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THE NATIONAL SOLAR ENERGY RESEARCH INSTITUTE:  
FUNCTION, ORGANIZATION, AND THE FIRST SIX MONTHS

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Abstract

The role of the Solar Energy Research Institute (SERI) in the national solar program is discussed. A brief history of developments leading to the formation of SERI is included. Functional responsibilities, organization and the current plans for staff and facilities growth are addressed.

1. INTRODUCTION

The formation of the National Solar Energy Research Institute (SERI) was mandated by the U.S. Congress for two major reasons. First, SERI is to provide support to the national program of research, development, demonstration, and deployment of solar energy technology. Second, SERI was created to contribute to the development of a solar energy industrial base to foster the widespread commercial use of the technology.

A comprehensive discussion of SERI and its role in the national solar energy program is contained in the SERI Mission Definition Report, which should be released by the Department of Energy (DOE) in December 1977 or January 1978. The SERI Mission Definition Report addresses the need for SERI, its objectives and scope, functional responsibilities, organization, operational plans, and the contribution SERI can be expected to make to the commercial development of solar energy. This paper presents much less detailed description of SERI and is not intended to either replace or adequately summarize all the topics addressed in the SERI Mission Definition Report. Rather, this paper is designed to introduce SERI to the research community represented at the Rolla energy conference.

The paper is organized into seven sections.

Following the introduction, the history of SERI is briefly addressed in Section 2. SERI's functional responsibilities and organization are discussed in Sections 3 and 4, respectively. Staffing and facilities are outlined in Section 5. A summary is contained in Section 6.

2. A BRIEF HISTORY OF SERI

In 1973, federal support for solar energy was centered in the National Science Foundation (NSF). In that year, the NSF budget for solar energy was \$3.96 million. A number of important events in 1973 and 1974, highlighted by the Mideast oil embargo, brought developing energy problems in the United States into sharp focus. In response to these developments, Congress passed several laws dealing with energy soon after the embargo. One of these laws was The Solar Energy Research, Development, and Demonstration Act of 1974 (PL 93-473). One of the objectives of this Act was to develop solar energy as viable future source for U.S. energy needs. Section 10 of the Act mandated the creation of the Solar Energy Research Institute. Section 10 of the law states:

"There is established a Solar Energy Research Institute, which shall perform such research, development, and related functions as the Chairman may determine to be necessary or appropriate in connection

with the Project's activities under this Act or to be otherwise in furtherance of the purpose and objectives of this Act."

The term "Project" refers to the Solar Energy Coordination and Management Project specified in the Act, an activity subsequently assumed by the Division of Solar Energy in the Energy Research and Development Administration (ERDA).

Most activities to plan the creation of SERI were centered at the Energy Research and Development Administration. Subsequent solar laws such as The Solar Heating and Cooling Demonstration Act of 1974 (PL 93-409), The Energy Reorganization Act of 1974 (PL 93-438), The Federal Non-Nuclear Energy Research and Development Act of 1974 (PL 93-577) provided additional guidelines for the creation of SERI. The ERDA planning effort to create SERI centered around two commissioned studies on the subject and Congressional oversight hearings on the role of SERI. The first study was awarded to the National Academy of Sciences<sup>1/</sup> and the second was undertaken by the Mitre Corporation.<sup>2/</sup> The objective of the National Academy of Sciences study was to examine the critical issues related to SERI and make recommendations concerning its mission, scope, and organization. The Mitre study was commissioned to assess the views of industry concerning the role and organization of SERI.

As the result of the commissioned studies and Congressional hearings, ERDA issued a request for proposals for SERI on March 12, 1976. The request called for proposals offering a combined manager-operator for SERI and an initial site with an option for the future site. The request was based, in part, on the decision to proceed with the establishment of a single central Solar Energy Research Institute of sufficient size to provide a major national focus for solar energy efforts. The request also specified that at least 300 acres of land had to be made available to ERDA for the permanent site and both the

permanent and interim sites had to be reasonably close to an international airport.

In July 1976, ERDA received 20 proposals representing 16 states. After a good deal of evaluation and site visits to most of the proposals, the contract for operation and management of SERI was awarded to Midwest Research Institute in March 1977. Proposals were evaluated and compared in terms of the initial staff proposed, plans for staff expansion and the management procedures and personnel proposed. The permanent and interim site of SERI was to be located in Golden, Colorado. At the time of the award, it was decided that SERI regional centers should also be established. Soon after the award, it was decided that planning grants should be awarded to each of four regional centers. One of the purposes of the grants was to further define the roles of the regional centers in the national solar program.

### 3. SERI FUNCTIONS

The overall objective of SERI is to accelerate the commercial development of all solar technologies. The term "commercial development" refers to a long and complex process in which a technology or product moves from merely a research idea to widespread production and use by the private sector. The process can be visualized as containing four distinct phases. These phases include research, (in which scientific feasibility is determined), development, (in which engineering feasibility is established), demonstration, (in which engineering feasibility is tested and design improvements are made) and commercialization (in which the product reaches widespread production and use in the private sector). The term "solar technologies" refers to all solar conversion techniques including: solar heating and cooling, wind energy conversion, solar thermal electric conversion, photovoltaic, ocean thermal energy conversion, and biomass conversion.

In achieving its overall objective, SERI intends to act in three principal roles; evaluation, performance, and management. As an evaluator, SERI's role is to objectively evaluate the scope and direction of the national solar program and, where appropriate, suggest changes. As a performer, SERI is to function as a center of excellence in research, analysis and assessment, information dissemination, education and training, and commercialization. SERI's manager role is designed to assist the Department of Energy (DOE) in management of selected elements of the national solar program.

Thirteen functional responsibilities have been derived which allow SERI to meet its overall objective. Each of these functions can play an important role in one or more phases of the commercial development process. The discussions that follow outline SERI's role in each function.

### 3.1 RESEARCH

Research is the first and often the most critical phase in the solar energy commercialization process. SERI's function in this area is both supportive and contributive. As a contributor to national solar energy research, SERI research functions will initially focus on three solar conversion processes: photovoltaic, bio/chemical, and thermal conversion. These three processes were chosen primarily because of their near-term or high future energy potential and the pressing need for additional research. In a supportive role, the research function will provide expert advice and assessment in all phases of solar commercialization and take technical management responsibility for selected national solar programs. Advice concerning all solar technologies will directly contribute to other SERI functions, especially analysis and assessment.

### 3.2 ANALYSIS AND ASSESSMENT

SERI's analysis and assessment function is particularly significant to the success of the solar commercialization process. Continuous assessment during the research, development and demonstration phases of the commercialization process is needed (1) to insure that public resources are used in an efficient and effective manner and (2) to insure that research efforts are sensitive to market demands, such as cost, reliability, aesthetics, etc.

SERI is in a unique position to carry out a much-needed comprehensive and ongoing assessment function. Previous assessment efforts within the national solar program have primarily been limited in scope to a particular solar technology, commercialization barrier, or social problem. Very few studies have addressed all the solar options and adequately compared them to other energy alternatives. Even studies attempting broader perspectives have been limited to a single analysis completed over a short period of time. The capabilities gathered in the analysis and assessment area represent the first time a significant number of researchers have been permanently assembled who are solely dedicated to the study of social issues related to solar energy development.

### 3.3 PROGRAM EVALUATION

The Nation has only limited resources available to meet national goals. SERI, through its program evaluation function, serves as a social auditor to insure that public funds dedicated to solar energy are being spent in an effective and socially desirable manner.

SERI undertakes program evaluations at various levels of detail. Broad evaluations are initiated which compare solar energy to alternative energy sources such as coal or nuclear. These comparisons include initial assessments of the long-term consequences of alternative energy futures. More detailed comparisons of the relative attractiveness of

individual solar technologies (e.g. photovoltaics, solar thermal, solar satellites, etc.) are also undertaken. At another level of detail, individual programs relating to a single solar technology are evaluated to determine the appropriateness of program emphasis. Finally, comparisons and evaluations of individual research projects or proposals are completed to determine funding priorities.

#### 3.4 PROGRAM MANAGEMENT

One of SERI's primary Congressional mandates is to provide significant support to the national solar energy program. The most direct way to provide this support is through SERI's program management function. As a manager, SERI's function is to assist the Department of Energy in the technical and administrative management of selected elements of the national solar energy program.

#### 3.5 PROGRAM DEVELOPMENT

Similar to program management, SERI's program development function takes place during all phases of the solar commercialization process. However, program development differs from management in that it contributes to rather than supports the national solar energy program.

Ongoing research, assessment and program evaluation at SERI will highlight gaps in the national solar program and areas that are receiving insufficient or inappropriate support. SERI's role in program development will be to recommend changes or additions to the national solar program to better achieve national solar goals.

#### 3.6 COMMERCIALIZATION

In one sense, all of the activities at SERI are part of the commercialization function because SERI's primary goal is to accelerate the widespread commercial production and use of solar energy. However, the commercialization

function is usually more narrowly defined to include only the final steps in the commercialization process. Focus is placed on transferring technologies that are essentially ready for commercial application from the laboratory to privately owned manufacturing and production facilities.

The major problem faced by previous public sector organizations in promoting the commercial development of a technology has been the lack of communication and understanding of private sector users and producers. To overcome this problem, SERI's commercialization efforts include close attention to the problems faced by business and industry. Ongoing liaison is established with the private sector to insure that public sector actions are sensitive to the needs of all solar energy producer and user groups. Particular attention is given to assisting small business and selected institutions which are crucial to the success of the solar commercialization process.

#### 3.7 INFORMATION DISSEMINATION

The information dissemination function at SERI is extremely important as solar technologies advance from one phase of the commercialization process to the next. Information dissemination also plays a role in increasing the level of understanding among the participants within each phase of the process. Effective mechanisms are needed to collect and disseminate information to the participants in each sequential phase of the commercialization process, as well as within each phase.

Currently, information about solar energy is collected by numerous government agencies, contractors and other organizations. In most cases, this information is merely cataloged and distributed on request. The result is that (1) much of the available technical information is not translated into a form usable to a broad audience, and (2) conflicting information is not

interpreted for the user.

The formation of the Solar Energy Information Bank at SERI will play a key role in overcoming information problems. The information bank, mandated by Congress in Public Law 93-473, will represent the integration of all existing solar information and data resources into a single national system. In addition to coordinating this integration, SERI will supervise the development of any additional resources necessary to meet the information and data requirements of the solar community.

### 3.8 UNIVERSITY RESEARCH

Another important responsibility within SERI is the administration of federally funded solar energy research programs at universities. Physical, biological, engineering, and social science research projects related to solar energy are administered and supported.

One of the most effective means of moving a solar technology beyond the research phase of the commercialization process is to commit a broad range of talented researchers to the problem. Confining research responsibility to a single point of view can slow or even halt the technology's progress. Supporting and administering research at universities offers an opportunity to investigate alternative approaches to solving difficult research problems. SERI's functional responsibility is to foster the application of numerous approaches to solar research while coordinating this research to avoid unnecessarily redundancies.

### 3.9 EDUCATION AND TRAINING

The education and training function of SERI is also supportive to the more general information dissemination function. Its goal is to encourage, facilitate, and support the extensive involvement of the academic community in the national solar energy program. All levels of the academic community will be addressed, from

faculty and postdoctoral students at universities to high school teachers and students.

SERI's involvement in the education and training field will contribute to national solar energy goals by (1) expanding the energy technology information base, (2) helping to provide a continuous supply of all types of well-trained solar energy specialists for the expanding solar energy market, and (3) facilitate an extensive interchange of ideas and information between the academic, research, and policy making communities.

### 3.10 CONFERENCES AND WORKSHOPS

SERI's role in convening conferences and workshops is, to a large extent, supportive of the more general information dissemination function. While conferences and workshops serve as a vehicle for information dissemination, they also offer an opportunity for researchers within SERI to obtain outside opinions and possible new solutions to solar energy problems. Conferences and workshops can facilitate the rapid exchange of new ideas among SERI researchers and other solar energy specialists throughout the Nation and the world. Perhaps more importantly, conferences and workshops can stimulate dialogue between solar experts and those individuals who are not currently involved in solar energy but ultimately will be key figures in the commercial production and utilization of the resource.

### 3.11 INTERNATIONAL PROGRAMS

The energy resource most abundantly available in almost every country of the world is some form of solar energy. This resource can take the form of direct solar radiation, wind, ocean thermal gradients, biomass, and wave or tidal power. Because the resource and the need to utilize it are not constrained by national boundaries, research programs must also be international in nature.

SERI's national prominence as a center of

excellence in solar energy research and assessment provides a natural setting to facilitate solar related international programs. These programs are carried out effectively at SERI because of their close relationship to SERI's information dissemination function.

### 3.12 STATE AND LOCAL PROGRAMS

In the last several years, state and local interest in solar energy has shown a tremendous growth. The objectives of SERI's state and local program function are to provide substantive aid to these entities in furthering solar development and to bring powerful state and local resources to bear on solar problems. The SERI regional network is the primary tool available to achieve these objectives.

The pursuit of state and local solar programs fills a gap often found in previous national commercialization efforts. State and local ordinances, laws, practices, or physical characteristics can have major impacts on solar commercialization. These problems must be solved in each locality before widespread commercial use of solar energy can be realized. Therefore, state and local programs directly support SERI's broader commercialization function and, hence, help achieve national solar energy goals.

### 3.13 INTERFACES AND LIAISON

Communication is an essential element in every phase of the solar commercialization process. SERI's interface and liaison function is designed to insure that appropriate communication channels are established and maintained between all sectors of the solar energy community.

One of the objectives of the interface function is to keep abreast of all solar research and assessment activities being conducted in the Nation and, to a lesser degree, the world. SERI and the Nation cannot afford research

duplication resulting from inadequate communication. Therefore, SERI must also be aware of ongoing non-government solar energy research activities.

Another objective of the interface function is to sustain an ongoing liaison with the public and all potential members of the solar community involved in production, distribution and installation.

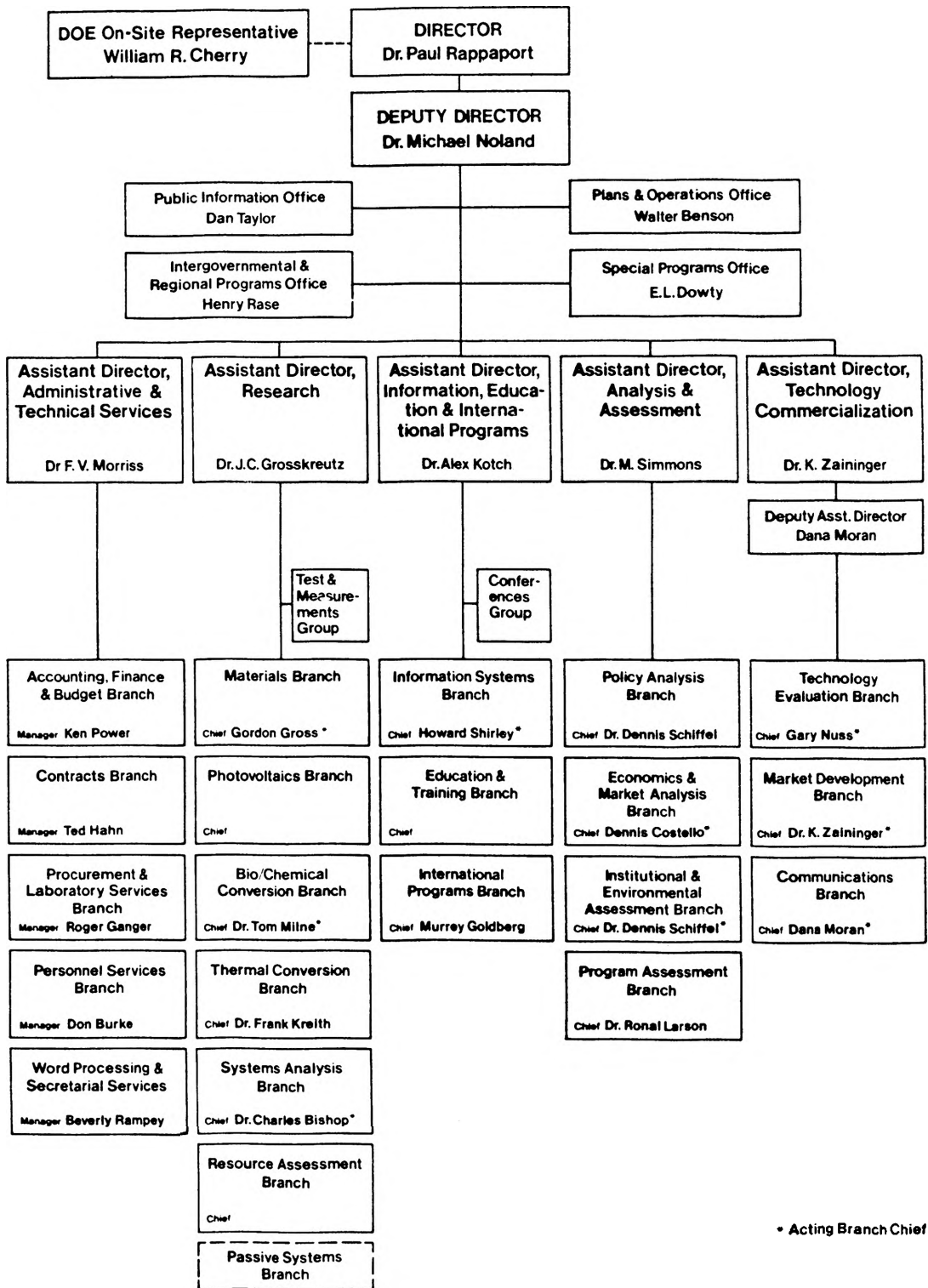
## 4. SERI ORGANIZATION

The SERI organizational chart is presented in Figure 1. Some changes in the organization shown in the figure are expected over the next year. However, little or no changes are expected in the basic organization. SERI consists of five operating divisions; four technical and one support. Each division is headed by an Assistant Director who reports to the Director and Deputy Director of SERI. The four technical divisions are: Research, Analysis and Assessment, Technology Commercialization, and Information, Education and International Programs. The support division is Administrative and Technical Services. Each division is further divided into branches, as shown in the figure.

# Solar Energy Research Institute

## Organization Chart

October 19, 1977



\* Acting Branch Chief

Figure 1: SERI Organization Chart



## 5. STAFFING AND FACILITIES

### 5.1 STAFFING

The overriding principal on which all SERI staffing activities are based is the acquisition of high quality professionals. SERI has grown from a initial staff of 40 on July 1, 1977 to over 100 on October 1, 1977. From October 1977 to October 1978, SERI plans to expand to a level of 300 professional and support personnel with strong emphasis on the hiring of qualified minorities, including females, at all levels. By October 1979, the total SERI staff is planned to reach 480. Plans for staff expansion beyond 1979 are still in a formative stage. Continued, although slower, growth is expected from 1979 to 1981. The SERI staff might be expected to stabilize in the range of 600 to 900 individuals by the early 1980's.

### 5.2 FACILITIES

SERI's facilities and facilities planning encompasses both interim and permanent quarters. SERI is currently housed in interim facilities at a new office and research complex in Golden, Colorado. SERI was initially located in one three-story wing of a new building in the Denver West Office Park. 30,00 square feet of space is available to sufficiently meet SERI's first year operations. As SERI expands during its second, third and fourth years, additional facilities in the office and research park will be constructed adjacent to the initial SERI building. These buildings will include laboratory facilities.

The permanent SERI facility is currently planned to be located on a 300 acre tract of flat undeveloped land on the eastern end of South Table Mountain in Golden, Colorado. The permanent site is within one linear mile of the interim facilities. The permanent facility will contain office space, laboratories, a large conference center, and an information systems

center. Some research yards will be located near the laboratories, while other experiments and tests will be placed on the periphery of the site.

Conceptual designs and accompanying environmental impact statements should be completed during 1978 and 1979. Final designs for the facility will probably be undertaken in 1980 and construction should begin early in 1981.

## 6. SUMMARY

During the first six months of SERI's existence, the staff has been working on a number of important tasks. Projects completed include; the SERI Mission Definition Report, FY 1978 Financial Plan, the Annual Operating Plan, Facilities Plans, Staffing Plan and initial task descriptions. A number of major projects dealing with various research and assessment aspects of solar technologies are now underway. Reports on these projects will be released throughout 1978.

As SERI grows, contributions to the body of knowledge concerning solar energy will also grow substantially. SERI contributions are expected to be the most important in the following areas;

- \* reduction of uncertainty by overcoming technical and economic barriers to the widespread utilization of solar energy:
- \* development of new approaches to using solar energy;
- \* assessment of environmental and institutional implications of widespread solar energy use;
- \* examination of socioeconomic factors

bearing on solar energy technology;

- \* support of development of a viable solar energy industry; and
- \* development and transfer of information to advance the understanding and accelerate the timetable by which solar energy technology becomes commercially important.

#### REFERENCES

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2. Industry Opinions on the Formation of a Solar Energy Research Institute, Mitre Corporation, McLean, Virginia, for the Energy Research and Development Administration (MTR-7067), October 1975.

#### BIOGRAPHY

Mr. Dennis R. Costello is currently Acting Branch Chief for Economics and Market Analysis at SERI. Mr Costello was among the 40 initial staff at SERI on July 1, 1977. Previous to that date, he was Acting Section Head for Energy Systems at Midwest Research Institute (MRI) in Kansas City, Missouri; SERI's parent organization.

For the past 3 years, Mr. Costello has been undertaking economic and policy-related analyses of various solar technologies, especially photovoltaics and solar heating and cooling. He was principal investigator on a project to investigate barriers and incentives to solar heating and cooling of buildings for the Federal Energy Administration. Mr. Costello also led tasks to assess economic factors in the development of photovoltaic power systems.

Mr. Costello received the B.A. in Economics (1972) from the State University of New York where he graduated Magna Cum Laude and the M.A. in Economics (1973) from Ohio State University.