

8. Major Programs and Funding Levels for ELF Bioeffects Research

In the long run, better scientific understanding is the only way to resolve problems posed by power-frequency fields. Yet funding for field-effects research has been irregular over the years and current levels of federal support are modest. A history of the research funding provided by the six largest programs is shown in Figure 8-1. These and other research programs are described below.

The U.S. Navy played an important early role in research on the bioeffects of ELF electric and magnetic fields. In 1968, the Navy proposed to build an ELF submarine communications facility in northern Wisconsin that would have covered many thousands of square miles. In response to concerns raised by the people of Wisconsin and to comply with the recently enacted National Environmental Policy Act, the Navy launched a large laboratory research program that examined the effects of ELF field exposures on many animal and plant species [Rozzell 74]. This program funded about \$8 million worth of research between 1969 and 1977 [Abromavage ??]. The Navy now has two operating ELF transmitting facilities, one in Wisconsin and one in Michigan. The Navy has continued to sponsor ecological field studies in the vicinity of these transmitters since they began operation. Funding for these program is currently about \$2 million per year [Abromavage ??].

Over the last decade, the Department of Energy's (DoE) Office of Energy Storage and Distribution has been the chief federal source of support for research on the possible biological effects of low-frequency fields. DoE's fiscal 1988 budget of \$2.2 million is detailed in Table 8-1. Congress has allocated \$3.0 million for DoE in fiscal 1989 [MWN 88a].

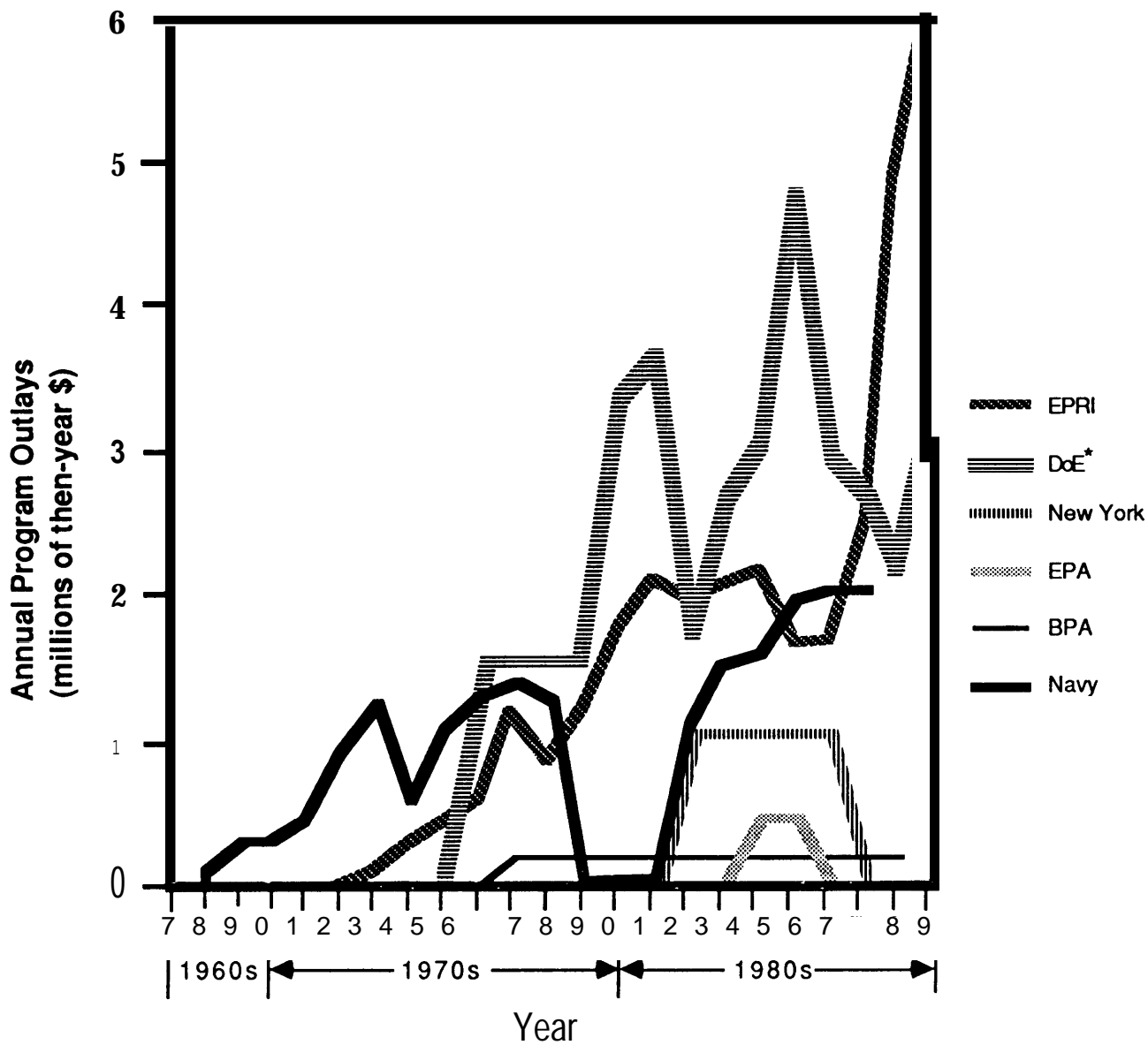
Several laboratories of the Environmental Protection Agency (EPA) have had smaller research programs involved in both exposure- and effects-related studies. Because of federal budgetary pressures, most of EPA's projects dealing with ELF fields were shut down in 1986 [MWN 86].

The federal government has not been the only source of research support in the United States. From 1982 through 1986, the state of New York operated a \$5 million research program on field effects administered by the New York Department of Public Health, with money largely provided by the state's electric utilities. Although this program has now ended, the research it generated has opened interesting new issues and produced several very useful results. Another useful but smaller state-funded venture has been the Maryland Power Plant Siting Program, which has supported database development and dosimetric studies at the Johns Hopkins Applied Physics Laboratory. California recently adopted a bill requiring the state's larger utilities to fund a two-year, \$2 million research project on the biological effects of ELF electromagnetic fields [MWN 88b].

The electric utility industry has also been involved in supporting research on ELF field effects. Utility support began as early as 1962, when American Electric Power Company (AEP) funded two small-scale studies at Johns Hopkins University, one of EHV lineworkers and one of mice exposed to strong electric fields. Several years earlier, AEP had become the first U.S. utility to build an EHV transmission line. The Bonneville Power Administration is another utility that has made a significant contribution to research. BPA has provided about \$200 thousand per year (in '87 dollars) for the past decade, primarily for environmental and livestock studies [Lee 87]. Several other utilities, most notably Southern California Edison, have mounted field research programs. Together, these sources have provided about \$3 million in funding over the last decade [Sahl 87].

The Electric Power Research Institute (EPRI) has supported a substantial amount of work since the

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* - Estimate for years '75-'79

Figure 8-1: History of funding for ELF bioeffects studies in the U.S. from 1968 to the present. From [Abromavage ??, BEMS 86, Gyuk 88, MWN 88a, Sussman 88].

Table 8-1: U.S. Department of Energy 1988 Funding for ELF Electric and Magnetic Fields Research.
From [Gyuk 88].

Project Site	Project Description	'88 Contract Amount
Battelle Pacific Northwest Laboratory	Pineal gland melatonin	\$600,000
Argonne National Laboratory	Circadian rhythms, mice	\$325,000
MidWest Research Institute	Response of human volunteers to 60 Hz electric and magnetic fields	\$300,000
Pettis VA Hospital, Loma Linda, CA	Cellular mechanisms	\$225,000
Southwest Research Institute	Baboon behavior	\$90,000
University of Rochester	Rodent behavior under lithium cyclotron resonance	\$170,000
Lawrence Berkely Laboratory	Reaction of leukaemia cells to electromagnetic fields	\$126,000
National Bureau of Standards	Effect of temperature on the emission of ions from high voltage DC lines	\$50,000
Program management		\$300,000
Total		\$2,186,000

early 1970s. EPRI support declined slightly in recent years but is now expanding, from \$1.7 million in FY 1986 to a projected \$6 million in FY 1990 [MWN 88c].

Many other nations have active fields-research programs. In approximate order of current funding commitments, these include Sweden, the U. K., West Germany, Canada, Japan, Italy, France, Finland, and Norway.

Sweden's program is the largest, currently running at about 11 million krona (\$1.9 million) per year. Swedish research includes projects in epidemiology, exposure assessment, and cancer induction and promotion. These projects are funded primarily by the Sweden's State Power Board and Sweden's National Institute of Occupational Health.

Research in the U.K. is funded primarily through the Central Electricity Generating Board (CEGB).

Since roughly 1980, the CEGB has spent 3.5 million pounds (about \$7 million) on fields-related research including epidemiological, laboratory, and human exposure studies. Recently the CEGB announced a doubling of its annual commitment to 1 million pounds (\$1.8 million) per year. The CEGB's parent body, the Electricity Council, has also contributed to fields-related research in the U. K., but at a much lower level than the CEGB.

Using support from both public and private sources, the West Germans are funding a half-dozen projects including animal teratology experiments, in vitro studies, and measurements of human exposure.

Canada's Ontario Hydro and Hydro Quebec have been actively involved in exposure related research for some time and have recently begun an animal cancer study. They also have active programs in high voltage DC (direct current) field and ion effects.

Japanese utilities have funded a number of studies of electric field dosimetry over the last few years. They have also supported a study at Southwest Research Institute on the effects of electric fields on baboon behavior.

Italy's programs are entirely utility funded and include electric field studies with chickens and rodents.