and development on a number of advanced energy conversion methods for eventual use in high-efficiency central station, decentralized and small power plants.

6. JUSTIFICATION (Use a separate sheet). See item 6 on Instruction Sheet

7. MAJOR RESOURCE REQUIREMENTS

RESOURCE	FISCAL YEAR	1975	1976	1977	1978	1979
a. MANPOWER (in man years)	(1) Scientific	48	48	48	48	48
	(2) Technical	24	24	24	24	24
	(3) Support	8	8	8	8	8
	(4) Other					
b. RAW MATERIALS (List materials and units of measure below, such as tons of coal, barrels of oil, kilograms of uranium, etc. Show amount of each in column of right.)		N/A	N/A	N/A	N/A	N/A
c. LAND AREA REQUIRED (in acres)	(1) Govt owned					
	(2) Consigned					
	(3) Privately owned	N/A	N/A	N/A	N/A	N/A
	(4) Other					
d. OTHER RESOURCES NEEDED						

<b>STUDY AGENCY</b> NAME AGENCY NIT TITLE AND SITE (has 42 characters and name of contractor; not abbreviations for state; has letters and spaces for)	NAME OF CONTRACTOR: Site where work will be performed		State:	County:
	NAME OF CONTRACTOR: Site where work will be performed		State:	County:
	NAME OF CONTRACTOR: Site where work will be performed		State:	County:
	NAME OF CONTRACTOR: Site where work will be performed		State:	County:
	NAME OF CONTRACTOR: Site where work will be performed		State:	County:
	NAME OF CONTRACTOR: Site where work will be performed		State:	County:
	NAME OF CONTRACTOR: Site where work will be performed		State:	County:
	NAME OF CONTRACTOR: Site where work will be performed		State:	County:
	NAME OF CONTRACTOR: Site where work will be performed		State:	County:
	NAME OF CONTRACTOR: Site where work will be performed		State:	County:

**DESCRIPTION OF PROJECT**  
 (has 74 lines of text or more than 70 characters per line)  
 Brief nature and scope to be undertaken, any new facilities to be acquired, etc.

A five year analytical and experimental program to conduct basic research and development on a number of advanced energy conversion methods for eventual use in high-efficiency central station, decentralized and small power plants.

2

ATTENTION (Use a separate sheet(s). See Item 6. on Instruction Sheet.)

**7. MAJOR RESOURCE REQUIREMENTS**

FISCAL YEAR	1975	1976	1977	1978	1979
(1) Scientific	48	48	48	48	48
(2) Technical	24	24	24	24	24
(3) Support	8	8	8	8	8
(4) Other					
<b>MATERIALS</b> (Show amount of materials and units of materials, such as tons of oil, kilograms of material, etc.)	N/A	N/A	N/A	N/A	N/A
(1) Govt-owned					
(2) Govt-leased					
(3) Privately owned	N/A	N/A	N/A	N/A	N/A
(4) Other					
<b>RESOURCES NEEDED</b> (Show amount and unit of resources needed)					



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county.

PERFORMED:

NAME OF CONTRACTOR:

Site where work will be performed    State:    County:

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NAME OF CONTRACTOR:

Site where work will be performed    State:    County:

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NAME OF CONTRACTOR:

Site where work will be performed    State:    County:

**BRIEF DESCRIPTION OF PROPOSAL**

*(No more than 24 lines of text and no more than 70 characters and spaces per line)*

Briefly outline nature and scope of work to be undertaken, including any new facilities which may have to be acquired or constructed.

A five year analytical and experimental program to conduct basic research and development on a number of advanced energy conversion methods for eventual use in high-efficiency central station, decentralized and small power plants.

**6. JUSTIFICATION** (Use a separate sheet(s). See Item 6. on Instruction Sheet.)

**7. MAJOR RESOURCE REQUIREMENTS**

RESOURCE	FISCAL YEAR	1975	1976	1977	1978	1979
a. MANPOWER <i>(in man years)</i>	(1) Scientific	48	48	48	48	48
	(2) Technical	24	24	24	24	24
	(3) Support	8	8	8	8	8
	(4) Other					
b. RAW MATERIALS <i>(List materials and units of measure below, such as tons of coal, barrels of oil, kilograms of uranium, etc. Show amount of each in columns at right.)</i>		N/A	N/A	N/A	N/A	N/A
c. LAND AREA REQUIRED <i>(in acres)</i>	(1) Govt-owned					
	(2) Govt-leased					
	(3) Privately-owned	N/A	N/A	N/A	N/A	N/A
	(4) Other					
d. OTHER RESOURCES NEEDED <i>(Specify item and unit of measure below. Show quantity of each in columns at right.)</i>		None	None	None	None	None
(1)	(1)					

**3**

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performed

NAME OF CONTRACTOR:

Site where work will be performed State: County:

NAME OF CONTRACTOR:

Site where work will be performed State: County:

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A five year analytical and experimental program to conduct basic research and development on a number of advanced energy conversion methods for eventual use in high-efficiency central station, decentralized and small power plants.

(separate sheet(s). See Item 6. on Instruction Sheet.)

7. MAJOR RESOURCE REQUIREMENTS

YEAR	1975	1976	1977	1978	1979
Manpower	48	48	48	48	48
Material	24	24	24	24	24
Money	8	8	8	8	8
Other					
of tons of cans of unit of ( )	N/A	N/A	N/A	N/A	N/A
Owned					
Leased					
Partly-owned	N/A	N/A	N/A	N/A	N/A
NEEDED if quantity not	None	None	None	None	None

(1)

4

## ENERGY RESEARCH AND DEVELOPMENT FACT SHEET (Continued)

Level of Effort:

- MAXIMUM  
 ORDERLY  
 MINIMUM

IDENTIFICATION NUMBER

0609550710550302

**JUSTIFICATION:** State the specific energy problem or objective, and specify how the proposal will contribute to the solution of the problem or attainment of the objective. Include reasons for selecting the recommended approach over other alternatives. Also include the benefits expected to be derived from meeting the objectives or solving the problems for which the project is proposed. Outline the risks/uncertainties (R/U), plans to minimize R/U, and basis for proceeding in face of R/U. Quantitative data should be used to the fullest extent.

The objective of this subprogram is to increase the efficiency of energy conversion from to electricity in central station, decentralized station and small special application plants. There are a number of advanced energy conversion devices and concepts that have the potential for higher conversion efficiencies over existing systems. These conversion systems include the Feher (CO<sub>2</sub>) cycle, Thermionics, Thermal Oscillators, Thermogalvanic Cells and Advanced Thermoelectric Materials. The Feher (CO<sub>2</sub>) cycle and Thermionic Conversion receive the highest priority under this subprogram because of their potential impact on large power systems. The CO<sub>2</sub> cycle system appears to offer efficiencies in the 40% to 50% range for temperatures about 1200°F. Thermionic topping cycles have the indicated potential of increasing the conversion efficiencies of conventional plants from present values of 30 to 40% to the range of 40 to 50%. Because of the modularity of a thermionic system, efficiency of a thermionic conversion system is relatively independent of power level, thus, thermionics may be applied to various types of decentralized power conversion.

Other conversion techniques such as Thermal Oscillators, Thermogalvanic Cells and Advanced Thermoelectric Materials have the potential of increasing the efficiencies of small power plants.

All of these conversion techniques have technical uncertainties involving materials and/or engineering fixes. This program does not involve large pilot or demonstration plants but rather research-oriented tasks and therefore the risks are minimal compared to the potential return.

## RESEARCH AND DEVELOPMENT FACT SHEET (Continued)

Level of Effort:

- MAXIMUM  
 ORDERLY  
 MINIMUM

IDENTIFICATION NUMBER

0609550710550302

NOTE: State the specific energy problem or objective, and specify how the proposal will contribute to the solution of the problem and its objectives. Include reasons for selecting the recommended approach over other alternatives. Also include the benefits to be derived from meeting the objectives or solving the problems for which the project is proposed. Outline the risks/uncertainties, minimize R/U, and basis for proceeding in face of R/U. Quantitative data should be used to the fullest extent.

Objective of this subprogram is to increase the efficiency of energy conversion from heat to electricity in central station, decentralized station and small special application power systems. There are a number of advanced energy conversion devices and concepts that have potential for higher conversion efficiencies over existing systems. These conversion devices include the Fehér (CO<sub>2</sub>) cycle, Thermionics, Thermal Oscillators, Thermogalvanic Cells and Advanced Thermoelectric Materials. The Fehér (CO<sub>2</sub>) cycle and Thermionic Conversion are the highest priority under this subprogram because of their potential impact on power systems. The CO<sub>2</sub> cycle system appears to offer efficiencies in the 40% to 50% at temperatures about 1200°K. Thermionic topping cycles have the indicated potential of increasing the conversion efficiencies of conventional plants from present values of 30% to the range of 40 to 50%. Because of the modularity of a thermionic system, the flexibility of a thermionic conversion system is relatively independent of power level, and thermionics may be applied to various types of decentralized power conversion.

Conversion techniques such as Thermal Oscillators, Thermogalvanic Cells and Advanced Thermoelectric Materials have the potential of increasing the efficiencies of small power systems.

These conversion techniques have technical uncertainties involving materials and/or engineering fixes. This program does not involve large pilot or demonstration plants but is research-oriented tasks and therefore the risks are minimal compared to the potential

2

**ENERGY RESEARCH AND DEVELOPMENT FACT SHEET (Continued)**

**MODULE** *(Include major facilities and major equipment. Indicate dates by Fiscal Year and Quarter).*

**a. DEVELOPMENT MILESTONES** *(number each consecutively)*

*(Limit Title of Milestone to 60 characters and spaces)*

**b. DATES**

Start		Complete	
FY	Q	FY	Q

- 1. diverse nature of this subprogram precludes specific development milestones.
- 2. program would consist of analysis, design studies, and experimental programs to investigate key issues of feasibility.
- 3. Init Program Plan for different areas of investigation.
- 4. Major facilities or major equipment will be required.

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*(Continue to next column)*

Level of Effort:

- MAXIMUM
- ORDERLY
- MINIMUM

IDENTIFICATION NUMBER

0609550710550302

a. DEVELOPMENT MILESTONES (continued)

(Limit Title of Milestone to 60 characters and spaces)

b. DATE

Start	Complete		
FY	Q	FY	Q

Complete  
C.

(Continue on separate sheet)

Page of

2



**9. SUMMARY OF FUNDING REQUIREMENTS—Federal Government Only (in millions of dollars)**

Requirement	(1)		(2)		(3)		(4)		Cl
	FY 1974 (Non-Add)		FY 1975		FY 1976		FY 1977		
	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	
a. OPERATING (See p. for detail) Total Operating Requirements (from Detail Sheet)	1.9	1.9	4.8	4.8	4.8	4.8	4.8	4.8	4.
b. CONSTRUCTION (See p. for detail) Total Construction Requirements (from Detail Sheet)	0	0	0	0	0	0	0	0	
c. EQUIPMENT (See p. for detail) Total Equipment Requirements (from Detail Sheet)	.1	.1	.2	.2	.2	.2	.2	.2	
d. GRAND TOTAL—OBLIGATIONS	2.0		5.0		5.0		5.0		5.
e. GRAND TOTAL—OUTLAYS		2.0		5.0		5.0		5.0	

... .. indicates the amount for use of both private and Federal government funds. A brief description of

LEVEL OF FUNDING

- MAXIMUM
- ORDINARY
- MINIMUM

IDENTIFICATION NUMBER

0509550710550322

(4) FY 1977	(5) FY 1978		(6) FY 1979		(7) Subtotal FY 1975-79		(8) Subject To Complete		(9) Total Available FY 1975-79		
	Outlays	Obli.	Outlays	Obli.	Outlays	Obli.	Outlays	Obli.	Outlays	Obli.	Outlays
.8	4.8	4.8	4.8	4.8	4.8	24.0	24.0	0	0	25.0	24.0
0	0	0	0	0	0	0	0	0	0	0	0
.2	.2	.2	.2	.2	.2	1.0	1.0	0	0	1.0	1.0
0		5.0		5.0		25.0		0		25.0	
	5.0		5.0		5.0		25.0		0		25.0

Brief description of the Cooperative programs and the rationale for the division of funding

2

**ENERGY RESEARCH AND DEVELOPMENT FACT SHEET (Continued)**

DETAIL OF FUNDING REQUIREMENTS—Federal Government Only (In millions of dollars)

OPERATING		(1)		(2)		(3)		FY
		FY 1974 (Non-Add)		FY 1975		FY 1976		
ITEM		Obt.	Outlays	Obt.	Outlays	Obt.	Outlays	Obt.
		<b>TOTAL (Carry forward to summary sheet)</b>		<b>2.0</b>	<b>2.0</b>	<b>5.0</b>	<b>5.0</b>	<b>5.0</b>
Name of Performing Organization:								
CO <sub>2</sub> Cycle	MANPOWER							
	MATERIALS							
	MAJOR PROCUREMENTS							
	ALL OTHER							
<b>TOTAL FOR THIS PERFORMING ORGANIZATION</b>		<b>0.5</b>	<b>0.5</b>	<b>2.0</b>	<b>2.0</b>	<b>2.0</b>	<b>2.0</b>	<b>2.0</b>
Name of Performing Organization:								
Thermionics	MANPOWER							
	MATERIALS							
	MAJOR PROCUREMENTS							
	ALL OTHER							
<b>TOTAL FOR THIS PERFORMING ORGANIZATION</b>		<b>0.7</b>	<b>0.7</b>	<b>1.3</b>	<b>1.3</b>	<b>1.3</b>	<b>1.3</b>	<b>1.3</b>
Name of Performing Organization:								
thermoelectric Materials	MANPOWER							
	MATERIALS							
	MAJOR PROCUREMENTS							
	ALL OTHER							
<b>TOTAL FOR THIS PERFORMING ORGANIZATION</b>		<b>0.4</b>	<b>0.4</b>	<b>0.7</b>	<b>0.7</b>	<b>0.7</b>	<b>0.7</b>	<b>0.7</b>
Name of Performing Organization:								
Other	MANPOWER							
	MATERIALS							
	MAJOR PROCUREMENTS							
	ALL OTHER							
<b>TOTAL FOR THIS PERFORMING ORGANIZATION</b>		<b>0.4</b>	<b>0.4</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>

(Continue on Separ

Level of Effort:

- MAXIMUM
- ORDERLY
- MINIMUM

IDENTIFICATION NUMBER

0609559710550300

(3) FY 1976		(4) FY 1977		(5) FY 1978		(6) FY 1979		(7) SUBTOTAL FY 1975-79		(8) BALANCE TO COMPLETE		(9) TOTAL EXCLUDING FY 1974 (Cols. 7 & 8)	
Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays
5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	25.0	25.0	0	0	25.0	25.0
2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	10.0	10.0	0	0	10.0	10.0
1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	6.5	6.5	0	0	6.5	6.5
.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	3.5	3.5	0	0	3.5	3.5
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	5.0	5.0	0	0	5.0	5.0

(Continue on Separate Sheet)

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2

**ENERGY RESEARCH & DEVELOPMENT FACT SHEET (FORM 2000)**

**1. DETAIL OF FUNDING REQUIREMENTS—Federal Government Only (in millions of dollars)**

**b. CONSTRUCTION**

ITEM	(1) FY 1974 (Non-Add)		(2) FY 1975		(3) FY 1976				
	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays			
<b>TOTAL (Carry forward to summary sheet)</b>	0	0	0	0	0	0			
<p><b>Title of project, Location (State and County) and Total Estimated Cost (TEC) (submit each item consecutively). Every project costing one million dollars or more should be separately identified with a brief statement of why it is required.</b></p> <p><b>TITLE OF PROJECT (Not to exceed 30 characters and spaces.)</b> ( )</p> <table border="1"> <tr> <td>State</td> <td>County</td> <td>TEC (in millions)</td> </tr> </table> <p>Statement:</p> <p align="center">No construction of facilities or large power plants contemplated in this time period.</p>	State	County	TEC (in millions)						
State	County	TEC (in millions)							
<p><b>TITLE OF PROJECT (Not to exceed 30 characters and spaces.)</b> ( )</p> <table border="1"> <tr> <td>State</td> <td>County</td> <td>TEC (in millions)</td> </tr> </table> <p>Statement:</p>	State	County	TEC (in millions)						
State	County	TEC (in millions)							
<p><b>TITLE OF PROJECT (Not to exceed characters and spaces.)</b> ( )</p> <table border="1"> <tr> <td>State</td> <td>County</td> <td>TEC (in millions)</td> </tr> </table> <p>Statement:</p>	State	County	TEC (in millions)						
State	County	TEC (in millions)							

(Continue on



**ENERGY RESEARCH & DEVELOPMENT FACT SHEET (Continued)**

SCHEDULE OF FUNDING REQUIREMENTS—Federal Government Only (In millions of dollars)

**EQUIPMENT**

ITEM <i>(Each item not to exceed 50 characters and spaces)</i>	(1) FY 1974 <i>(Non-Add)</i>		(2) FY 1975		(3) FY 1976		(4) FY 1977	
	Obis.	Outlays	Obis.	Outlays	Obis.	Outlays	Obis.	Outlays
	<b>TOTAL (Carry forward to summary sheet) ▶</b>	0.1	0.1	0.2	0.2	0.2	0.2	0.2
<i>(Each item not to exceed 50 characters and spaces)</i>								
major performing organization, if separate funds, with a separate line of each item of equipment of half million dollars or more.								
Cycle	.04	.04	.10	.10	.10	.10	.10	.10
ionics	.03	.03	.05	.05	.05	.05	.05	.05
semiconductor Materials	.02	.02	.03	.03	.03	.03	.03	.03
ET	.01	.01	.02	.02	.02	.02	.02	.02

*(Continue on Separate Sheet)*

Level of Effort:

- MAXIMUM
- ORDERLY
- MINIMUM

IDENTIFICATION NUMBER

0609550710550302

(3) 1976	(4) FY 1977		(5) FY 1978		(6) FY 1979		(7) SUBTOTAL FY 1975-79		(8) BALANCE TO COMPLETE		(9) TOTAL EXCLUDING FY 1974 (Cols. 7 & 8)	
	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	Obls.	Outlays	
0.2		0.2		0.2		0.2	1.0	1.0			1.0	1.0
.10	.10	.10	.10	.10	.10	.10	0.50	0.50			0.50	0.50
.05	.05	.05	.05	.05	.05	.05	0.25	0.25			0.25	0.25
.03	.03	.03	.03	.03	.03	.03	0.15	0.15			0.15	0.15
.02	.02	.02	.02	.02	.02	.02	0.10	0.10			0.10	0.10

(Continue on Separate Sheet)

Page of

2



First Priority:

Low-BTU Gasification of Coal

Gas Turbines

Second Priority:

MHD

Potassium Topping Cycle

Fuel Cells

Third Priority:

Use of Waste Fuel

Advanced Concepts

Enabling Technology

2. INDUSTRIAL CONTRIBUTION

In these programs, the level of industrial contribution will vary over the program's life, depending on the degree of technical risk, on the amount of investment required, and on the time required for financial return on the investment. Until technical feasibility has been demonstrated, little, if any, industrial contribution is likely. Based on discussions with industrial representatives and on past experience, industrial contribution to the pilot stage will be approximately 25 percent, for by this stage the risks and time to financial return are diminishing.

The demonstration plants will be built at sites selected by a consortium of electric utilities. One of these utilities will operate the plant and market the power generated. The cooperating utilities are anticipated to make large contributions toward the construction of the plant, approximately 50 percent.

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