N76 12479

STATUS OF ERDA-DOD APPLICATIONS PLANS

Title of Project: DOD PHOTOVOLTAICS DEMONSTRATION STUDY

Period of Contract: 7 July - 2 August 1975

Value of Contract: $30,000

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Presented on 23 July 1975 at

NATIONAL SOLAR PHOTOVOLTAIC PROGRAM

REVIEW MEETING

Los Angeles, California

The Army Mobility Equipment Research and Development Center (USAMERDC) is presently conducting a one month DOD Demonstration Study sponsored by ERDA. The objective of this study effort is to produce a demonstration program which will define the role of Solar Terrestrial Photovoltaic (P/V) systems as power sources for DOD applications. To accomplish this goal, numerous potential demonstrations of DOD applications are being identified and analyzed. After the best demonstration projects are selected, the P/V power source requirements and an implementation plan for each demonstration project will be developed.

USAMERDC has been assigned DOD program management responsibility for investigation of terrestrial applications of solar P/V devices. This assignment includes the study which is the subject of this paper as well as conducting the demonstrations evolving from the study. In addition, USAMERDC has been tasked to establish a Tri-Service coordinating mechanism relative to application of P/V devices and has been funded for a study to identify early market potential for P/V devices within DOD.

In spite of limited experience in Solar P/V devices, USAMERDC is well qualified to perform the P/V activity outlined above. One of USAMERDC's primary missions is R&D in Electric Power Generation and Distribution. Of particular significance are major R&D activities in power conditioning and energy storage. Expertise and experience in these technologies will be most beneficial in establishing requirements for P/V power sources.

DOD is dedicated to conservation of energy and reduction of dependence on hydrocarbon fuel. The military is also interested in determining applications where P/V offers a tactical advantage. There may also be applications which prove cost effective, such as remote locations which have a high logistics burden due to resupply of fuel. Characteristics of P/V systems which make them attractive to the military for electric power sources include high reliability, low maintenance, unattended operation, long life, silent operation and reduced logistics.

ERDA is committed to purchase 90 KW of P/V power systems which will be supplied to DOD for demonstrations to provide DOD with a basis for future military utilization of P/V devices. Two 3 KW systems will be available on 1 January 1976 for installation in the selected demonstration projects. Two 12 KW systems will be provided on 1 April, and the final 60 KW system will be supplied in August 1976.

USAMERDC's study approach is to initially identify multiple DOD applications, analyze their power system requirements relative to use of P/V units, and recommend the most promising

applications to DOD and ERDA for selection of the demonstration projects. A preliminary systems analysis will be performed and an implementation plan will be developed for each of the selected projects. The final task will be the preparation of a report summarizing results of the study.

The first two weeks of the study were primarily devoted to identifying potential applications of P/V power sources and developing evaluation criteria. Numerous agencies have been contacted and there has been good response at all levels; potential applications have been provided by all the Services. Candidate demonstration systems and locations are being analyzed using the derived evaluation criteria. Technical data regarding available batteries and power conditioning devices are being accumulated. The most promising demonstration candidates in each of the three power sizes (3 KW, 12 KW, and 60 KW) will be submitted by 25 July. Following selection of the demonstration projects the systems engineering, systems analysis, and implementation plan for each project will be initiated.

The evaluation criteria place emphasis on military market potential and military advantages. The military market potential is an indicator of both potential energy savings and production base potential. The application should benefit from use of a P/V power source; there should be an improved mission capability. In addition to the above primary considerations, the suitability of P/V to integration with the load utilizing available storage and power conditioning equipment is important. Candidates are also being evaluated to determine if there are similar applications in the civilian sector and their potential for an impressive demonstration which can readily "sell" the advantages of utilizing P/V in military applications.

USAMERDC's projected role in the DOD demonstration program includes:

a. Assisting in development, fabrication and assembly of the Photovoltaic power source.

b. Installation of the power system at the demonstration site and integration of it with the load.

c. Operation and maintenance of each demonstration project.

d. Monitoring system performance for at least 12 months to determine capability of P/V source to provide sufficient power to required quality, as dictated by the using equipment.

e. Evaluation of the P/V power system's design using recorded data; determine if there is adequate or surplus storage and/or array, etc.

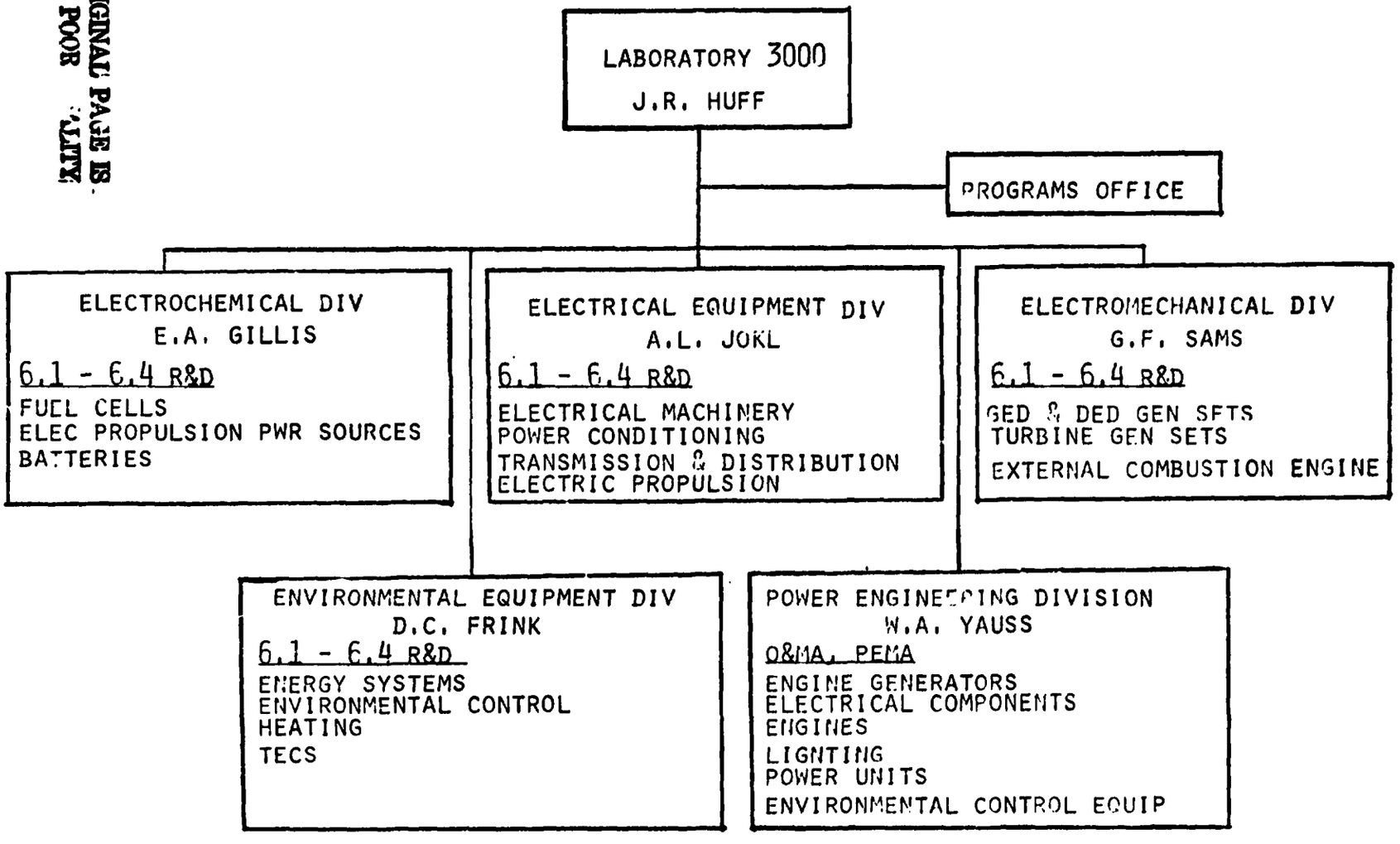
DOD PHOTOVOLTAICS DEMONSTRATION STUDY

PERFORMED BY: U.S. ARMY MOBILITY EQUIPMENT RESEARCH & DEVELOPMENT CENTER
FORT BELVOIR, VIRGINIA

STUDY DURATION: 7 JULY 1975 - 2 AUGUST 1975

AMOUNT: $30,000

PRINCIPAL INVESTIGATORS: RICHARD T. SALE
EDWARD A. GILLIS



ACTIVE TECHNICAL AREAS

- ENERGY STORAGE
  - MAGNETIC
  - PNEUMATIC
  - BATTERY
  - FLYWHEEL
  - HYDROGEN
- STORAGE CONVERTERS
  - FUEL CELL
  - ROTATING ELECTRICAL MACHINE
  - HEAT ENGINE
- POWER CONDITIONING

MILITARY INTEREST IN PHOTOVOLTAICS

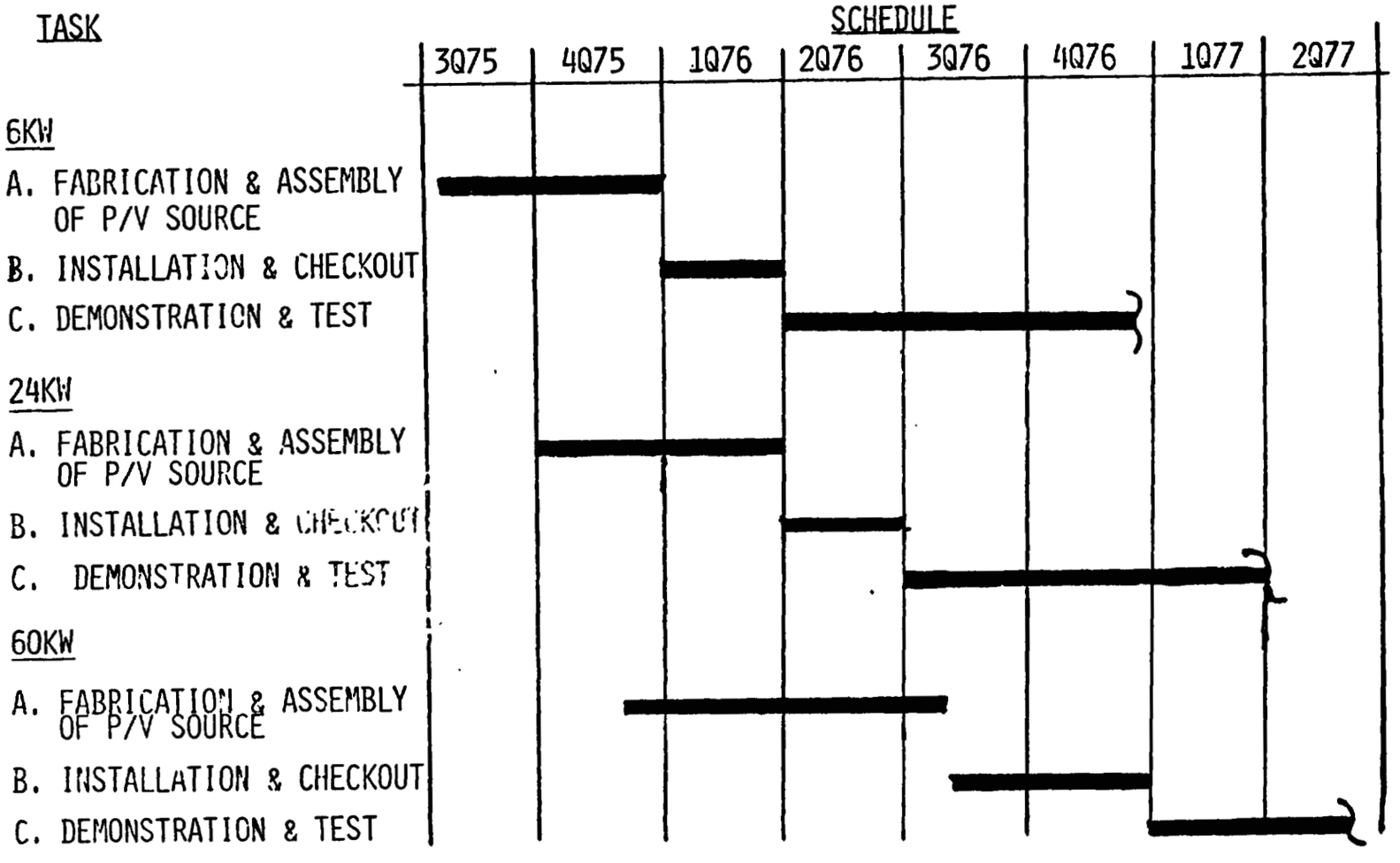
- CONSERVE ENERGY - REDUCE DEPENDENCE ON POL
- APPLICATIONS WHICH RESULT IN TACTICAL ADVANTAGES - INCREASE ABILITY TO PERFORM MISSION
- APPLICATIONS WHICH ARE COST EFFECTIVE - SUCH AS REMOTE SITES WHERE LOGISTICS BURDEN CAN BE SUBSTANTIALLY REDUCED
- P/V CHARACTERISTICS WHICH OFFER ADVANTAGES FOR SELECTED MILITARY APPLICATIONS
    - HIGH RELIABILITY, LOW MAINTENANCE
    - UNATTENDED OPERATION
    - LONG LIFE
    - SILENT
    - REDUCED LOGISTICS
- INCREASE PRODUCTION BASE TO ENHANCE PRIVATE SECTOR USAGE AND INCREASE AVAILABILITY OF PETROLEUM FOR CRITICAL MILITARY APPLICATIONS

SOLAR ELECTRIC POWER

DOD PROGRAM MANAGEMENT RESPONSIBILITY

- MARKET SURVEY
- DEMONSTRATION
- TRI-SERVICE COORDINATION

DOD DEMONSTRATION PROGRAM - 90KW



OBJECTIVES

- DEFINE DEMONSTRATION PROJECTS OF SOLAR TERRESTRIAL PHOTOVOLTAICS AS A POWER SOURCE FOR DOD APPLICATIONS

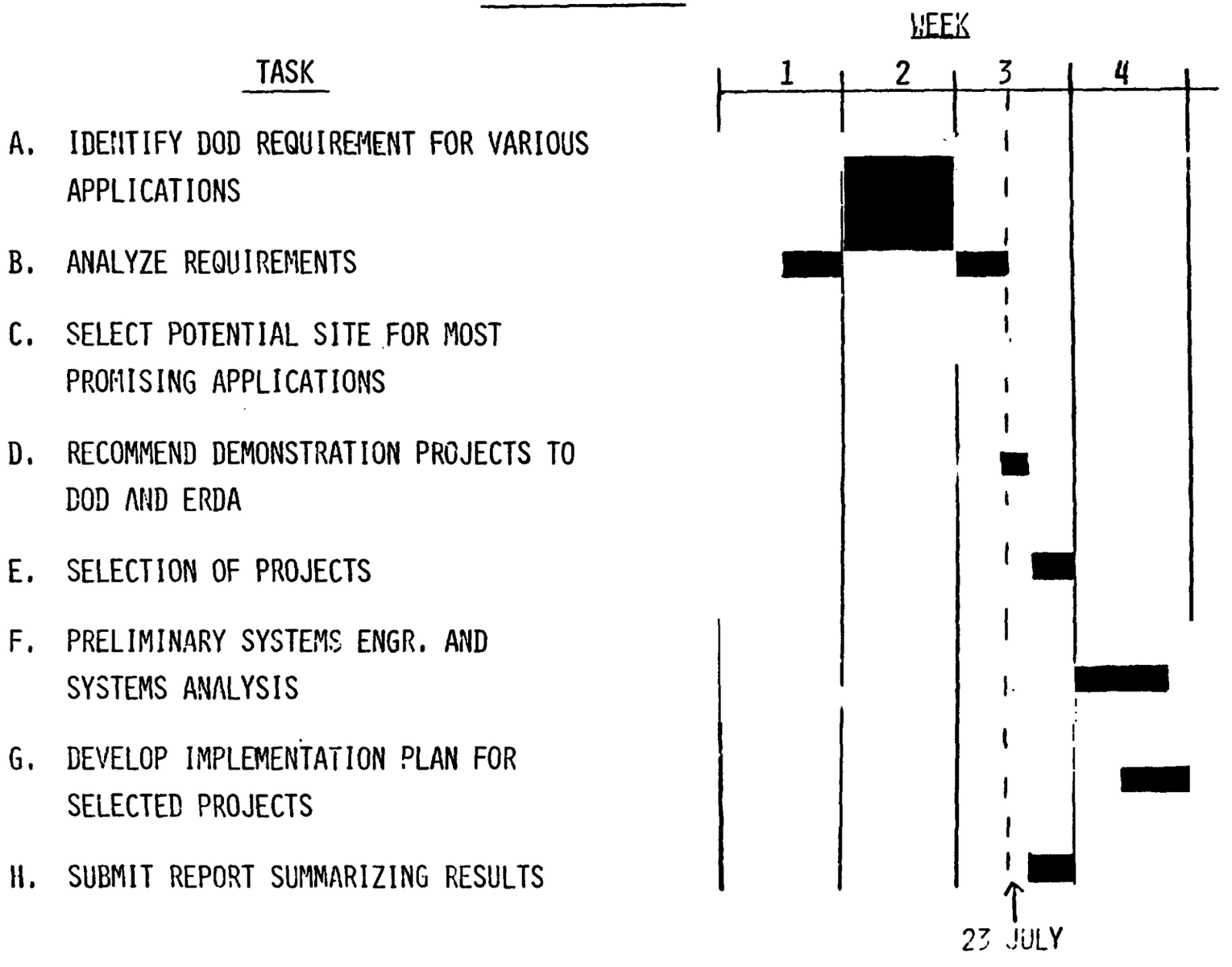
- SELECT DEMONSTRATION PROJECTS WHICH OFFER HIGH POTENTIAL MILITARY PAYOFF

- PROVIDE HARDWARE AND SYSTEM REQUIREMENTS NECESSARY TO DEVELOP AND ASSEMBLE THE COMPLETE P/V POWER SOURCE FOR EACH DEMONSTRATION PROJECT

STUDY APPROACH

- IDENTIFY DOD SYSTEMS REQUIREMENTS
- ANALYZE POWER SYSTEM REQUIREMENTS RE APPLICATION OF P/V POWER SOURCES
- SUBMIT RECOMMENDED APPLICATIONS TO DOD AND ERDA FOR SELECTION OF DEMONSTRATION PROJECTS
- DEVELOP IMPLEMENTATION PLAN FOR EACH SELECTED DEMONSTRATION PROJECT
- PREPARE REPORT

STUDY SCHEDULE



STATUS

- NUMEROUS APPLICATIONS IDENTIFIED BY DOD AGENCIES
- EVALUATION CRITERIA DEVELOPED
- CANDIDATE SYSTEMS ANALYZED
- RATIONALE SUPPORTING RELATIVE RATINGS OF APPLICATIONS BEING DOCUMENTED
- POWER CONDITIONING AND STORAGE DATA BEING ACCUMULATED
- RECOMMENDED LOCATION OF DEMONSTRATION PROJECTS BEING FINALIZED
- MOST PROMISING CANDIDATES FOR DEMONSTRATION PROJECTS WILL BE SUBMITTED BY 25 JULY

AGENCIES CONTACTED

DOD

- OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE FOR INSTATLLATIONS AND LOGISTICS
- COORDINATORS FOR ENERGY - ARMY, NAVY, AIR FORCE
- PROJECT MANAGER - MOBILE ELECTRIC POWER
- DEFENSE COMMUNICATIONS AGENCY

ARMY

- CORPS OF ENGINEERS
- HARRY DIAMOND LABORATORIES
- ELECTRONICS COMMAND
- NIGHT VISION LABORATORY
- ARMY SECURITY AGENCY
- SHARPE DEPOT
- MASSTER
- AVIATION COMMAND
- MISSILE COMMAND
- ARMAMENTS COMMAND
- PICATINNY ARSENAL
- FRANKFORD ARSENAL

AGENCIES CONTACTED (CONTINUED)

NAVY

- NAVAL RESEARCH LABORATORY (ACTING AS FOCAL POINT FOR OTHER ORGANIZATIONS)
- NAVAL WEAPONS CENTER
- NAVAL ELECTRONICS LABORATORY
- NAVAL CIVIL ENGINEERING LABORATORY

AIR FORCE

- WRIGHT PATTERSON AFB, PROPULSION LAB
- CIVIL ENGINEERING OFFICE (PENTAGON)
- AIR FORCE ACADEMY
- TYNDALL AFB
- BOLLING AFB

MARINE CORPS

- CONCEPTS AND ANALYSIS BRANCH
- MOBILE ELECTRIC POWER GROUP
- COMMAND, CONTROL AND COMMUNICATIONS (QUANTICO)

NASA - LEWIS

JPL

EVALUATION CRITERIA

- PRIMARY IMPORTANCE
  - MILITARY MARKET POTENTIAL
  - MILITARY ADVANTAGES
- SECONDARY IMPORTANCE
  - SUITABILITY AS A POWER SOURCE RELATIVE TO LOAD AND DEPLOYMENT
- OTHER CONSIDERATIONS
  - SIMILAR CIVILIAN APPLICATIONS
  - IMPRESSIVE DEMONSTRATION

EXAMPLES OF APPLICATIONS SUBMITTED

6 KW

- CATHODIC PROTECTION
- NIGHT VISION DEVICES
- RADIOS

24 KW

- INSTRUMENT LANDING SYSTEM
- WATER WELL PUMP
- WATER PURIFICATION

60 KW

- REMOTE RADAR SITE
- HELOSHED, MOBILE COMMUNICATIONS UNIT
- WAREHOUSE (FORKLIFT BATTERIES)

USAMERDC PROJECTED EFFORT IN DEMONSTRATIONS

- ASSIST IN DEVELOPMENT, FABRICATION AND ASSEMBLY OF P/V POWER SOURCE
- INSTALLATION AND INTEGRATION
- OPERATE AND MAINTAIN EACH DEMONSTRATION SYSTEM
- MONITOR SYSTEM PERFORMANCE, ADEQUACY OF SOURCE TO MEET LOAD REQUIREMENTS
- EVALUATE POWER SYSTEM DESIGN