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USE OF SEEDIS BY OTI PROGRAMS DURING FISCAL YEAR 1979

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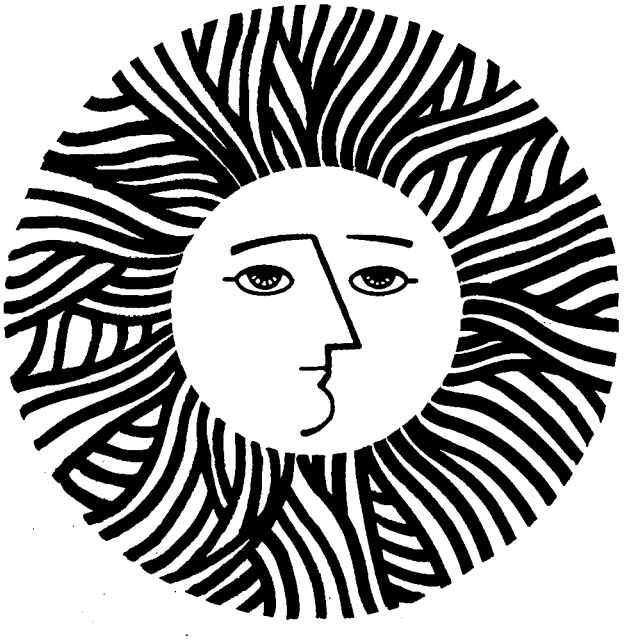
Henry Ruderman and Deane Merrill

April 1980



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USE OF SEEDIS BY OTI PROGRAMS DURING FISCAL YEAR 1979

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INTRODUCTION

This document describes the use of Lawrence Berkeley Laboratory's SEEDIS (Socio- Economic Environmental Demographic Information System) by DOE's Office of Technology Impacts (OTI). SEEDIS, developed and maintained by LBL's Computer Science and Applied Mathematics (CSAM) Department, is being used (a) by OTI staff in DOE headquarters, and (b) by the OTI-funded LBL Energy Analysis Program (EAP).

The growth of OTI SEEDIS usage during FY 1979 is shown in Figure 1. (OTI, primarily through EAP, presently accounts for 30 to 40 per cent of total SEEDIS activity.) Prior to August 1979, OTI and EAP used SEEDIS in the CDC computers maintained by the BKY central computing facility. Response was slow and expense was high. When a new version became available in the CSAM VAX computer network, usage increased dramatically. Although a limited version of SEEDIS is still available on the BKY computers, it is not being used or maintained.

During FY 1979 OTI provided $80K to CSAM, for SEEDIS development and applications. This document describes the activities accomplished with that funding. In fact, the effort expended (about 1.3 FTE's plus overhead) exceeded the funding. The deficit was covered by other SEEDIS-related projects.

Late in 1979 OTI advised CSAM that no further funding would be provided to CSAM for SEEDIS development. A small sum would be allocated, but only for specific tasks unrelated to EAP projects. EAP's funding, closely tied to specific applications, cannot support CSAM's activities at the required level.

That portion of SEEDIS development which is directly related to OTI activities should be supported by OTI. Other development of a more general nature is being supported by other agencies and other offices within DOE.

SEEDIS is indispensable to the OTI activities planned for FY 1980. The FY 1980 EAP budget submitted to OTI was based on the assumption that SEEDIS and the CSAM computers will continue to be available to EAP during FY 1980. This will not be the case unless OTI funding is allocated to CSAM during FY 1980.

Unlike the LBL computer center, CSAM is not a laboratory support group. Like EAP, CSAM is funded solely through research grants. (The new LBL Applications Programming Department does not have the SEEDIS expertise required by OTI.) For this reason, joint EAP-CSAM funding is appropriate for OTI SEEDIS-related activities.

USE OF SEEDIS BY THE ENERGY ANALYSIS PROGRAM

The Energy Analysis Program, a part of the Energy and Environment Division at LBL, is engaged in several assessment programs for OTI. These assessments rely heavily on SEEDIS for storing and accessing data and for graphical analysis and display of the results. During FY 1979 the .ASE and RIIA were the two assessments that were the major users of SEEDIS. In addition to TASE and RIIA continuing, new projects for FY 1980 such as Locational Analysis, Urban and Community Impact Analysis, and Coastal Issues are planning to use SEEDIS.

RIIA (Regional Issues Identification and Assessment)

The RIIA program analyzes the specific environmental, health and socioeconomic issues associated with energy development on a regional level. The objective of this program is to provide the Division of Policy Analysis and other federal, state and local policy analysts with a framework for assessing those regional issues that might potentially constrain domestic energy development. The program is sponsored by the Regional Assessments Division of OTI.

The major use of SEEDIS for RIIA during FY 1979 was to prepare bar and pie charts as well as thematic maps for the Phase I final report. The system is capable of producing publication quality figures. Some examples are shown in figures 2 and 3. A graphics capability of this type is mandatory for the RIIA program. The RIIA work on SEEDIS during FY 1979 was done on the main BKY computer system. The BKY system cannot provide the quick response needed for interactive graphics, and therefore using it required a large amount of staff time. Furthermore, CSAM

no longer supports the BKY version of SEEDIS so that improvements in the data base management and graphics capabilities are not made.

The RIIA project has high priority within OTI for FY 1980, and the graphics needs have, if anything, increased. Hence, this project will need a high quality and flexible graphics capability to produce charts and maps. It is the intention of EAP to transfer the existing RIIA data files from the BKY system to the VAX. However, with the current uncertainty concerning the continued availability of the VAX to EAP staff, this move is being held in abeyance.

The OTI programmatic guidance letter for FY 1980 under the RIIA program contains a task to develop a regional energy/environment data base. This task also appears to include preparing an update of the FY78 data book for Federal Region IX. SEEDIS will be the ideal system for setting up the data base, because much of the data can be extracted from files already in the system. A report generator interfaced to the data base can be used to prepare tables for the data book. Moreover, if the data base is in SEEDIS, the CARTE mapping routines and the CHART graphical display programs can be used to draw the figures.

TASE (Technology Assessment of Solar Energy)

The TASE program was initiated during FY 1978 as part of the activities of the the Technology Assessments Division (TAD). The primary objective of this program is to determine the probable consequences to the environment resulting from the widespread implementation of various solar technologies. The capabilities of SEEDIS have been used for the TASE program in support of agricultural assessments, solar technology

siting efforts, and regional analysis of potential impacts.

During FY 1979 data was extracted and mapped from a large number of data bases in SEEDIS, including

Populations at Risk to Air Pollution
1977 City-County Data Book
1974 Census of Agriculture
Housing and Heating Characteristics (Tessmer)
FERC Generating Unit Reference File
California Biomass Data Base.

Data from other sources was also displayed such as

Land Use Patterns for Federal Region IX
SRI Agricultural Residue Inventory
Hawaii and California Statistical Abstracts.

In addition to producing maps, SEEDIS was used to manipulate the data and produce bar charts.

Presently, work is proceeding on developing software for providing better displays and incorporating additional data. All the TASE work involving the SEEDIS system has been carried out in the CSAM VAX. During FY 1979, Mark Henriquez of EAP was one of the developers of the VAX Color Cartographic System and remains the major user. If the system continues to be available, he plans to use the software tools developed by CSAM to set up within SEEDIS a permanent data base of land and water

use information for general use.

Locational Analysis

Two sets of data provided by EID were set up for use with the SEEDIS mapping programs. One contained county level data on Class I PSD areas and the other the locations of non-attainment areas. These data were used to generate maps of federal regions which showed areas that may be excluded from synfuels development. Further work using SEEDIS is anticipated during FY 1980.

Urban and Community Impact Analysis

During the current fiscal year EAP will concentrate on examining demographic, economic and social impacts on communities in Federal Region IX as part of the Urban and Community Impact Analysis of synfuels development. As a first step, clustering analysis is being performed on BEA region data to select the communities to be examined. Some of the data were extracted from county level data bases in SEEDIS, and the CODATA Tools were used to aggregate and merge the data. The CARTE mapping routines are being used to display the locations of the clusters which facilitates an intercomparison of the results of various clustering runs.

Coastal Issues

This program is still in a developmental stage, so that it is too early to determine precisely how SEEDIS can be used effectively. However, the mapping capability, especially for displaying land use patterns, demographic variables, and environmental impacts near proposed sites, has

potential application to this program.

FY 1979 CSAM ACTIVITIES FOR DOE/OTI

This section describes the support provided to OTI and EAP by CSAM during FY 1979. The SEEDIS enhancements were motivated by requests from OTI/DOE, or were required by the LBL Energy Analysis Program. Other developments of a general nature, not described here, were supported by other government agencies and other offices within DOE. OTI funding was insufficient to cover all of the enhancements required; the remaining expense was borne by other SEEDIS-related projects.

Energy-related Data:

A sample set of SEAS (Strategic Environmental Assessment System) output files was installed for interactive analysis in SEEDIS. The data include estimates and projections of airborne pollutants by AQCR (Air Quality Control Region), liquid and solid pollutants by WRASA (Water Resources Aggregated Sub Area), and economic activity indicators by county. The data were compressed and stored for selective random access. A data dictionary was constructed to aid the user in selecting desired data items. The software which was developed can be used for other large files, in addition to future SEAS files.

The April 1979 version of the FERC (Federal Energy Regulatory Commission) GURF (Generating Unit Reference File) was converted and installed in SEEDIS. For each generating unit, the capacity on line or expected to be on line in 1960, 1965, 1970, 1975, 1977, 1980, 1985, 1990, and 1995 was derived from the original file. Then the number of units and the available capacity was calculated for each county, for each year, for each unit and fuel type. (About a dozen grouped unit and fuel types

were defined by EAP for use in their analysis). The resulting file was used by EAP in subsequent analysis. The summary file of total capacity (not broken down by fuel type) was installed for interactive access in SEEDIS. The latter file was also aggregated for all higher geographic levels, including states, AQCR's, 1969 and 1979 BEA (Bureau of Economic Analysis) areas, WRASA's, Federal Regions, Census Regions, PAD (Petroleum Allocation District) Regions, and Bechtel Model Regions. A data dictionary, containing a detailed description of the aggregation specifications, is available on-line in SEEDIS.

A copy of the FEDS (Federal Energy Data System) energy consumption data was received from EIA and converted for installation in SEEDIS. Considerable difficulty was experienced in obtaining the data; two defective tapes were received, and a third set of data (not yet checked) was received more than eight months after the original request. Prior to receipt of the third set, the second set, containing 1972-1977 data only, was converted for use by EAP. A data dictionary was prepared for installation in SEEDIS. Conversion and installation of the third data set has been postponed in favor of more urgent priorities.

The 1970 Housing and Heating Characteristics data file, for California, was obtained from Brookhaven National Laboratory and installed in SEEDIS. Maps of data contained in this file were prepared by EAP for use in the TASE project. The corresponding file for the entire U.S. has been obtained but has not yet been installed.

A file received from DOE headquarters, containing various geocodes (EPA Air Quality Control Regions, BEA Economic Area codes, etc.) of counties, was installed as a central component of SEEDIS. The file has since been

enhanced to include additional geocodes, county populations and areas, latitudes and longitudes of population centroids, and other information. Information in the file permits automatic aggregation of county level data to larger areas.

The Brookhaven Energetics Atlas, a file containing 1972 county level estimates of energy production and consumption by fuel type, was moved from the CDC 6600 computer to CSAM's VAX. Presently it is being installed in VAX SEEDIS. Apparent discrepancies between the computer-readable and published version of this file are being investigated.

Printed county- and AQCR-level data on environmentally protected areas were entered into the VAX and formatted for use in making maps in SEEDIS. The task involved the collaborative effort of about seven persons in CSAM and EAP.

SEEDIS Capabilities:

Analysis of energy-related data required the installation of mapping capabilities for many geographic areas not previously defined in SEEDIS. In each case, the task involved the preparation and installation of geocode files containing place names, and of geographic base maps containing latitude- longitude coordinates of polygon boundaries.

During 1979, geocode files and geographic base maps for the following additional geographic areas were constructed and installed in SEEDIS. (This list does not include other areas, e.g. states and counties, implemented during 1978).

U.S. by Federal Regions

U.S. by Census Regions

U.S. by Bechtel Regions

U.S. by Petroleum Allocation Districts

U.S. by Air Quality Control Regions

U.S. by single-state portions of AQCR's

U.S. by cities as defined by EPA (point locations)

U.S. by air quality monitoring station (point locations)

U.S. by 1977 BEA Economic Areas

U.S. by 1969 BEA Economic Areas

U.S. by single-state portions of 1969 BEA Economic Areas

U.S. by single-state portions of 1977 BEA Economic Areas

U.S. by Water Resources Aggregated Sub Areas

U.S. by major river basins (Water Resources Regions)

U.S. by Standard Metropolitan Statistical Areas

CODATA Tools

A set of general purpose programs, to allow users to readily format their own data for use in SEEDIS, was prepared. These programs, known as CODATA Tools, are carefully documented and installed so as to make them extremely easy to use. They are being heavily used by EAP staff for creation and manipulation of new data files. In addition, they form an integral part of the data extraction module in SEEDIS.

The following CODATA tools have so far been implemented:

COCAT: convert data file to standard format

COCL: change line length of data file

COROW: select specified rows

COCOL: select specified columns

COROADD: add specified rows

COMRG: merge two files

COCOCAL: calculate new columns

COCOCAL2: calculate new columns, from auxiliary input

CODDF: change data description format

COCP: convert data to SEEDIS internal format

Additional functions will be implemented in the near future:

CPCO: extract data from SEEDIS internal format

COROAGG: aggregate data by geographic areas

CORODAG: disaggregate by geographic areas, using proxy variable

CONEW: prompting user for input, create a new data file

COJOIN: concatenate several data files

Consulting and Assistance:

Deane Merrill made two visits to DOE/OTI, primarily to instruct Ron Matheny in the use of SEEDIS. After the first visit, Matheny succeeded in extracting data from DOE's local computer, sending it via telephone into SEEDIS, reformatting it using the VAX text editor, and producing maps with the use of SEEDIS. Additional consultation by CSAM, with members of OTI and of OTI's contractor CDC, was required to define in detail the data format needs of SEEDIS, and the programmatic needs of OTI.

Consultation with EAP staff is a constant responsibility. Typically, three to five conversations a week are required to give EAP personnel the assistance they need for effective use of SEEDIS.

In order to keep abreast of EAP activities and to explain new SEEDIS developments to EAP, Deane Merrill has continued to attend regular weekly EAP staff meetings, as he has done for almost six years. This continued contact has been crucial in maintaining the communication required for effective collaboration.

System Support

During FY 1979 OTI (primarily through EAP) accounted for approximately 10 per cent of the computing activity in CSAM's VAX computers. Maintenance and operation of these computers required three FTE's of effort.

CSAM EFFORT DURING FY 1979

The following estimates represent the effort expended by CSAM during FY 1979 in connection with OTI-funded projects:

Installation of sample SEAS data: 3 person months. Each future data set in the same format can be installed with 1 person month additional effort.

Federal Energy Regulatory Commission Generating Unit Reference File: 1.5 person months.

FEDS (Federal Energy Data System) consumption data: 1.5 person months.

1970 Housing and Heating Characteristics: 0.5 person months.

County Geocode File: 1 person month.

Brookhaven Energetics Atlas: 0.3 person month to date.

Data on environmentally protected areas: (CSAM effort only): 0.5 person month.

New geographic areas in SEEDIS: 1.5 person months, of which about 1 person month should be allocated to OTI.

CODATA tools: total effort about 3 person months, from which several programs have jointly benefited. About 1 person month should be allocated to OTI.

Consultation with DOE headquarters personnel: 0.5 person month.

Consultation with OTI and EAP personnel: 1.5 person months.

System support: about 10 per cent of 3 FTE's, or 4 person months.

Total CSAM effort during FY 1979: approximately 16 person months, or 1.3 FTE's.

FY 1980 CSAM ACTIVITIES FOR DOE/OTI

As in FY 1979, CSAM effort during FY 1980 will include:

(a) installation of energy-related data files specifically required for OTI projects;

(b) development of software capabilities specifically required for OTI projects;

(c) consultation with EAP and OTI as required;

(d) a proportional fraction of system maintenance and operation for the CSAM VAX computers.

The tasks to be performed in FY 1980 are directly related to EAP's OTI-funded projects described in this report. Priorities will be determined in response to OTI's and EAP's changing needs during the course of the year.

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Monthly SEEDIS Usage by Energy Analysis Program

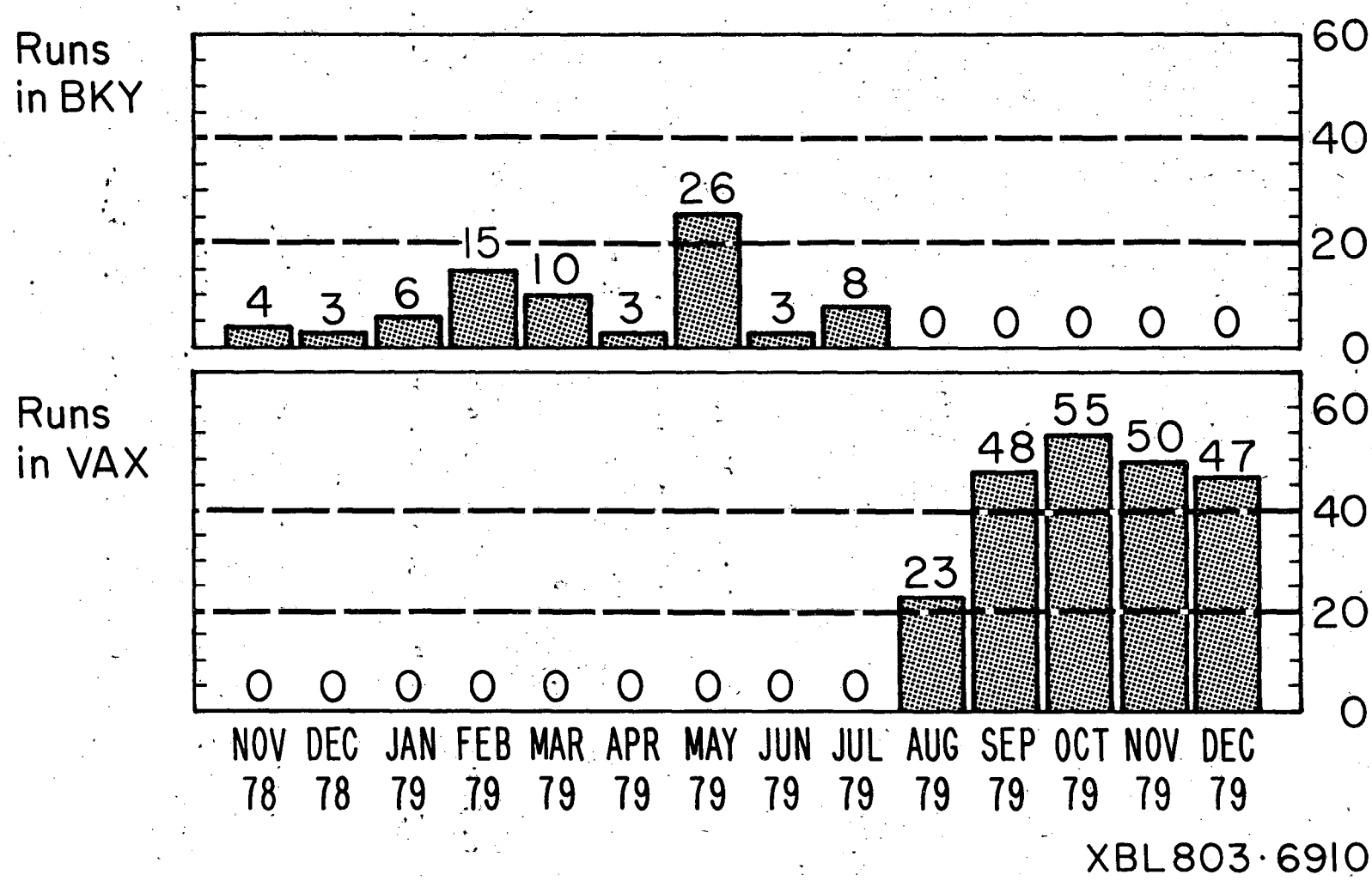

Fig. 1

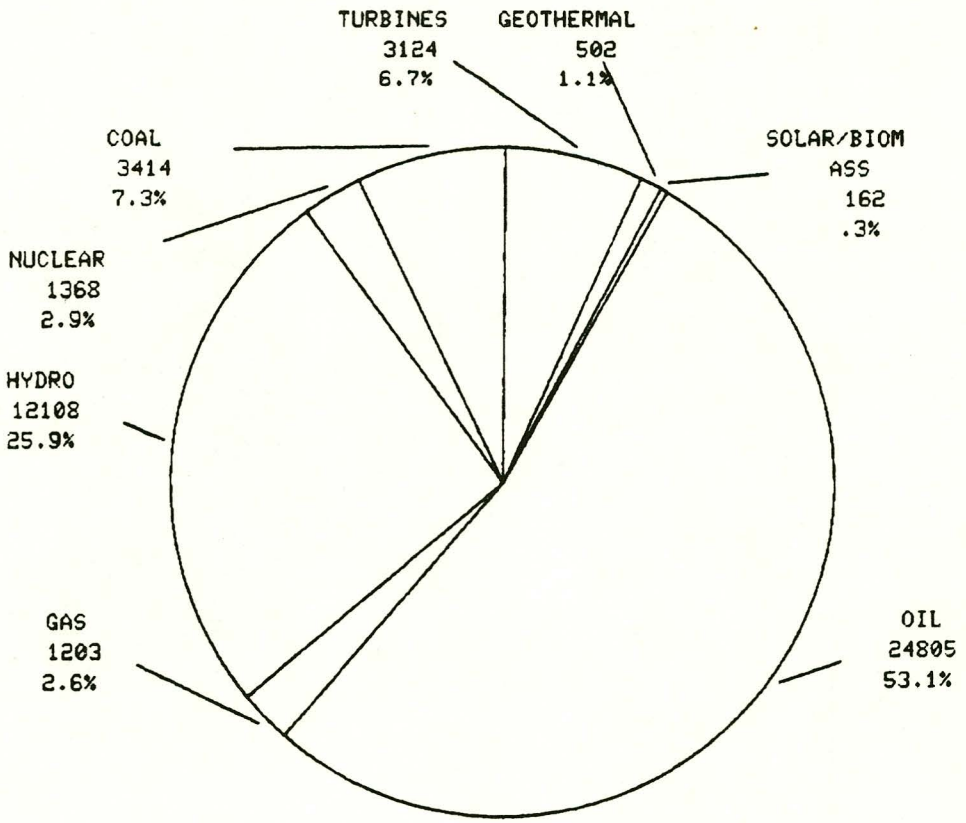

Fig. 2. Electric Generating Capacity in Federal Region IX, 1975
(Megowatts)

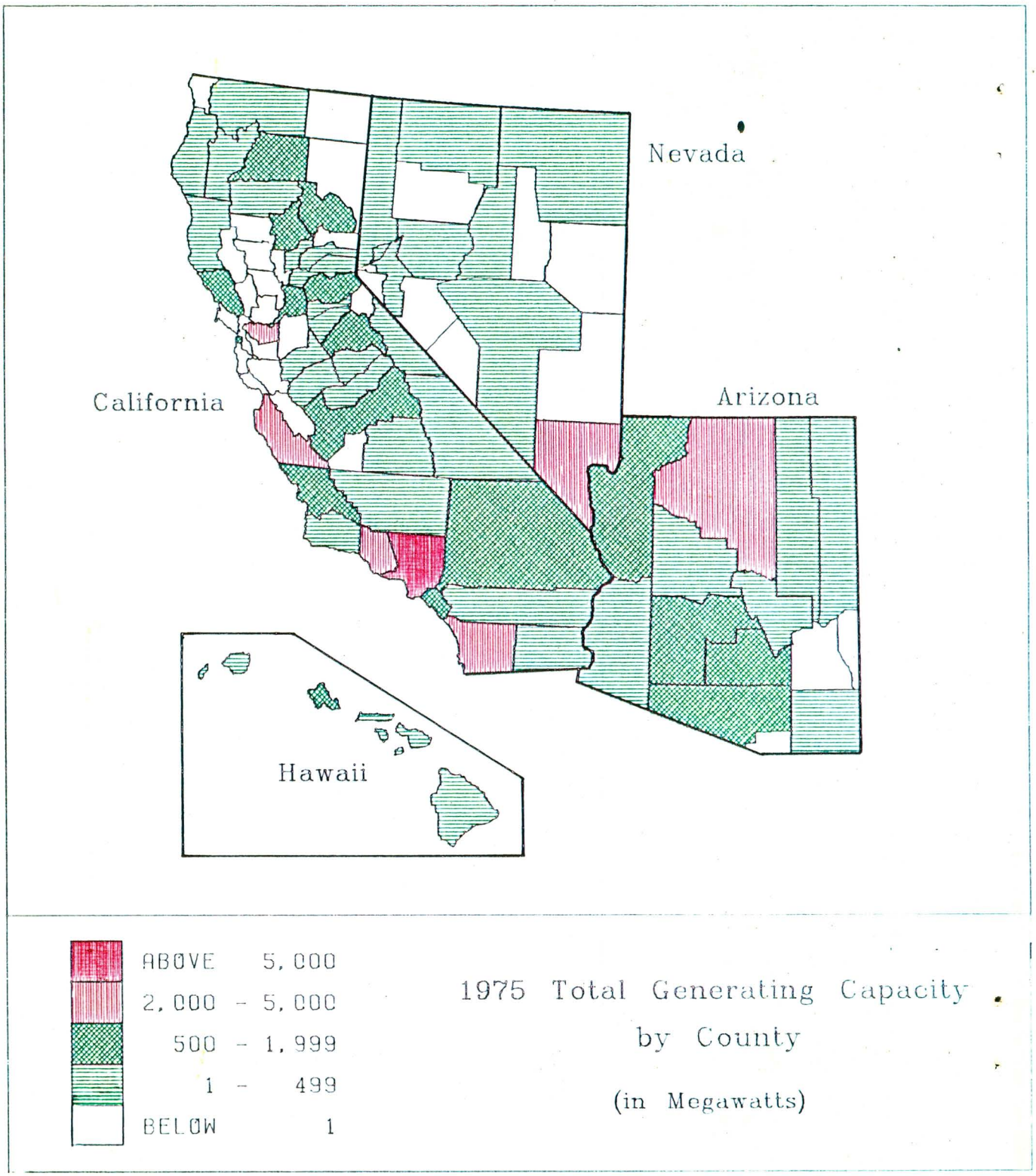
Nevada
California
Arizona
Hawaii
ABOVE 5,000
2,000 - 5,000
500 - 1,999
1 - 499
BELOW 1
1975 Total Generating Capacity by County
(in Megawatts)

Fig. 3

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