Congress Weighs Large Increases in EMF Funding

Federal funding for electromagnetic field (EMF) research would increase significantly under two new Congressional proposals.

Rep. George Brown (D-CA) is sponsoring a bill to give the Department of Energy (DOE) $70 million over ten years, of which $30 million will come from nonfederal sources. Brown plans to hold hearings in early 1992.

Senator Frank Lautenberg (D-NJ) has proposed giving $45 million to the Environmental Protection Agency (EPA) over four years. Both measures would take effect in fiscal year 1993 (FY93), which begins on October 1, 1992.

Although a similar proposal by Rep. Frank Pallone (D-NJ) has stagnated in the House of Representatives for two years (see *MWN*, M/J90, J/A90 and M/A91), the Brown and Lautenberg initiatives are likely to attract more support. As chairman of the House Committee on Science, Space and Technology, Brown has the seniority to move his legislation onto the floor of the House. Meanwhile, the Lautenberg proposal has already been adopted by a Senate subcommittee.

Brown's bill would transfer lead responsibility for EMF research to DOE's Office of Environment, Safety and Health from its Office of Conservation and Renewable Energy (OCRE), which is planning a national research agenda (see p.1). In a statement, Brown said that his proposal is not meant to stop DOE's planning process, but rather to help "refine it and improve it."

DOE's health office is a more appropriate place for EMF research, since OCRE also promotes electric power use, an aide to Brown explained.

In his statement, Brown protested the way that the DOE was designated as the lead federal agency (see *MWN*, S/O91). "This provision was inserted without benefit of debate and without the involvement of the authorizing committees," he said. Interestingly, no one has yet taken credit for writing this provision.

Brown's National Electromagnetic Fields Research and Public Information Dissemination Act (H.R.3953) would require the federal government to seek contributions from outside sources, such as private companies and states, to cover half of the $60 million research budget. An additional $10 million in federal funds would be earmarked for a public information program.

H.R.3953 also mandates the creation of an interagency committee to coordinate federal research, and would require the National Academy of Sciences (NAS) to evaluate the research each year. The bill's conflict of interest provisions call for an EMF researcher to disclose all related funding sources and to abstain from giving paid testimony and from working as a consultant.

Lautenberg's proposal calls for a new federal EMF research program at EPA, a technical advisory committee to oversee the program and a public information center. The proposal has been approved by the Senate Subcommittee on Toxic Substances, Environmental Oversight, Research and Development and is now pending before the full Environment and Public Works Committee.

Introduced as an amendment to the Environmental Research, Development and Demonstration Authorization Act of 1991 (S.1655), Lautenberg's legislation would provide $8 million for FY93, $10 million for FY94, $12 million for FY95 and $15 million for FY96. At least $1 million each year would be used for public information. The House version of S.1655 does not include a similar amendment.

Lautenberg's proposal surprised many Washington insiders. Earlier this year his spokesman said that the senator had dropped plans for EMF legislation (see *MWN*, J/A91).

Bigger EPA EMF Budget

EPA now has an EMF research budget of $1.94 million for fiscal year 1992 (FY92), an increase of more than $1 million over the amount that its Office of Research and Development received in FY91. FY92 began on October 1.

EPA has not yet determined how the funds will be spent and no decision will be made until the agency completes its research strategy document (see *MWN*, J/A91), an aide to Dr. Ken Sexton, the director of the Office of Health Research, told *Microwave News*. He added that EPA is committed to funding a public–private partnership research effort, like the ones being developed by HEI (see p.6) and by the NERP steering committee (see p.5).

In FY91, EPA gave $525,000 of its $750,000 research budget to HEI.

The EPA research plan will no doubt be affected by DOE's new lead role and its efforts to forge a new national research agenda. EPA and DOE officials have already met to begin coordinating their efforts (see p.1).

California Governor Vetoes $7 Million EMF Bill

On October 14, Republican Governor Pete Wilson of California vetoed legislation that would have required state utilities to fund a $7 million, four-year electromagnetic field (EMF) research, education, training and public information program. The bill, SB920, had passed both houses of the state legislature in September and had widespread support among utilities, labor and environmental groups (see *MWN*, S/O91).

"Given the fact [that] a study was just completed and because there are currently several studies ongoing nationwide, I do not feel that it is prudent for California ratepayers to expend another $7 million," Wilson explained in his veto message. The California Department of Health Services (DHS) is conducting a $2 million EMF study in accordance with legislation passed in 1988 (see *MWN*, S/O88 and N/D88). Both SB920 and the 1988 law were sponsored by Democratic Senator Herschel Rosenthal, the chairman of the Energy and Public Utilities Committee.

In a letter to Wilson, Rosenthal said he was "surprised" by the governor's veto, pointing out that in a 1990 progress report

to the legislature, the DHS had recommended that the state fund further research "into the basic mechanisms of EMF effects, which appear to be inadequately funded, compared to epidemiological and whole animal research." Under the proposed law, new research projects would have received up to 80% of an initial $4 million dollar allotment.

Though the bill had almost unanimous support in both houses of the legislature, an override of the veto is unlikely. "Most members of the assembly were under the impression that the governor supported the bill," Michael Shapiro, a Rosenthal aide, told *Microwave News*. "Overrides are generally not a successful strategy in California. We're really hoping for an agreement," he said.

Most observers are confident that similar legislation will be signed into law next year. In an interview, Dr. Raymond Neutra of the DHS, who is overseeing the state's ongoing EMF research, said that he expects a new EMF bill to be placed on a fast track during the next legislative session. Jack Sahl of Southern California Edison in Rosemead agreed, noting that the governor may not have been aware of the strong utility support for SB920.

Rosenthal is also optimistic. "We are hoping to salvage the whole bill," Shapiro said in a telephone interview. But he went on to explain that Rosenthal might agree to a compromise mandating only EMF education and training for utility personnel, public information campaigns and EMF surveys—20% of SB920 was earmarked for these programs.

NERP's Prospects Improve

The National EMF Research Program (NERP) has gained support from key federal and state officials and has received start-up funding (see *MWN*, J/A91 and S/O91).

The Department of Energy (DOE) has signaled a willingness to include the NERP in its new national research agenda. A DOE deputy assistant secretary, Dr. Robert San Martin, who is responsible for the EMF research program, told *Microwave News* that he expects his department to help fund the NERP if it needs federal backing.

Wertheimer: Research Directions After Peters

Failure to address seasonal variations in current loads may be "the most obvious possible explanation" for the apparent lack of an association between childhood cancer and measured magnetic fields in Dr. John Peters's epidemiological study, Dr. Nancy Wertheimer writes in a recent unpublished analysis.

Peters and coworkers at the University of Southern California (USC) in Los Angeles found a statistically significant doubling of childhood leukemia associated with high current wire codes but did not identify a similar risk with 24-hour and spot magnetic field measurements (see *MWN*, J/F91, M/A91 and S/O91). This is the second U.S. study to replicate Wertheimer and Ed Leeper's original 1979 study that first linked power lines to childhood cancer. A 1988 study by Dr. David Savitz, like Peters's, found a stronger cancer risk association with wire codes than with measured fields.

Pointing out that the seasonal variations were "much discussed" in the early planning stages of the project, Wertheimer expresses surprise that there was no mention of this aspect of the study design when the results were published in the *American Journal of Epidemiology* in November.

Wertheimer is primarily concerned with the interpretation of Peters's study. Press reports have called the results "contradictory," and even USC's November press release said the findings "paint a somewhat confusing picture." Troubled by an emerging "conventional wisdom" that there is no association of childhood cancer with household magnetic field measurements, Wertheimer offers her outlook about both the Peters study and the direction of future research.

She organizes her thoughts around four questions:

• *Are control groups really free of significant EMF exposure?* The problem here is that "average" EMF exposure may entail health risks, yet researchers have done little to obtain a truly low-exposure control group, Wertheimer says. She suggests that current efforts are like studies of cancer risks that com-pare people who smoke two-and-one-half packs a day with those who smoke two packs. EMF risks are often determined simply by dividing measurements into average- and very-high-exposure groups. When the study population is divided into four groups, Wertheimer argues, a comparison of the highest-exposure group with the lowest indicates a greater cancer risk, especially if subjects exposed to bed heaters are removed from the lowest-exposure group.

• *Are researchers looking at the right etiological time period?* Wertheimer favors looking at one or two years prior to diagnosis as the critical period of exposure. Wertheimer and Leeper's original childhood study, among others, supports the hypothesis that this period is a critical time.

• *Are studies obtaining a suitable control group?* Pointing out that some observers, such as Dr. Philip Cole, have suggested that there was a bias in the selection of the control group that minimized the number of high-exposure subjects in the Peters study, Wertheimer adds that "control selection bias can cut both ways—it can reduce *or* increase an observed association."

• *Are researchers measuring the right aspect of EMF exposures?* Wertheimer suggests that the angle of the magnetic field vector may be more important than the field intensity. Here she revisits a topic she addressed last year in a paper at DOE's EMF research review in Denver, CO (see *MWN*, N/D90). She writes of "rather intriguing evidence" in favor of this idea: In previous studies, homes where the average field vector was "vertical" seemed to show little cancer risk, while homes with a "horizontal" average vector did "show a cancer risk that is roughly related to measurement intensity."

Indeed, two representatives of the NERP steering committee were the only outsiders invited to participate at an October 10-11 DOE meeting to develop the department's approach to EMF research. That session was a prelude to DOE's November 20-21 workshop (see p.1).

The California Department of Health Services (DHS) may contribute funds to the NERP if the state approves an EMF research program next year, according to Dr. Raymond Neutra (see p.4). Neutra stipulated, however, that the NERP must coordinate its plans with California's efforts and must enforce a strict conflict of interest policy. DHS Commissioner Dr. Molly Coye is one of three new members of the NERP steering committee; Neutra is her representative.

At its quarterly meeting, held October 16-17 in Washington, DC, NERP's steering committee announced that it will receive funds to cover its operations for one year while a research program is designed. The New York State Energy R&D Authority has promised $75,000 for administrative expenses. The grant was made contingent on the NERP seeking an additional $150,000, but the authority promised to make up any needed funds. The NERP plans to solicit support from state governments, utilities, labor unions and electrical equipment manufacturers, among others; it also plans to add at least one federal official to its roster.

The steering committee set up subcommittees to select a group to administer its work and to develop criteria for selecting an organization to oversee the NERP research program.

The committee's next meeting is planned for February.

HEI Board of Directors Delays EMF Research Plan

The board of directors of the Health Effects Institute (HEI) has delayed the release of the institute's proposed national electromagnetic field (EMF) research agenda pending its revision. The board is seeking "some clear expressions of priority" among the research options, according to HEI President Andrew Sivak.

"The board felt that as a public document, the plan needed a broader context, with more background on EMF research," Sivak told *Microwave News*, adding that he expects to return to the board with a revised document by mid-December.

In an October 30 letter to Dr. Richard Setlow of Brookhaven National Laboratories in Upton, NY, Sivak explained that one board member suggested that HEI provide "a strategic plan, not just a plan of operations." Setlow is the chairman of the feasibility study committee, which helped assemble the agenda.

HEI, based in Cambridge, MA, has been developing the research plans "to provide credible scientific information" on possible health effects from power line EMFs (see *MWN*, M/A91, M/J91, J/A91 and S/091). This work is being sponsored by the Environmental Protection Agency and some electrical utilities. The draft plan, which Sivak presented to the HEI board on October 23, provides both a "short list of research directions" to be pursued if there is limited funding and an expanded list, which is "less constrained by resources."

The short list calls for:

- Identification of a reproducible effect, in a well-controlled biological system, at field intensities relevant to environmental exposure;
- Determination of the initial site of interaction;
- Elucidation of the transduction system;
- Assessment of the health consequences of such an exposure.

Among the key issues identified by HEI are: looking at biological end points other than cancer—such as reproductive and neurobehavioral effects; addressing the argument that the signal-to-noise ratio is too small to make low-level EMF effects plausible; characterizing and standardizing exposure parameters; and attracting top scientists to EMF research.

The draft plan, which was obtained by *Microwave News* after Sivak declined to make it available, signals a certain skepticism about the existence of EMF effects at environmental levels. For instance, the plan notes that, "The overall evidence [for health risks] is inconsistent at best." Nor is HEI confident that "top-line scientists" would be willing to get involved in EMF research, because it is an arena "that is plagued with results that are in apparent violation of physical laws, with no accepted mechanism of interaction, with poor replication of earlier studies, and with effects that are small."

Cancer Epi Studies from Taiwan, Sweden and the U.K.

Taiwan: Childhood Risks Below 1 mG

Drs. Ruey Lin and C.Y. Li of the National Taiwan University have found a statistically significant association between childhood leukemia and *measured* magnetic fields. They also identified a trend toward increased risk with stronger magnetic fields.

In a paper presented at the Department of Energy's research review in Milwaukee, WI, in early November, Lin reported a statistically significant increased rate of leukemia among children exposed to EMFs as low as 0.8-0.9 mG. A nonsignificant doubling occurred at 0.6-0.7 mG and at 0.7-0.8 mG.

Based on five measurements in different rooms in the case houses, the average magnetic field in these homes was 0.83 mG, compared with 0.77 mG in the homes of controls—a statistically significant difference.

Questionnaire data indicated that the households with leukemia cases used electrical appliances more frequently than did the controls. Most of the 146 cases had acute lymphoid leukemia, Lin told *Microwave News* in Milwaukee. There were 305 controls. Lin was the first researcher to report a link between EMF exposure and brain tumors (see *MWN*, Oct84 and J/A85).

Sweden: Few New Clues from Workers

A new epidemiological study from Sweden adds to the body of research showing a link between some, but not all, types of electrical work and leukemia and brain cancer.

"Although a homogeneous pattern of increased risks of leukemia or brain tumor was not noted, the hypothesis that magnetic fields might play a part in the origin of cancer cannot be rejected," concluded Drs. Siv Törnqvist, Bengt Knave and Tomas Persson of the National Institute of Occupational Health in Solna and Dr. Anders Ahlbom of the Karolinska Institute in Stockholm.

The researchers found a number of statistically significant odds ratios (ORs): 5.7 for acute myeloid leukemia among iron and ore miners; 2.8 for chronic lymphoid leukemia (CLL) among power linemen; and 2.1 for all leukemias among telegraph and telephone workers. All linemen combined had an OR of 2.0 for CLL, which is a risk of borderline significance.

Increased rates of all types of brain tumors were identified among iron and steel welders (OR=3.2), among radio and TV repairmen (OR=2.9) and among the general class of welders and flame cutters (OR=1.3). All of these risks were statistically significant or of borderline significance.

All electrical occupations, as a class, did not show an increased risk of leukemia or brain tumors. And none of the occupations showed an excess of both cancer types.

Electromagnetic field (EMF) exposures were estimated primarily by job category. However, the team did take some "limited" measurements at 50 Hz of intensity and duration of exposures.

Power linemen on 400 kV lines and welders probably had the highest magnetic field exposures among those with higher cancer risks. The team argued that, "If magnetic fields were the cause of leukemia and brain tumors, the same effect would be expected in both occupations," but this was not the case. Furthermore, iron and ore miners, who had an elevated leukemia risk, had an average exposure of less than 0.35 mG.

"We have very limited information on intensity and duration of exposure to magnetic fields and other potential risk factors, which most likely vary considerably within, as well as between, the occupational categories we have studied here," the team cautioned.

New Reports from EPRI

The following reports have been published by the Electric Power Research Institute (EPRI). Copies of the reports marked with an asterisk (*) are available from Research Reports Center, PO Box 50490, Palo Alto, CA 94303, (415) 965-4081. Copies of the report marked with a dagger (†) are available from Robert Banks Associates, Inc., PO Box 14574, Minneapolis, MN 55414, (612) 623-4600. There is no charge for most reports requested by EPRI member utilities, U.S. utility organizations, U.S. government agencies and the media.

* J.H. Cooper, ***Single Conductor Transmission Cable Magnetic Fields*** (Report No.EL-7340), August 1991. Price: $500.00. The magnetic fields from buried single conductor cables can vary by as much as a factor of ten, depending on how they are built and installed. Research at EPRI's Waltz Mill Underground Test Facility in Pennsylvania also indicated that existing procedures for calculating field strengths are generally accurate and that soil had little or no effect on aboveground magnetic fields.

****EMDEX II System Documentation*** (EN-7497), 2 vols., September 1991. Price: $200.00 each. The EMDEX system was developed to measure and record long-term personal exposures to EMFs. The new EMDEX II is smaller and easier to use, according to the report. Vol.1 provides details on how to use the meter. Vol.2 is the technical reference manual.

****1990 Annual Report: EMF Health Effects Research Abstracts*** (EN-7460), July 1991. Price: $5.00. This is the second annual report on EPRI's EMF research program. It includes a statement on each of 32 ongoing projects.

†***1991 EPRI EMF Science & Communication Seminar,*** Forthcoming. Price: $250.00. Papers by speakers at this year's EPRI utility seminar, including reviews of research on bioeffects (with emphasis on melatonin), wire codes, measurements, mitigation and risk assessment and communication. Also features visual materials from the workshop presentations.

* John Peters et al., ***Exposure to Residential Electric and Magnetic Fields and Risk of Childhood Leukemia*** (EN-7464), November 1991. Price: $200.00. This is an interim report on the University of Southern California childhood leukemia study, which was widely reported in the press when preliminary results were announced last February. A shorter version of this report was published in the *American Journal of Epidemiology* in November (see *MWN*, J/F91, M/A91, S/O91 and p.5). Peters and coworkers found an elevated cancer risk among children living near power lines, but there was no association with measured EMFs.

* G.B. Rauch, ***Pilot Study of Non-Residential Power Frequency Magnetic Fields*** (EL-7452s), August 1991. Price: $495.00. EPRI researchers describe measurement protocols that were developed after gathering data at more than 34 sites in and around public schools, office buildings, power plants and substations. Techniques to characterize the spatial, temporal and harmonic content of EMF sources are reviewed. "The study showed that visual inspection alone cannot predict all possible magnetic field sources."

* L.E. Zaffanella, ***Field Effect Research at the High Voltage Transmission Research Center*** (HVTRC) (EL-7104), February 1991. Price: $200.00. Presents data from five different studies performed at EPRI's HVTRC, in Lenox, MA. Among the topics discussed are the effects of spark discharges and induced currents from overhead transmission lines and the effects of power frequency magnetic fields on video display terminals.

* L.E. Zaffanella et al., ***Network Analysis of Ground Currents in a Residential Distribution System*** (EL-7369s), August 1991. Price: $295.00. Research at EPRI's HVTRC, cosponsored by Ontario Hydro, found that ground currents in residential distribution systems, which could have a significant effect on residential EMF levels, are only moderately predictable. The uncertainty is attributed to variations in the resistance of water pipe joints, through which grounded currents often flow.

The researchers investigated leukemia and brain tumor deaths among Swedish male workers aged 20-64 between 1961 and 1979. See Siv Törnqvist et al., "Incidence of Leukaemia and Brain Tumours in Some 'Electrical Occupations'," *British Journal of Industrial Medicine*, 48, pp.597-603, 1991.

U.K.: Ambiguous Results Among Adults

Adults who lived within 50 meters of an overhead power line had a slightly elevated risk of developing leukemia or lymphoma—a finding that verged on statistical significance. Dr. J. Youngson of the University of Manchester and Drs. A.D. Clayden, A. Myers and R.A. Cartwright of the University of Leeds concluded that the results show a "suggestion of a trend with distance."

"The results of this study suggest the possibility of an increased risk in the region of 1.3 at high levels of magnetic field or at close proximity to overhead power lines. However, this study lacks the statistical power to detect any small true increase in risk at these calculated levels of exposure to magnetic fields," the team concluded, adding that if there is an increased risk from residential exposures, it is probably "extremely small."

There were ORs of 1.87 and 3.0 for those living in homes with the highest calculated magnetic field levels, 3 mG or more and 10 mG or more, respectively, but these findings were based on small numbers and were not statistically significant. There was neither a significantly increased risk nor a significant trend for the combined data set.

The team calculated magnetic field exposures from the estimated maximum load currents of the overhead lines in the five years prior to diagnosis. Only 4% of the study population had a computed magnetic field exposure greater than 0.1 mG.

The study population included men and women aged 15 or older who were diagnosed with non-Hodgkin's lymphoma or leukemia between 1983 and 1985. The team analyzed 3,144 cases and a matched set of controls, all living in northern England.

See J.H.A.M. Youngson et al., "A Case/Control Study of Adult Haematological Malignancies in Relation to Overhead Power Lines," *British Journal of Cancer*, 63, pp.977-985, 1991. A number of the members of the study team published a study of EMFs and childhood cancer last year (see *MWN*, N/D89).

HIGHLIGHTS

Connecticut Police Ban Hand-Held Radar Units

In a precedent-setting move, the Connecticut State Police have banned the use of hand-held radar devices. On October 10, Lt. Colonel Patrick Tully, chief of the police's Office of Field Operations, ordered that antennas of two-piece radars be mounted on the outside of patrol cars. "Under no circumstances shall the antennas be operational inside the vehicles," he wrote in a departmental memo.

Connecticut's action follows growing national concern about a possible association between police radar and cancer (see *MWN*, M/J91). The number of lawsuits that have been filed by police officers and their families is expected to grow from five to as many as 20 by early next year, according to John Sweeney, the Agoura Hills, CA, attorney who is handling most of the suits (see *MWN*, J/A91 and S/O91).

A spokesman for Tully, Sgt. John Mannion, told *Microwave News* that the department's 70 hand-held units have been shelved and that the department is using only two-piece sets. Only 40 troopers are assigned to radar patrol each day, he said, and the state police have 210 two-piece units, so there will be no reduction in the enforcement of speeding violations.

Tully's action set off a ripple effect among municipal police forces in Connecticut. By mid-November, according to the Manchester, CT, *Journal Inquirer*, 24 police departments had limited or prohibited the use of police radar units. The towns include Shelton and Windsor Locks, where one and two officers, respectively, have filed workers' compensation claims, charging that use of radars caused them to develop cancer. Both towns have rejected the claims, and the three officers plan to appeal to the state workers' compensation agency, according to the *Journal Inquirer*.

At the request of the International Brotherhood of Police Officers (IBPO), the state Department of Health Services (DHS) has agreed to evaluate these and other reported cancer cases. Sam Franzo, an IBPO representative, said that the union is collecting medical information which it will forward to the DHS. In addition, an official with the federal Centers for Disease Control will survey the technical literature, according to the health department. IBPO represents some 1,800 officers in 42 Connecticut police departments.

Franzo plans to push for more action to limit the use of police radars. "We have to have legislation," he told *Microwave News*. "Some police chiefs refuse to believe the claims linking cancer to radar." The chairman of the state General Assembly's Labor & Public Employees Committee, Rep. Joe Adamo (D-West Haven), has promised to investigate.

The state police department, according to Mannion, has conducted two exposure surveys. None of the measured levels exceeded the 5 mW/cm^2 safety level set by the 1982 American National Standards Institute (ANSI) for X-band and K-band radiation. Both surveys were carried out at Retlif Testing Laboratories in Ronkonkoma, NY, and were coordinated by Fred Helene, a consultant based in Wallingford, CT. A report on the test results will be submitted to the state police by the end of the year, Helene said.

Another set of measurements, taken at the Michigan State University Radar Testing Laboratory in East Lansing, reveals

that, under normal operating conditions, exposure levels are less than 1% of the ANSI limit. "We are able to conclude with a high degree of certainty that there is no evidence to support the allegation that police traffic radar operators are at risk due to prolonged exposure," the lead investigator, Dr. David Fisher, reported. *Microwave Exposure Levels Encountered by Police Traffic Radar Operators* (August 30, 1991, No. MSU-ENGR-91-007) is available at no cost from: Fisher, Department of Electrical Engineering, Michigan State University, 260 Engineering Bldg., East Lansing, MI, 48824.

The Michigan State data are consistent with preliminary results released earlier this year by Battelle of Columbus, OH, and by the Institute for Police Technology and Management in Jacksonville, FL (see *MWN*, M/A91).

Radiofrequency and Microwave Radiation Resources

Robert Cleveland and Michael Buccigrossi, ***Trip Report: Measurement Survey, New York, NY, July 31-August 1, 1991,*** unpublished and undated report by the U.S. Environmental Protection Agency (EPA) and the Federal Communications Commission (FCC), 9 pp. Available from: Buccigrossi, EPA Region II, Radiation Branch, 26 Federal Plaza, New York, NY 10278.

This report includes surveys of radiofrequency and microwave (RF/MW) radiation levels near three different types of emitters. The first site had a complex of 12 land-mobile, two-way communications antennas—operating at 43, 46 or 450 MHz and at 75, 90 or 450-500 watts—on top of a residential building. Within five feet of the antennas, readings of 133-265 $\mu W/cm^2$ were recorded. On the main roof of the building, there were "hot spots" as high as 16 $\mu W/cm^2$. Inside a top-floor apartment, levels were less than 0.3 $\mu W/cm^2$, the minimum level the meter can detect. At the second site, a penthouse apartment several hundred feet from a cluster of microwave antennas on top of a nearby building, levels were as high as 8 $\mu W/cm^2$ about 10-20 cm from a metal window frame. Residents of the penthouse had complained of electromagnetic interference to their electronic equipment. Readings of 3-8 $\mu W/cm^2$ and 0.3-1.3 $\mu W/cm^2$ were recorded at two other locations in the penthouse, but there were no other detectable levels in the apartment. Near the third site, another penthouse, there was a cluster of nine cellular antennas. With an effective radiated power of up to 120 watts per antenna, the cluster generated levels of 133-318 $\mu W/cm^2$ directly in front of one of the antennas—these readings dropped to 1.3-2.7 $\mu W/cm^2$ ten feet away. On the rest of the roof, the radiation levels were again less than 0.3 $\mu W/cm^2$.

Robert Cleveland and Edwin Mantiply, ***Electric and Magnetic Fields Near AM Broadcast Towers*** (EPA/520/6-91/020), U.S. Environmental Protection Agency, July 1991, 81 pp. Available for $19.00 from: National Technical Information Service (NTIS), 5285 Port Royal Rd., Springfield, VA 22161, (800) 336-4700, Order No. PB-92-101427.

Measurements of RF radiation taken 1-100 meters from eight AM broadcasting stations generally agreed with predictions made using a computer model—except within several meters of a transmitting tower base or near metal fencing or other metal objects. The model, known as the Numerical Electromagnetic Code (NEC), was developed at the Lawrence Livermore Laboratory in Livermore, CA, to identify regions near transmitting facilities where RF safety limits may be exceeded. The stations, all located in southern California, operate at 550 kHz–1.45 MHz and represent a range of electrical heights and power outputs.

Environmental Science Associates, Inc., ***Gibraltar Peak Communications Site: Environmental Impact Report*** (No. 91-EIR-12), County of Santa Barbara, CA, Resource Management Department, September 1991, 317 pp.

A proposed expansion of the Gibraltar Peak Communications Facilities in Santa Barbara County would result in localized RF radiation levels which would exceed the NCRP recommended exposure limits for the general public and increase the area in which occupational limits are regularly exceeded. Half of the report is an analysis of the health effects of RF radiation by Dr. Bill Guy, a retired professor of bioengineering at the University of Washington, Seattle. Members of a family that was moved from the antenna farm (see *MWN*, M/A91) have filed a $7 million lawsuit against both the owners of the Gibraltar site and a communications firm that operates many of its antennas, according to an article in the October 14 *Santa Barbara News-Press*.

Margaret Garson et al., "A Chromosomal Study of Workers with Long-Term Exposure to Radiofrequency Radiation," ***Medical Journal of Australia, 155***, pp.289-292, September 2, 1991.

There were no statistically significant differences in the rate or types of chromosomal aberrations in the stimulated lymphocytes of 38 radio linemen as compared with 38 controls. The linemen worked for Telecom Australia, erecting and maintaining broadcast, telecommunication and satellite facilities; they were exposed to 400 kHz–20 GHz radiation for an average of 15.4 years. Exposures were below the Australian occupational standard, which limits SARs to less than 1 mW/cm² (see *MWN*, M/A86). Recent tests showed that for frequencies of up to 100 MHz, induced currents from RF exposures were less than 100 mA in each leg.

Health Physics, 61, pp.3-67, July 1991.

Features six papers adapted from presentations at the Health Physics Society's June 1990 summer school, *Assessing Non-Ionizing Radiation Hazards:* Larry Anderson, "ELF: Exposure Levels, Bioeffects and Epidemiology"; John D'Andrea, "Microwave Radiation Absorption: Behavioral Effects"; Robert Kavet and Richard Tell, "VDTs: Field Levels, Epidemiology and Laboratory Studies"; Richard Luben, "Effects of Low Energy [EMFs] (Pulsed and DC) on Membrane Signal Transduction Processes in Biological Systems"; Sol Michaelson, "Biological Effects of [RF] Radiation: Concepts and Criteria"; Ron Petersen, "[RF/MW] Protection Guides."

Jon Klauenberg and James Merritt, "No Evidence for Microwave Interaction with Noradrenergic Neurotransmitter Systems," and Dennis Hjeresen, "Reply," ***Health Physics, 60***, pp. 282-284, February 1991.

Two members of the U.S. Air Force School of Aerospace Medicine's (USAFSAM) division of radiation sciences take issue with Hjeresen's conclusion in a 1989 paper that microwaves can affect noradrenergic neurotransmitters. In his response, Hjeresen, of Los Alamos National Lab, describes how the Air Force, his sponsor, operated: "[A]fter [our] results...were formally submitted to [USAFSAM], pressure was applied, suggesting that we not report significant biological effects of low-power microwave irradiation....The [USAFSAM] has consis-

tently suggested to us that there are no effects of low-level microwave exposure despite evidence to the contrary presented in the peer-reviewed literature. Empirical results from their laboratories would be helpful and might provide a more compelling argument for their position. Because the [USAFSAM] is one of the few remaining funding sources for research in the microwave bioeffects field, a more satisfying scientific response would be sustained by financial support for unrestrained research in this area by independent laboratories."

B.K. Nelson et al., "Marked Increase in the Teratogenicity of the Combined Administration of the Industrial Solvent 2-Methoxyethanol and Radiofrequency Radiation in Rats," *Teratology, 43*, pp.621-634, 1991.

RF radiation acted alone and synergistically with the industrial solvent 2-methoxyethanol (2ME) to cause malformations in the offspring of rats exposed during pregnancy. This team of NIOSH researchers used 10 MHz CW radiation at SARs of 0.8-6.6 W/Kg to maintain a 4°C increase in the rats' rectal temperature. RF exposure alone increased malformations by 30% and 2ME alone increased them by 14%. Together, the RF and the agent caused a 76% increase, "evidence of synergism." Polish researchers have also shown that RF can enhance the action of a chemical teratogen (see *MWN*, J/F87). For other RF teratological studies, see *MWN*, Oct83, Ap84, Jn84, N/D86 and N/D87.

Richard Tell, ***Induced Body Currents and Hot AM Tower Climbing: Assessing Human Exposure in Relation to the ANSI Radiofrequency Protection Guide,*** FCC, Washington, DC, October 7, 1991, 82 pp. Available from: NTIS, see above. Order number was unavailable at press time.

Tests at two AM radio transmitters in Bakersfield and Riverside, CA, showed that the induced body currents in workers climbing the towers can routinely exceed the 1991 IEEE guidelines for "controlled" RF exposures (see p.1). Among Tell's other findings: The range of frequencies in the AM band can account for a threefold difference in the body current and a ninefold variation in the resulting wrist SAR; considerable power reductions—down to a few tens of watts—may be necessary to meet the IEEE guidelines; RF burns can easily occur in workers on hot towers even at power levels as low as 1 kW; and, "Pending the development of additional insight into the issue of body currents and exposure mitigation for hot AM tower work, broadcasters should proceed in a cautious manner with respect to authorizing routine tower work while the tower is energized." The data obtained in this study are consistent with EPA–FCC measurements taken at a Spokane, WA, AM station (see *MWN*, J/A88).

FROM THE FIELD

German Workshop on Mechanisms of EMF Interactions

On September 11-12, 1991, the Deutsche Forschungsgemeinschaft (DFG)—the German equivalent of the U.S. National Science Foundation—held a conference on Interaction Mechanisms of Electromagnetic Fields (EMFs) with Cellular Systems *at the Max Planck Institute for Solid State Research in Stuttgart.*

The statement reprinted below represents a consensus of the 25 biologists, chemists and physicists who participated at the workshop. The statement was drafted by Drs. Werner Grundler, Friedemann Kaiser, Fritz Keilmann and Jan Walleczek and was translated from the German by Walleczek. Grundler is at the Center for Radiation and Environmental Research in Neuherberg, Kaiser is at the University of Darmstadt, Keilmann is at the Max Planck Institute in Stuttgart and Walleczek is a visiting scientist at the VA Medical Center in Loma Linda, CA.

In an interview with Microwave News *following the workshop, Walleczek said that the DFG is planning to sponsor a second meeting next spring in Frankfurt to draft an EMF research plan, with special emphasis on extremely low frequency (ELF) EMF effects. Walleczek anticipates that, if the DFG decides to approve an EMF project, a commitment will be made to a well-funded multiyear research effort.*

After evaluating the current experimental evidence and after discussing possible mechanisms of interaction, it was concluded that there now exists firm evidence that *non-thermal* effects due to EMF exposures can be triggered in living cells under selected conditions.

Over the past 15 years this insight has matured because of the steady increase in the number of positive findings using a variety of different cellular systems. For example, important knowledge has accumulated from gene expression and calcium metabolism in lymphocytes and other cells, cycle times of lymphocytes and yeast cells and investigations of cell differentiation in fibroblasts. In addition, clear responses of the central nervous system and a reduction in the synthesis of the hormone melatonin have been observed.

The applied fields encompass a wide range of frequencies between microwaves and static magnetic fields. Control experiments in which temperatures, frequencies and field intensities were varied—as well as theoretical estimates of field-induced heating—rule out the possibility that the reported observations could be explained by thermal effects.

In addition to the fundamental thermodynamic constraints, theoretical concepts which could play a mechanistic role in the mediation of the observed electromagnetic influences were discussed. These included possible underlying nonlinear processes (nonlinear dynamics), the chemistry of transient radical pair and triplet states and signal transduction mechanisms.

The current state of knowledge does not yet allow a definitive explanation of the experimental findings. On the other hand, *a systematic variation of field parameters* (e.g., frequency, amplitude of the electric and/or magnetic field) in one of the above-mentioned, reproducible biological experiments could lead to significant progress in the theoretical interpretation of the reported results.

Unanimously, it was decided that these talks should continue and that they should include other scientists who could make relevant contributions. There is reasonable hope that this innovative and highly interdisciplinary field of research will receive appropriate financial support in the near future.

EMFs from Light Boxes

To the Editor:

In an attempt to determine whether there are health risks associated with using a light box for viewing photographic transparencies, we measured magnetic field levels from both commercially available and custom-made light boxes at a photo agency in Woodstock, NY. The tests yielded some surprising results: Magnetic fields at a height of 4.5 cm above the viewing surface (the height of an average loupe) in some cases were as high as 60-80 mG. The magnetic field strength is about 6 mG at 30 cm from the surface and drops to less than 2 mG at 62 cm. This means that people editing color transparencies may be

exposed to the same field levels as electricians working with industrial power supplies, underground and overhead power line workers and welders.

Virtually all light boxes have a "ballast"—a device for converting 110 volts AC to the current necessary for a fluorescent bulb—which is the source of strong magnetic fields. A photo editor may spend hours a day within inches of the ballast, which is often located near the center of the box. The cumulative exposure can be substantial.

One option for mitigating these exposures is to remove the ballast from the light box and put it at the end of a cable. Our measurements showed that with the ballast removed the magnetic field strength was a nominal 2-3 mG at the viewing surface. Changing the circuit, however, will invalidate the UL-approved designation of the light box. Another option is to hold the loupe and the transparency away from the light box—only working at the surface when absolutely necessary.

Sincerely,

Mark Antman
The Image Works
PO Box 443
Woodstock, NY 12498

Stewart Maurer, PhD
Department of Electrical Engineering
New York Institute of Technology
1855 Broadway, New York, NY 10023

EMF Exposures Among Aluminum Workers

To the Editor:

Aluminum workers have been a focus of interest concerning occupational EMF exposure in several recent studies [see *MWN*, J/A90]. It has been pointed out that workers in the "potrooms," where the large electrolytic cells are housed, are subjected to strong DC magnetic fields, often in excess of 100 G. We recently had the opportunity to take some preliminary measurements of AC fields: Such measurements revealed fields greater than 100 mG in some regions of the potrooms. These AC fields may be due to the close proximity of the rectifiers and/or the AC ripple.

Sincerely,

Michael P. Milburn, PhD
ELMAG Research & Consulting
203-888 Burrard St.,
Vancouver, BC V6Z 1X9, Canada

UPDATES

COMPATIBILITY & INTERFERENCE

Apache Helicopter and EMI... The Army continues to be criticized for failing to shield its aircraft adequately from potentially dangerous EMI—such charges have been leveled by members of Congress, by the DOD Inspector General and by dozens of newspapers and magazines, including the *New York Times*, the *Washington Post* and *Time*. The latest barrage, fired in an article in the fall issue of *Compliance Engineering* magazine, is aimed at the Army's Apache attack helicopter. William von Achen, *Compliance Engineering*'s editor and the author of the piece, writes that, "The EMI problems that have plagued the Apache are particularly troublesome, since Army officials knew, or should have known, of the potential for such difficulties almost from the project's inception." According to a 1988 Inspector General investigation, von Achen reports, the Apache cannot be deployed from an aircraft carrier because of EMI, and may be susceptible to "commercial microwave, television and airport radar," as well as "combat emitters, such as U.S. and allied missile radar controllers" (see *MWN*, S/O88). Von Achen also reveals that the Apache encountered serious electronic problems during its first combat duty in the 1989 U.S. invasion of Panama. He suggests that the Army—which still requires its aircraft to meet only a 20 V/m immunity requirement, while Navy and Air Force aircraft must meet a much stricter 200 V/m standard—should have known that its EMI shielding was insufficient because of its experience with the Black Hawk helicopter (see *MWN*, N/D87 and N/D88). EMI may have been responsible for a number of accidents and fatalities involving the Black Hawk—though widely reported as fact, these charges have repeatedly been denied by the Army (see *MWN*, S/O91). Furthermore, von Achen reports that Navy engineers found that EMI disrupted steering equipment, automatic flight control systems, AC and DC power systems, fire detection devices, command instrument systems and other electronic components in the Black Hawk. Nevertheless, Army officials sidestepped *Compliance Engineering*'s charges about the Apache, asserting that, "There are no known deficiencies in the EMI area that preclude operational use of the AH-64 (Apache) for all its intended missions." *Compliance Engineering* is published by Dash, Straus & Goodhue, Inc., in Boxborough, MA.

LAW

Attorney Advocates Utility Reform... Utility executives must "return to their proper task—assisting the public—rather than fighting the citizens they serve," states Seattle, WA, attorney Philip McCune in an article in the winter issue of the *University of Michigan Journal of Law Reform*, published in Ann Arbor. McCune argues that growing fear of EMF health effects, coupled with "imperfect legal rules," could result in undue costs to utilities and consumers alike. "Power companies must change their approach to the construction of new power lines if they wish to expand their electrical transmission capacity," McCune writes. His article begins with a discussion of current legal theories governing EMF litigation, including eminent domain and inverse-condemnation proceedings and tort actions for those who have suffered financial, emotional or physical harm from power line EMFs. He then presents a number of "simple solutions" for utilities to allay public concerns and reduce public exposures to EMFs. These solutions include avoiding major population centers when planning transmission lines, purchasing wider rights-of-way, implementing EMF-reduction technologies when designing new lines and increasing community trust through communication. "Reforming public relations strategies and increasing safety will require some added expense, but this should not hinder their implementation," McCune asserts, adding that, "The cost of alternative power line construction

techniques represents a small fraction of the total dollars at stake in the construction of electrical transportation devices today."

MAGLEV

Fire Destroys Test Vehicle... Japanese researchers developing magnetic levitation technology saw one of their trains gutted by a fire that broke out during a test run on October 3, according to an article in the October 17 issue of *Nature*. The fire started when one of the rubber tires, designed to support the train at low speeds, went flat. Though no one was injured in the accident, maglev's status as the commercial transport system of the future may have been dealt a serious blow, according to *Nature*. David Swinbanks, reporting from Tokyo, cites a number of other potential problems with the high-speed rail technology, including difficulty in shielding the insides of the trains from high magnetic fields—there is concern that these fields could stop a pacemaker or present long-term health risks to passengers. Swinbanks goes on to state that "ambitious plans by proponents of the maglev train...must now be very much in question because of the numerous technical hurdles in the way." Yet Japanese Transport Minister Kanezo Muraoka reportedly said that the $23 million vehicle would be replaced and that further testing would go ahead on schedule. Attempts by *Microwave News* to obtain more information on the accident from the Japan Railway Technical Research Institute, which is conducting the tests, were unsuccessful.

MEDICAL DEVICES

Apnea Monitor Recalled... On September 23, Aequitron Medical, Inc., of Minneapolis, MN, issued a recall for its Model 8200CE apnea monitor because EMI could interrupt the device's lifesaving alarm function, according to the October 2 *FDA Enforcement Report*. The Model 8200's EMI susceptibility has been linked to at least 70 deaths and has been the subject of Congressional hearings, a GAO investigation and litigation (see *MWN*, J/A91). More than 12,000 of these monitors have been distributed in the U.S., Canada and Belgium. Despite repeated requests, the company has refused to provide *Microwave News* with information on the recall.

MEETINGS

Australian ELF Workshop... Papers on the biological effects of power frequency EMFs, risk perception and regulation were presented at the Australian Radiation Protection Society's *50 Hz Fields and Health* workshop on October 3-4, 1991, in Sydney. Among the contributors were Australia's Drs. Michael Repacholi and Vincent Delpizzo, the U.S.'s Drs. Jan Stolwijk, Tom Tenforde, Larry Anderson and Granger Morgan and the International Agency for Research on Cancer's Dr. Michel Coleman. The two-volume proceedings are available for $44.00 (Aus.), including postage and handling, from: Graeme Elliott, *Radiation Protection in Australia*, PO Box 128, Rosanna, Victoria 3084, Australia.

NIOSH Proceedings Out... The 229-page compilation of plenary papers and recommendations from NIOSH's January 1991 *Scientific Workshop on the Health Effects of Electric and Magnetic Fields on Workers* has been published (see *MWN*, J/F91 and M/A91). Presented in the booklet, which was edited by NIOSH's Philip Bierbaum and Dr. John Peters of the University of Southern California in Los Angeles, are papers by Dr. Stephen Cleary on *in vitro* studies, Dr. Larry Anderson on *in vivo* research, Dr. Gilles Thériault on epidemiology, Dr. Dan Bracken on exposure assessment and William Feero on EMF management. The volume is available at no cost from: Publication Dissemination, DSDTT, National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, OH 45226, (513) 533-8287.

RESOURCES

OTA on Circadian Rhythms...A new report by the Congressional Office of Technology Assessment (OTA), titled *Biological Rhythms: Implications for the Worker*, asserts that altered circadian cycles can result in reduced productivity, fatigue, stress, insomnia and depression. These effects, common in many shift workers, may be due to abnormal sleep schedules and altered exposure to daylight, which regulate the pineal gland and production of the hormone melatonin. Doses of bright, fluorescent light may help the body adjust to schedule changes, according to the report. OTA concludes that much more research is needed to understand fully the biological effects of circadian rhythms. Copies of the 250-page report (GPO 052-003-01254-5) are available for $11.00 each from: Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, (202) 783-3238.

Wall Chart... The U.K.'s National Radiological Protection Board (NRPB) is offering a wall chart that illustrates the sources and effects of NIER, together with protection techniques. Single copies of *Non-Ionizing Radiations* are available free from: Publications Office, NRPB, Chilton, Didcot, Oxon OX11 0RQ, U.K., (44+0235) 831600.

ETC...

Microwaves and Murder... An FCC clerk was shot to death outside the agency's Manhattan field office on November 27 by a woman who had previously complained that radiowaves were "interfering with her," and who said that she had been subjected to "illegal surveillance" by the FCC, according to press reports. The suspect, a 53-year-old woman from Greeley, CO, apparently singled out Catherine Forster just because she worked for the FCC. In past incidents, the suspect had threatened to kill an employee at FCC headquarters in Washington, DC, and had to be physically removed from field offices in New York City and Denver, according to an account in the December 2 issue of *Broadcasting*. Richard Smith, head of the FCC's field operations bureau, told *Broadcasting* that bizarre types of behavior, even attacks, are not uncommon, adding that, "This is something we deal with day in and day out." No other FCC employee has been killed in the line of duty.

CONFERENCES

1992 Conference Calendar

January 23-25: **1st Congress of the European Bioelectromagnetics Association,** Brussels, Belgium. Contact: Dr. M. Hisenkamp, Dept. of Orthopedic Surgery and Traumatology, Hôpital Erasme, Université Libre de Bruxelles, Route de Lennik 808, B-1070 Brussels, Belgium, (32+2) 555-3640.

January 26-30: **IEEE Power Engineering Society Winter Meeting,** Hilton Hotel, New York, NY. Contact: Frank Schink, 14 Middlebury Lane, Cranford, NJ 07016, (908) 276-8847.

February 3-7: **The Health Physics of Non-Ionizing Radiation,** Battelle Conference Center, Seattle, WA. Contact: Dr. John A. Leonowich, Battelle Pacific NW Labs, PO Box 999, Mail Stop K3-70, Richland, WA 99352, (509) 375-6849.

March 9-10: **EMF: How Dangerous?** Marriott Hotel, Arlington, VA. Contact: Barry LeCerf, EMF Conference, 5072 West Chester Pike, PO Box 556, Edgemont, PA 19028, (215) 359-1249.

March 10-15: **Congress on Electromagnetic Pollution and Biogeopathogenical Research,** Foz do Iguacu, Brazil. Contact: Dr. José Barbosa Marcondes, Caixa Postal 3321, São Paulo, Cep. 01060, Brazil.

March 12-13: **1992 IEEE 18th Annual Northeast Bioengineering Conference,** University of Rhode Island (URI), Kingston, RI. Contact: Dept. of Electrical Engineering, URI, Kingston, RI 02881.

March 30-April 2: **Biological Effects of Ionizing and Non-Ionizing Radiation: Nuclear, UV, RF/MW, IR and Ultrasound,** George Washington University (GWU), Washington, DC. Contact: GWU, School of Engineering and Applied Science, Washington, DC 20052, (800) 424-9773.

April 1-2: **28th Annual Meeting of the National Council on Radiation Protection and Measurements** (NCRP), Marriott Hotel, Crystal City, VA (outside Washington, DC). Contact: Roger Ney, NCRP, 7910 Woodmont Ave., Suite 800, Bethesda, MD 20814, (301) 657-2652.

April 5-9: **Meeting of the Federation of American Societies for Experimental Biology** (FASEB), Convention Center, Anaheim, CA. (The International Society for Bioelectricity will participate.) Contact: FASEB Office of Scientific Meetings and Conferences, 9650 Rockville Pike, Bethesda, MD 20814, (301) 530-7010.

April 13-16: **International Magnetics Conference,** Adam's Mark Hotel, St. Louis, MO. Contact: John Nychuis, Purdue University, School of Electrical Engineering, West Lafayette, IN 47907, (317) 494-3524.

April 13-16: **70th Annual Convention of the National Association of Broadcasters** (NAB), Convention Center, Las Vegas, NV. Contact: NAB Services, 1771 N St., NW, Washington, DC 20036, (800) 342-2460.

April 26-May 1: **6th International Congress on Hyperthermic Oncology,** Convention Center, Tucson, AZ. Contact: Joseph Segilia, Conference Services, University of Arizona, 1955 E. 6th St., Tucson, AZ 85719, (602) 621-7724.

May 10-14: **2nd International Workshop on Non-Ionizing Radiation** (NIR), University of British Columbia (UBC), Vancouver, Canada. Contact: Wayne Greene, NIR Workshop, 50/2075 Westbrook Mall, UBC, Vancouver, BC V5Y 1P9, Canada.

May 12-14: **Instrumentation/Measurement Technology Conference** (IMTC), Meadowlands Hilton, East Rutherford, NJ (outside New York City). Contact: Robert Myers, IMTC, 3685 Motor Ave., Suite 240, Los Angeles, CA 90034, (213) 287-1463.

May 17-21: **24th Annual National Conference of Radiation Control Program Directors** (CRCPD), Clarion Plaza Hotel, Orlando, FL. Contact: Terry Devine, CRCPD, 205 Capital Ave., Frankfort, KY 40601, (502) 227-4543.

May 17-22: **8th World Congress of the International Radiation Protection Association** (IRPA), Convention Center, Montreal, Canada. Contact: IRPA 8, 2155 Rue Guy, Suite 820, Montreal, Quebec H3H 2R9, Canada, (514) 932-9552.

May 25-27: **1992 International Symposium on Electromagnetic Compatibility,** Xiang Shan Hotel, Beijing, China. Contact: Min Fang, Chinese Institute of Electronics, Nongzhanguan Nanlu No.12, Room 2310, Beijing, 100026 China, (86+1) 5001144, ext.2310.

May 27-29: **46th Annual Symposium on Frequency Control,** Lodge & Convention Center, Hershey, PA. Contact: Michael Mirarchi, Synergistic Management Inc., 3100 Route 138, Wall Township, NJ 07719, (908) 280-2024.

May 30-June 3: **27th Annual Meeting & Exposition of the Association for Advancement of Medical Instrumentation** (AAMI), Marriott Hotel, Anaheim, CA. Contact: AAMI Education Dept., 3330 Washington Blvd., Suite 400, Arlington, VA 22201, (703) 525-4890, ext.214.

June 2-4: **1992 IEEE Microwave Theory and Techniques Society International Microwave Symposium,** Albuquerque, NM. Contact: Mike Little, Rome Air Development Center, RADC/OCTP, Griffiss AFB, NY 13441.

June 9-12: **Conference on Precision Electromagnetic Measurements,** Paris, France. Contact: Ginette Bonami, Société des Electriciens et des Electroniciens, 48 Rue de la Procession, F-75724 Paris Cedex 15, France, (33+1) 45 67 07 70.

June 14-19: **1st World Congress for Electricity and Magnetism in Biology and Medicine,** Walt Disney World Village, Orlando, FL. Contact: W/L Associates, 120 W. Church St., Frederick, MD 21701, (301) 663-1915.

June 23-25: **20th International Power Modulator Symposium,** Hilton Hotel, Myrtle Beach, SC. Contact: Mark Goldfarb, Palisades Institute for Research, 2011 Crystal Dr., Suite 307, Arlington, VA 22202.

July 12-16: **IEEE Power Engineering Society Summer Meeting,** Seattle, WA. Contact: Betty Tobin, Society Special Services, IEEE, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855, (206) 684-3370.

July 18-25: **1992 IEEE Antennas and Propagation Society International Symposium, URSI Radio Science Meeting** and Nuclear EMP Meeting, Hyatt Regency Hotel, Chicago, IL. Contact: Prof. Piergiorgio Uslenghi, Dept. of EECS (M/C 154), University of Illinois, Box 4348, Chicago, IL 60680, (312) 996-5487.

August 2-5: **27th Microwave Power Symposium,** Marriott Hotel, Washington, DC. Contact: International Microwave Power Institute, 13542 Union Village Circle, Clifton, VA 22024, (703) 830-5588.

August 8-14: **Annual Scientific Meeting and Exhibition of the Society of Magnetic Resonance Imaging in Medicine** (SMRIM), International Congress Center, Berlin, Germany. Contact: SMRIM, 1918 University Ave., Suite 3C, Berkeley, CA 94704, (415) 841-1899.

August 10-14: **Non-Ionizing Radiations: Health Physics and Radiation Protection,** Massachusetts Institute of Technology (MIT), Cambridge, MA. Contact: Director, MIT Summer Session Office, Room E19-356, Cambridge, MA 02139, (617) 253-2101.

August 11-13: **1992 Asia-Pacific Microwave Conference,** Convention Center, Adelaide, Australia. (Held in conjunction with the *5th Australian Millimeter and Submillimeter Wave Symposium.*) Contact: Professor Harry Green, Dean, Faculty of Engineering, University of Adelaide, GPO Box 498, Adelaide SA 5001, Australia.

August 18-20: **1992 IEEE International Symposium on Electromagnetic Compatibility,** Marriott Hotel, Anaheim, CA. Contact: George Kunkel, Spira Mfg., 12721 Saticoy St. South, North Hollywood, CA 91605, (818) 764-8222.

September 1-4: **3rd International Scientific Conference on Work with Display Units,** International Congress Center, Berlin, Germany. Contact: Dr. Ahmet Çakir, Ergonomic Institut fur Arbeits- und Sozialforschung, Soldauer Platz 3, D-1000 Berlin 19, Germany, (49+30) 302 10 50.

September 2-4: **11th International Wroclaw Symposium on Electromagnetic Compatibility** (EMC), Technical University, Wroclaw, Poland. Contact: W. Moron, EMC Symposium, Box 2141, 51-645 Wroclaw 12, Poland, (48+6) 71 48 10 41.

September 6-12: **26th Congress Ampere on Magnetic Resonance,** Vraona

Bay Hotel, outside Athens, Greece. Contact: Dr. F. Milia, Institute of Materials Science, NCSR Demokritos, GR-153 10 Ag. Paraskevi Attikis, Greece, (30+1) 65 22 872.

September 21-24: **8th International Conference on Electromagnetic Compatibility,** Heriot-Watt University Conference Center, Edinburgh, U.K. Contact: Conference Services, Institution of Electrical Engineers (IEE), Savoy Pl., London WC2R OBL, U.K., (44+71) 240-1871, ext.222.

September 22-25: **1992 International Symposium on Antennas and Propagation,** Hokkaido University Conference Hall, Sapporo, Japan. Contact: Yoshio Hosoya, NTT Radio Communication Systems Labs, 1-2356, Take, Yokosuka, Kanagawa, 238-03, Japan, (81+468) 59-3134.

September 23-25: **5th International Conference on Harmonics in Power Systems,** Atlanta, GA. Contact: Nancy Heitman, IEEE Service Center, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855, (206) 684-3370.

October 5-9: **1992 International Aerospace and Ground Conference on Lightning and Static Electricity,** Atlantic City, NJ. Contact: Mike Cupples, FAA Technical Center, ACD 230, Atlantic City International Airport, NJ 08405, (609) 484-5228.

October 12-13: **Radar 92: International Conference,** Conference Center, Brighton, U.K. Contact: IEE, see September 21 above.

October 13-16: **1992 EPRI EMF Science & Communication Seminar,** Fairmont Hotel, San Francisco, CA. Contact: EMF Health Studies Program, Electric Power Research Institute (EPRI), PO Box 10412, Palo Alto, CA 94303, (415) 855-2320.

October 29-November 1: **14th International Conference of the IEEE Engineering in Medicine and Biology Society,** Le Palais des Congrès, Paris, France. Contact: Robert Plonsey, Dept. of Biomedical Engineering, Duke University, Durham, NC 27706, (919) 660-5124.

November 2-5: **1992 Regional Symposium on Electromagnetic Compatibility,** Hilton Hotel, Tel Aviv, Israel. Contact: Ortra Ltd., PO Box 50432, Tel Aviv 61500, Israel, (972+3) 664825.

November 12-14: **JINA '92 International Symposium on Antennas,** Nice, France. Contact: Dr. J.L. Guiraud, CNET-PAB, Centre de la Turbie, 06320 La Turbie, France.

Dates and Locations To Be Announced

September/October: **11th International Conference on Gyromagnetic Electronics and Electrodynamics,** Crimea, Ukraine. Contact: Dr. L.K. Mikhailovsky, Moscow Power Engineering Institute, 105835 Moscow, E-250, Krasnokazarmennaya, 14, Russia, (7+095) 362-55-32.

November: **Annual Department of Energy Contractors Review,** Contact: W/L Associates, 120 W. Church St., Frederick, MD 21701, (301) 663-1915.

DOE Maps Out National EMF Research Agenda *(continued from p.1)*

istration officials. The White House Office of Management and Budget "is very interested in talking with us—that's a very good sign," San Martin said.

There were mixed messages as to whether there will be a surge in new funds for the national EMF program. At the workshop, San Martin and others from the DOE denied widespread rumors that the DOE EMF research budget would grow to $15 million in fiscal year 1993 (FY93), which begins October 1, 1992. "It seems unlikely to me that there's going to be a massive injection of new federal funds," said Reid Detchon, a senior DOE official.

Representatives from the Environmental Protection Agency (EPA) and other federal agencies agreed with the DOE view that federal funding is likely to remain limited.

Many researchers were critical of the prospect of a no-growth budget. "We're angry and annoyed about the lack of a consistent DOE program. The lack of a consistent federal effort is harming the national program," said Jack Sahl of Southern California Edison in Rosemead, CA. Speaking on behalf of many participants, Dr. Asher Sheppard of the VA Hospital in Loma Linda, CA, called the level of federal commitment "pitiful."

Despite DOE's refusal to promise more research funds, however, senior officials made it clear that an increase is in fact possible if a workable, unified plan is developed. "In such a case, I don't see a problem with resources," San Martin said.

Congress might also provide more funds, according to James Cunningham of the New York Power Authority, who has been actively promoting a national research effort. An additional $3-5 million in new federal research funds per year is "not out of the question," he said (see also p.4).

Workshop participants explored how to expand EMF research even in the absence of a larger budget. Most agreed that the new national effort should include current programs. Many suggested that, overall, 70% of the available funds should be allocated for science, 20% for engineering and 10% for communications.

The new DOE agenda is likely to include the National EMF Research Program (NERP), the proposed public–private partnership (see p.5). John Coughlin, chairman of the NERP steering committee and head of Wisconsin's Public Service Commission, argued that, "We're a necessary part of the mix." In an interview with *Microwave News* San Martin agreed, saying that the DOE might contribute funds to the NERP.

Under the new agenda, as sketched by DOE officials, the DOE would coordinate the work of other federal agencies, state governments and the NERP. The officials suggested that while the federal government might take the lead on scientific research, the electric utilities might do the best job of devising mitigation methods and the states might be best able to manage communications with the public.

Efforts are under way to smooth over differences between the DOE and other agencies with responsibility for EMFs. For instance, on November 4, representatives of the DOE and EPA met in the office of Rep. George Brown (D-CA). But a participant at the meeting said that, "It was clear that DOE and EPA hadn't yet worked out their differences."

Tensions between DOE and other federal officials were heightened by the department's decision not to invite representatives from other federal agencies to an October 10-11 DOE meeting held in preparation for the November workshop.

The DOE is now drafting a strategic EMF implementation plan. Public meetings are scheduled for January and February 1992, and a final research agenda is due by May 1992.

In addition to representatives from seven federal agencies, the 65 participants at the November workshop included experts from state agencies, private and industry research institutions, trade associations and a labor union.

15 GHz for controlled and uncontrolled exposures, respectively.
• The exposure limits still map out the well-known "well shape" for protection against energy absorption at whole-body resonances (30-300 MHz). At these most stringently regulated frequencies, the limits are 1 mW/cm² and 200 μW/cm² for uncontrolled and controlled exposures, respectively. The strictest limit specified in the 1982 standard was 1 mW/cm². The new 200 μW/cm² level is consistent with the 1986 recommendations of the National Council on Radiation Protection and Measurements (NCRP)—though these apply to the general population regardless of the environment (see *MWN*, M/J86).
• The applicable frequency range has been extended to 3 kHz, down from 300 kHz in the 1982 standard.
• Maximum induced currents for 3 kHz–100 MHz are now included to protect against shocks and burns. The most stringent requirements are current limits of 45 mA and 100 mA through each foot for uncontrolled and controlled exposures, respectively, for 100 kHz–100 MHz. At lower frequencies, larger currents are allowed.
• Emitters with an input power of up to seven watts continue to be excluded from the standard for 100 kHz–1.5 GHz. The exclusion does not apply to devices that are attached to the human body, however.

ANSI will publish a request for public comment on the revised standard in the December 27 issue of *Standards Action*, its biweekly newsletter. The comment period will run through February 25, 1992. The C95.1 standard will then be considered by the ANSI Board of Standards Review to determine whether it will become an "American National Standard." Fred Feiner, an ANSI spokesman, explained that any negative comments which have not been resolved by the IEEE will be presented to the board.

The revision of the new standard began in 1983 (see *MWN*, J/A83) and, since then, has been the subject of almost continuous controversy. The work of the SCC-28 group has been criticized on both procedural and substantive grounds (see *MWN*, J/A85, J/A86, J/A87, M/A88, M/A89, S/O89, N/D90 and S/O91).

The IEEE Standards Board also approved a revised standard (C95.3–1991) for the measurement of RF/MW radiation at its September meeting.

Both the C95.1 and the C95.3 standards are in the process of being printed and should be available by early 1992, according to Susan Valinoti of the IEEE Standards Department. Drafts are available now from: Customer Service, IEEE, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855, (800) 678-IEEE (678-4333). A copy of C95.1 costs $28.00; C95.3 costs $36.50. Add $4.00 for postage and handling for either standard or $6.00 for both. There is a discount for IEEE members.

Chairmen of ELF Subcommittee Named

On November 2 at a meeting held in Orlando, FL, SCC-28 Chairman Thomas Budinger of the Lawrence Berkeley Laboratory in Berkeley, CA, named Dr. John Bergeron and William Feero as the chairmen of the recently formed subcommittee 3 on extremely low frequency (ELF) safety guidelines. Bergeron is with GE Corporate Research and Development in Schenectady, NY, and Feero is with Electric Research and Management in State College, PA.

"The charge of the ELF subcommittee is to develop a scientific consensus on safe exposure guidelines and to identify practical experiments to resolve outstanding questions," Bergeron told *Microwave News*. He hopes that the subcommittee will complete its work within four years.

The subcommittee has set up two task forces: one on epidemiology chaired by Dr. Ralph Buncher of the University of Cincinnati in Ohio and one on biophysics and biology chaired by Dr. Bill Guy, who recently retired from the University of Washington, Seattle. Guy was the chairman of the subcommittee that wrote the 1982 RF/MW standard, and he played an active role in the development of the 1991 revision.

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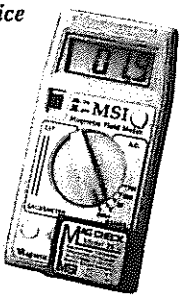
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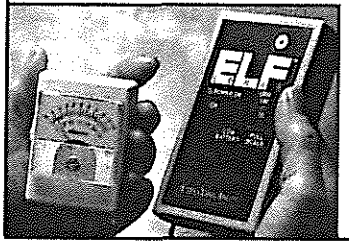
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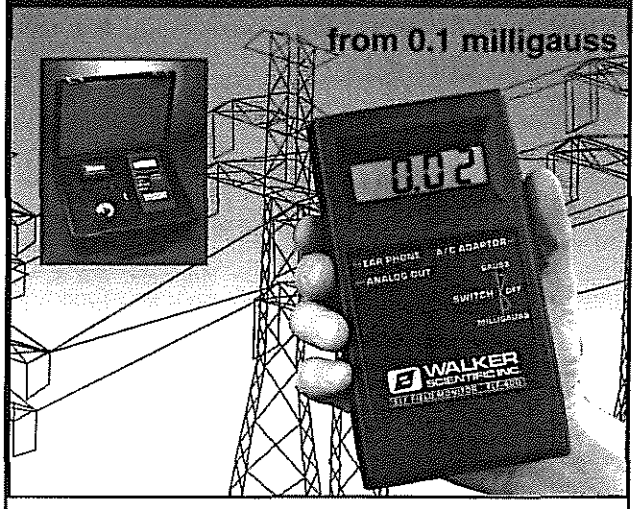
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MICRO WAVE NEWS

Vol. XII No. 6 A Report on Non-Ionizing Radiation November/December 1992

INSIDE...

EMF NEWS pp.2-10

Power Line Talk:
Public Wants To Know About EMFs • NY Utility Measures School Yard EMFs • Connecticut Opts for "Voluntary Exposure Control" • Realtors on Power Lines and Property Values • Florida Reaffirms Magnetic Field Limits • NERP Steering Committee Assesses Its Options

Brodeur on Power Lines, Schools and the California Health Department

An Interview with Dr. Anders Ahlbom

Danish Studies Add to EMF–Cancer Link

Power Line Delayed in Denmark

Swedish Worker with Brain Tumor Wins Compensation

DOE & NIEHS Prepare for Research Program

Federal Research Program Timetable

Legal Notebook:
NY Utility Wins Appeal in "Cancerphobia" Case • Trial Date Set for Zuidema Claim • Did EPRI Delay Health Studies?

Agency Comments on CIRRPC Report

FROM THE FIELD pp.10-11

NCRP Scientific Committee 89 Membership

HIGHLIGHTS pp.11-12

Technician Files $5 Million MW Injury Suit

ANSI Adopts IEEE RF/MW Standard

UPDATES pp.13-14

GE Named as Defendant in Police Radar Case • Israeli Worker's Radiation Claim • More on Finnish VDT–Pregnancy Study • GWEN Suspected of Power Line Interference

CONFERENCES pp.14-15

1993 Conference Calendar

CLASSIFIEDS pp.15-16

White House Report Argues EMFs Are Not a Public Health Issue

There is "no convincing evidence in the published literature" to support the possibility that exposures to extremely low frequency (ELF) electromagnetic fields (EMFs) are "demonstrable health hazards," and an expanded research effort is not warranted, according to a report prepared for the Bush Administration. "In the broad scope of research needs in basic science and health...concerns over exposures to ELF EMF should not receive a high priority," the report concludes.

"In the scheme of things, this doesn't need additional funding," said Dr. Alvin Young, chairman of the Committee on Interagency Radiation Research and Policy Coordination (CIRRPC), which commissioned the report. "If people were dropping dead from this, it would be different," Young told *Microwave News*. CIRRPC is part of the White House Office of Science and Technology Policy (OSTP).

But even before its release on November 12, the 372-page report prompted sharp criticism. "This is the last thing we need," said a senior federal official with responsibility for EMFs. The official, who requested anonymity, described the document as the "equal and opposite" of the 1990 Environmental Protection Agency (EPA) draft report which concluded that EMFs are probable or possible human carcinogens (see *MWN*, M/J90).

When, in mid-October, CIRRPC asked its member federal agencies for

(continued on p.8)

Commentary from San Diego

The Swedes Come to America

By the time Maria Feychting and Dr. Birgitta Floderus stepped up to the podium at the Department of Energy (DOE) meeting in San Diego on November 12th, millions of Americans—as well as millions of others around the world—had already heard about their landmark studies linking weak EMFs to cancer. *CNN* aired a report on October 13th and replayed it many times the next day on its *Headline News* channel. Details of Feychting and Dr. Anders Ahlbom's and Floderus's results were later featured in *Time* magazine (October 26) and in the *Los Angeles Times* on Sunday, November 8th, the day the conference opened. The following day, the *Times* piece appeared all over the U.S.—in the *Seattle Times*, the *Denver Post* and the *Philadelphia Inquirer*, among many other newspapers.

The CNN broadcasts coincided with the Electric Power Research Institute's (EPRI) *EMF Science & Communication Seminar*. So, when utility managers arrived in San Diego, they had already had a month to mull over the implications of the news from Sweden.

(continued on p.12)

« Power Line Talk »

EMFs top the list of health concerns among readers of *USA Weekend*, Gannett Co.'s Sunday magazine section. In September, the publication solicited questions about possible health hazards, suggesting issues such as pesticides, radon and air pollution, in addition to EMFs. The majority of the responses reflected worries about radiation from power lines and electrical appliances, according to Maryalice Yakutchik, who is writing a cover story on EMFs for the January 3 issue. "They didn't necessarily call it EMF, but they asked about EMF issues: What about my electric blanket? What about the clock radio next to my bed? The concern was very genuine." Yakutchik said her story will respond directly to a dozen or more questions from readers. *USA Weekend* is a supplement in more than 350 Gannett papers, reaching about 15 million readers.

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By next spring, officials at 35 schools in New York State will know the levels of EMFs in their school yards. The Syracuse, NY-based **Niagara Mohawk Power Corp.** will be estimating EMF exposures at those upstate schools that have transmission lines of at least 69 kV on, or next to, their property, according to Jack Toennies, director of environmental licensing and planning at Niagara Mohawk. The project is part of an agreement between the utility and the state PSC. "The reason for initiating the whole thing is that students, teachers and parents are concerned about EMFs, and this will be a good source of information," said PSC's Dan Driscoll, who praised the utility's efforts. Niagara Mohawk will gauge the distances between various spots in the yards and the power lines and use a computer model to calculate EMF exposures. "It's more efficient and consistent this way," Toennies noted, explaining that it is easier for a technician to measure distances than to measure EMFs. If the estimated exposures are high, or if school officials make a request, Niagara Mohawk will confirm the measurements with an on-site survey. The results will be available by March 31, 1993.

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Having decided that the term "prudent avoidance" does not adequately describe its approach to EMFs, the **Connecticut Department of Health Services** (DOHS) has chosen what it says is a more "proactive" policy: **voluntary exposure control** (VEC). "Whereas prudent avoidance is a fearsome concept, [VEC] is an empowering one," explained **Carolyn Jean Dupuy**, a DOHS epidemiologist. The VEC policy recommends giving people information about EMFs and letting them decide how best to control their exposures, Dupuy said. The DOHS move follows an April report by the Connecticut Academy of Science and Engineering (CASE) which concluded that it would be "inappropriate" to recommend prudent avoidance (see *MWN*, M/J92). Indeed, Dr. **Michael Bracken**, a professor at Yale University in New Haven and a member of the CASE committee that wrote the report, scorned such a policy. At a July 30 workshop in Connecticut, he said that, "Prudent avoidance legitimizes the notion that there might be health effects when the evidence does not really exist" (see *MWN*, J/A92). Neither CASE nor the DOHS acknowledges a link between EMFs and health effects. "No definitive cause-and-effect relationship between exposure to EMFs and an increase in health risks has been established," wrote DOHS Commissioner Susan Addiss in an October 16 letter to state Senator Cornelius O'Leary. Meanwhile, Dr. **Jan Stolwijk**, also of Yale University and chairman of the CASE committee, has proposed a $400,000 study on childhood cancer and power lines in Connecticut. The CASE report mentions the possibility of doing an epidemiological study on childhood cancer in Connecticut, but notes that there are "limitations" due to the state's population size.

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Would-be home owners are thinking twice about buying houses with power lines in the backyard, but according to an article in the November/December issue of ***Real Estate Today***, the outlook is not necessarily bleak. Author Sharon Tomecek begins by presenting the issue as an obstacle for sellers and realtors: "Properties located near power lines are a new breed of problem." But by the end of the story, Tomecek quotes the owner of an Illinois real estate company who says that power lines can be seen as an advantage: "Sell the privacy that power lines afford. A 15 to 20-foot easement surrounds the line, so your yard doesn't back up to your neighbor's." The down side is that

Brodeur on Cancer at Fresno School

An article by Paul Brodeur in the December 7 issue of *The New Yorker* turns the spotlight on a grade school in Fresno, CA, where as many as 14 present and former employees have developed cancer. The most troublesome aspect of the story: All who developed the disease had worked in the section of the school that is closest to nearby high voltage power lines. Brodeur chronicles the developing awareness of the EMF issue among teachers at the school over the last two years and paints a picture of growing disillusionment with the responses of public health officials—Dr. Raymond Neutra and his colleagues at the California Department of Health Services, in particular.

Interspersed is the history of the EPA report on the potential link between EMFs and cancer. After describing the most recent studies out of Sweden, Brodeur asks whether U.S. authorities will soon take steps to reduce exposures—by routing power lines away from schools and day-care centers, for example. Answering his own question, he argues that, "Given the record of the government and the industry in dealing with the power-line problem thus far...no one should expect that any of this will occur soon, if at all, unless a concerned and determined citizenry forces action."

buyers are concerned about the health effects of EMFs, the aesthetics of power lines and reduced property values. A study by Florida Power & Light found that transmission lines had no effect on the price of property, but a suburban Chicago realtor determined that homes near power lines sell for 10% less and take two-and-a-half times as long to change hands as homes that aren't near power lines, according to the article. Salespeople are approaching the issue in a variety of ways. One firm suggests that agents supply concerned buyers with information about EMFs, while another recommends taking EMF readings.

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Florida's Department of Environmental Regulation (DER) decided at an October 22 meeting not to lower its power line magnetic fields limits, despite pressure from **Hillsborough County**. "I don't feel there's enough evidence yet to let us set different numbers," DER's Buck Oven told *Microwave News*. Oven acknowledged, however, that the present standard—150-250 mG at the edge of a ROW, depending on the voltage of the line—is not a health-based rule. "It's a politically-based rule," he said, explaining that the governor and the state legislature had told the DER to adopt a standard, but that "the philosophy was to maintain the status quo." The county has been battling the DER—first with a lawsuit and then with a proposal for a 3 mG standard—ever since the DER first announced standards in 1989 (see *MWN*, M/A89, J/F90, M/J91, J/F92 and J/A92). A spokesman for the Hillsborough County attorney's office said that there is a "strong likelihood" that the county will refile its suit. At the same time, **Energetics** Inc. has finished the final draft of its mitigation report, which is now under review by the state's EMF task force, according to Ken Klein, manager of the project (see *MWN*, M/A89, M/J90 and J/A92). The report should be issued around the first of the year, he said.

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Now that the federal government has enacted a National EMF Research Program (NERP) (see p.6 and *MWN*, S/O92), the steering committee for the parallel NERP initiated by state officials must find a new role (see *MWN*, J/A92). The committee will meet in January to discuss its future. In a November 23 conference call, committee members weighed two options: serving as a clearinghouse for the nonfederal matching funds required under the law and providing a link between federal and state officials. The committee also decided to recommend two of its members for the federal NERP advisory committee—**John Coughlin** of the Wisconsin Public Service Commission and **James DuShaw** of the International Brotherhood of Electrical Workers.

A Conversation with Dr. Anders Ahlbom

MicrowaveNews *caught up with Professor Anders Ahlbom at the Department of Energy's annual review of power line research in San Diego in mid-November. Ahlbom is an epidemiologist at the Institute of Environmental Medicine at the Karolinska Institute in Stockholm, Sweden. (For a detailed report on Ahlbom and Maria Feychting's study of residential EMF exposures and cancer, see* MWN, *S/O92.)*

MWN: Where do we stand on the possible link between EMFs and cancer?

Ahlbom: Overall, the childhood leukemia hypothesis has been strengthened. Our study adds weight to the hypothesis.

MWN: Have you always believed that there is a link?

Ahlbom: No. My view has certainly changed over the years. I still remember that when I first read the Wertheimer–Leeper paper, I discarded it. I did not like the design. Later, I was asked to review the Wertheimer–Leeper, Fulton and Tomenius studies, and I still did not take them seriously. Savitz changed my mind. And Peters did a high-quality study.

MWN: What about the Fulton study and the U.K. study by Meyers, Cartwright and Clayden?

Ahlbom: I agree with Nancy Wertheimer's criticisms of the Fulton study, and, unfortunately, the U.K. study has only a small number of exposed subjects.

MWN: Here in San Diego, the main criticism of your study is the small size of your study population.

Ahlbom: It is the weakest part of the study. I regret that Sweden is not bigger.

MWN: You are now going home after hearing all sorts of questions and criticisms about your study. Has anyone said anything that makes you doubt your conclusions?

Ahlbom: No. Overall, we have received support for our methodology and interpretations. We have, of course, received lots of questions and suggestions.

MWN: A few days after your study was released, Dr. Jørgen Olsen of the Danish Cancer Registry announced that he had found an increase in cancer—he reported lymphoma—among children exposed to power line EMFs in Denmark (see p.5). Do you have any plans to compare Olsen's results with yours?

Ahlbom: We have been talking with our Danish colleagues for some time and, as a result, we have used similar study designs. This will allow us to combine the two sets of data and do a small meta-analysis. There are also childhood cancer studies ongoing in Finland and in Norway; when those data are ready, we will add them, too. This last step may take a little time because the Finnish and Norwegian studies are running late.

MWN: What do you make of the fact that you did not observe an increased risk of brain tumors among the EMF-exposed children and adults?

Ahlbom: I can only speculate. I don't know. It's possible that we did not see a risk for brain tumors because our study was too small. It could be that David Savitz—whose study was also

small—saw too many exposed cases and we showed too few. We simply have to wait for more information from other studies.

MWN: And Dr. Birgitta Floderus's finding of chronic lymphocytic leukemia rather than acute myeloid leukemia among EMF-exposed workers?

Ahlbom: Again, I can only speculate. We are talking about small studies, so it is not surprising to see some random variations. Also, you might expect to see different effects in different populations.

MWN: What does your study say about the size of the EMF risk?

Ahlbom: With the limited information we have today and without knowing the appropriate exposure metric, risk analyses are not possible. You can make the following calculation based on the assumption that what we are observing is not an artifact: in Sweden, there are approximately 75 cases of childhood leukemia per year and our study indicates that, of the approximately two cases a year among those who live along a power line corridor, one is attributable to EMFs.

MWN: What about the effects of all the various sources of magnetic fields?

Ahlbom: That's difficult to estimate. If you assume that 10% of Swedish children are exposed to magnetic fields and that EMFs double the risk of leukemia, then you can attribute five to ten cases of leukemia per year to EMFs.

MWN: What can you say about the possible impact of appliances?

Ahlbom: We cannot be certain because we did not do interviews. It was impractical because of the amount of time that had elapsed since some of the cases were reported. We did do 24-hour measurements for a subsample of our study population, and that data must still be analyzed. But we have preliminary indications that the major source of exposure was from power lines.

MWN: Some people are saying that your basic result is that living close to a power line entails a cancer risk.

Ahlbom: I have heard that argument. Certainly distance is a very important parameter for estimating exposures from power lines. It is our version of the Wertheimer–Leeper wire codes, but it's more sophisticated than wire codes. The crudest index of exposure is the distance from the line. The next level of analysis is based on distance and on the type of line. And next is distance, type of line and the load on the line. If you use only distance from the line as the index of exposure, you still see an association with leukemia, but it's not as clear as when you use current-load data.

MWN: Could something other than magnetic fields be responsible for the excess cancers?

Ahlbom: It could be some unknown confounder—I call it the "phantom confounder." It is always possible, but, as long as we don't have a candidate for the confounder, it's not really useful to talk about it. As for currently known or suspected risk factors, they don't seem likely to explain the results.

MWN: Do you think that transients rather than the AC fields could have something to do with the observed effect?

Ahlbom: Transmission lines were the dominant source of exposure in our study. In contrast, the primary exposures in the Wertheimer–Leeper, Savitz and Peters studies were distribution lines. Yet, the results were all similar. That would argue for average field exposure as the key variable.

MWN: What do you think of NUTEK's [the National Board for Industrial and Technical Development] decision to act on the basis of your results?

Ahlbom: I was very surprised. But it was a clever move. It stopped attacks that would have come if NUTEK's Jaak Nõu had said we have to wait for more data. His credibility would have suffered because he told people for five years that we had to wait for the results of the ongoing studies—including our study. Remember that we don't yet know what the regulations or recommendations will be.

MWN: How do you plan to publish your results?

Ahlbom: We will be submitting a paper to a journal in a couple of weeks. This will be only the first in a series of publications. We are writing separate papers on the childhood and the adult study populations. We are also preparing a paper on the details of our methodology.

MWN: Have we now done enough epidemiology?

Ahlbom: I don't think so. Each new epidemiological study provides new, important information to add to the previous ones. There are still only seven studies of childhood cancer and EMFs.

MWN: But some scientists are saying that we must do more to understand the mechanism of interaction.

Ahlbom: There is no question that we need more mechanistic information. It would give us a better metric for assessing exposures and give us a better handle on how large the magnetic field risks really are. But it would be wrong to stop epidemiologic studies.

MWN: How important is it that we don't have a clear picture of the mechanism?

Ahlbom: You must remember that even for cigarettes—while we know there is a lot of chemical exposure—we really don't know what it is about cigarette smoke that causes cancer. The association between EMFs and cancer stands on two legs: an epidemiological leg and a mechanistic leg. Today, the epidemiological leg appears stronger.

MWN: What do you think of the argument that goes: There can't be an association between EMFs and cancer because electric power generation has been growing much faster than childhood cancer rates?

Ahlbom: Those comparisons are based on very crude aggregate data. I don't think that that kind of data can compete with case–control studies or other studies with information on the individual level.

MWN: So where do we go from here?

Ahlbom: People should sit down and see if they have some new ideas. We must not repeat the same studies again. We should try something new.

Danish Studies Offer New Support for EMF–Cancer Link

Two new studies—one residential and one occupational—from the Danish Cancer Registry in Copenhagen add to the growing evidence of a link between magnetic fields and elevated cancer risks.

Dr. Jørgen Olsen and colleagues found that children who lived near high voltage facilities had a significant fivefold increased risk of lymphoma at average exposures of 1 mG or more. This finding is not inconsistent with the Swedish finding of excess childhood leukemia, Olsen told *Microwave News* at the DOE meeting in San Diego in mid-November. On his return to Denmark, he explained that he recently learned that the children in his study had Hodgkin's disease, a subtype of lymphoma. He added that Hodgkin's and leukemia, though different, "both arise from the hematopoietic tissue."

While Olsen's team found a nonsignificant 40% increased risk for leukemia, brain tumors and lymphoma combined at average exposures of 1 mG or more, the risk rose to a statistically significant 5.6 times the expected rate at 4 mG or more. The researchers cautioned that their results were based on small numbers, with correspondingly wide confidence intervals.

Above 4 mG the risks for leukemia and for brain tumors were also elevated—six times the expected rate in each case—but neither was statistically significant.

The Swedish studies have gone a long way toward dispelling some of his lingering doubts about a magnetic field–cancer link, Olsen said. He is now collaborating with Dr. Anders Ahlbom and Maria Feychting, both of the Institute of Environmental Medicine at the Karolinska Institute in Stockholm, on an analysis of the combined Danish and Swedish data (see p.3).

Danish Power Line Blocked

The Danish and Swedish epidemiological studies have prompted a delay in the construction of a 400 kV power line in Denmark until a review of the potential health risks is completed by an expert panel set up by the Minister for the Environment.

"There has been a great deal of discussion about the new cancer studies," Johan Henrik Lous of Elkraft, the Danish power company, told *Microwave News*. The power line would cross the southern part of the island of Zealand, on which Copenhagen is located, and the island of Falster, and establish a link with the German power grid at Rostock. Lous explained that only 33 km of the 108-km line would be AC—the rest would be DC—and that it would cost approximately 20 times more to bury the line than to string it overhead.

The review panel, which is headed by Dr. Carl Wandel, a professor of physics at the University of Århus, is expected to release its report by the end of the year.

Olsen and coworkers surveyed 1,707 children under 15 years of age, diagnosed between 1968 and 1986 with leukemia, brain tumors or lymphoma, and 4,788 controls. Exposures were estimated by distance from the electrical facilities and by current loads—a method similar to that used in the Swedish study.

They estimate that, in Denmark as a whole, high voltage transmission lines expose 4,000 children to 1 mG or more and 600 children to 4 mG or more. Olsen said he plans to submit a paper for publication by the end of the year.

In the occupational study, Danish men who worked at jobs with chronic exposures of more than 3 mG had a significant 64% elevated risk of leukemia. Dr. Pascal Guénel of the Institut National de la Santé et de la Recherche Médicale (INSERM) in Paris, France, and coworkers did not find an increased risk for brain tumors or melanoma, nor did they see a cancer risk for intermittent EMF exposures. Guénel and his Danish colleagues, Drs. Povl Raskmark and Jørgen Bach Andersen from Ålborg University and Elsebeth Lynge from the Danish Cancer Registry, found that the populations at greatest risk were primarily electricians and iron foundry workers.

There was a suggestion of an elevated rate of breast cancer among men but not among women.

The researchers looked at the cancer incidence between 1970 and 1987 among a cohort of 2.8 million working men and women, ages 20-64. They estimated that 18,000 men and 4,000 women had continuous occupational exposures and that 154,000 men and 79,000 women had intermittent exposures of more than 3 mG.

The study has been accepted for publication in the *British Journal of Industrial Medicine*, Guénel told *Microwave News*.

Brain Tumor Recognized as Work-Related Injury in Sweden

A 47-year-old electrician who developed a brain tumor has had his illness recognized as a work-related injury by the Swedish workers' compensation system, marking the first time occupational exposure to EMFs has been recognized as a cause of cancer in Sweden.

The electrician, who worked for 22 years at a steel mill in Borlänge, northwest of Stockholm, was diagnosed in late 1991 with an astrocytoma at the Academic Hospital in Uppsala, according to articles in several Swedish newspapers.

Union representatives filed his claim as a workplace injury after investigators took EMF measurements at the mill, states a report in the November 2 *Arbetsmiljö*, a publication of the Swedish Association of Work Protection in Stockholm. The Borlänge workers' compensation office accepted the claim and the national authorities have said they will not challenge the decision.

The case received prominent notice in the Swedish press. A September 18 story in a local newspaper, *Dala-Demokraten*, "Electrician Job Caused Brain Tumor," called the news "political dynamite" and said the decision "shakes Swedish industry." The tabloid *Aftonbladet* (November 5) stated that "the link between cancer and EMFs has now been established."

All Sides Gearing Up for New Federal Research Program

Planning for the new National EMF Research Program (NERP) is off to a fast start, spurred by congressionally mandated deadlines. By December 24, the Department of Energy (DOE) must outline a five-year, $65 million plan and the Bush Administration must appoint members to two key committees (see box below for complete timetable).

A number of important policy questions must still be answered. The first is how the DOE and the National Institute of Environmental Health Sciences (NIEHS) will work together to sponsor health studies, the key objective of the law. NIEHS is responsible for health research and communications, but the funding is channeled through the DOE, which also retains responsibility for engineering research. The two agencies have formed a task force to oversee the transfer.

"We are committed to a smooth transition," Dr. Gary Boorman, chief of the chemical carcinogenesis branch at NIEHS, told *Microwave News*. Robert Brewer, director of DOE's utility systems division, who is working closely with Boorman, agreed. "We are committed to making this work," he said. Both officials predicted that there will be no immediate dramatic changes in the research program.

The DOE has asked the heads of nine agencies to submit the names of their respective representatives to President Bush for appointment to an interagency committee. This committee will have primary responsibility for setting the federal research and communications agendas. The members of an advisory committee will be more difficult to select, Brewer said, because the law requires that a broad mix of qualifications and interests be represented.

Another question is whether the DOE will sustain its existing research program. According to Brewer, there will be one program. "We have no direction from Congress to do otherwise," he said. But in private briefings, other senior energy officials have said that DOE's research effort may indeed continue.

Whether the DOE will keep its program depends, of course, on funding. Congress has already given the DOE $6 million for its EMF program for the 1993 fiscal year, which began October 1. When Congress appropriates money under the new law in its next session, it will have to decide whether to support both programs—which would entail the provision of an additional $6.5 million, to be matched by nonfederal sources—or simply add another $500,000.

Larry Mansueti, director of technical services for the American Public Power Association (APPA) in Washington, wants additional funding. "Our members want an accelerated research program. That means old money and new money," he said.

Hanging in the balance is what will happen to those investigators who are already funded by the DOE. "As far as I can see,

Timetable for the EMF Research Program: Who? What? When?

Who	Task	Deadline
Secretary of DOE	Establish a comprehensive program	December 24, 1992
The President	Appoint members to the interagency committee*	December 24, 1992
Secretaries of DOE & DHHS	Appoint members to the advisory committee†	December 24, 1992
Secretary of DOE	Agree with NIEHS on research & information programs	April 24, 1993
Interagency committee	Develop a comprehensive program agenda	June 24, 1993
Interagency committee	Recommend research guidelines	June 24, 1993
Interagency committee	Recommend communications objectives	June 24, 1993
Secretary of DOE & Director of NIEHS	Select from solicited proposals	January 24, 1994¶
National Academy of Sciences§	Status reports to interagency & advisory committees	Periodically
Director of NIEHS	Report to interagency committee	June 1, 1995
Interagency & advisory committees	Report to Congress	December 31, 1995
Director of NIEHS	Report to interagency committee	March 31, 1997
Interagency & advisory committees	Final report to Congress	September 30, 1997
Advisory committee	Disband	December 31, 1997

* The interagency committee will consist of nine members appointed by the President, including a representative from each of the following federal agencies: Department of Defense, Department of Energy, Department of Transportation, Environmental Protection Agency, Federal Energy Regulatory Commission, National Institute of Environmental Health Sciences (NIEHS, which is part of DHHS, the Department of Health and Human Services), National Institute of Standards and Technology, Occupational Safety and Health Administration and Rural Electrification Administration.

† The ten-member advisory committee will make recommendations to the interagency committee, to the secretary of the DOE and to the director of NIEHS on the design and implementation of the research program. The advisory committee will include experts on health effects, measurement surveys and mitigation, as well as representatives of state regulatory and health agencies, electric utilities, electric equipment manufacturers, labor unions and the public. The secretaries of the DOE and the DHHS will each select five members.

¶ The selections can be made earlier. The law states, "Within 15 months after the date of the enactment of this act, and as often thereafter as appropriate, the secretary [of the DOE] and the director [of NIEHS] shall, in consultation with the interagency committee, solicit and select proposals to conduct activities under the program." President Bush signed the law on October 24, 1992.

§ The National Academy of Sciences will submit periodic reports evaluating research results and recommending ways to promote communications efforts.

Source: *Congressional Record*, October 5, 1992, pp.H12,138-H12,139.

the current DOE researchers will continue their work," Boorman said. Brewer made a similar commitment. "There will be no break in the continuity of the work. We will provide whatever support is needed," he explained.

Arrangements also have to be made to secure nonfederal matching funds required under the law. A committee has been set up by electric utility groups to aid in soliciting this money, according to Richard Loughery, EMF issue manager for the Edison Electric Institute (EEI) in Washington. "Our credibility is at stake. We lobbied for the program, and we don't want to be seen as slowing things down," he said in an interview with *Microwave News*. Loughery is working with representatives from APPA and the National Rural Electric Cooperative Association.

Earlier this year, the DOE organized a series of workshops as part of its NERP planning process (see *MWN*, M/J92) after Congress designated it the lead federal agency on EMF research—before the switch to NIEHS (see *MWN*, S/O91). Reports from the DOE workshops—*Electric and Magnetic Fields Policy Support Workshop, May 4-5, 1992* (October 1992); *EMF Science and Engineering Research Workshop, June 3-5, 1992* (October 1992); and *National EMF Research and Communication Program: Communication Workshop* (November 1992)—are available from: DOE's Advanced Industrial Concepts Division, CE-232, 1000 Independence Ave., SW, Washington, DC 20585, (202) 586-5377.

President Bush signed the new EMF program into law (Public Law 102-486) on October 24 as part of H.R.776, the Energy Policy Act of 1992 (see *MWN*, J/F92, M/A92, M/J92 and S/O92).

Legal Notebook

NY Utility Wins Appeal in "Cancerphobia" Case

Plaintiffs in one of the nation's most high-profile power line lawsuits—the Marcy-South case—lost their appeal on October 5. The Appellate Division of the New York State Supreme Court in Brooklyn upheld an earlier ruling that denied the landowners compensation for losses in property value due to fear about the health effects of EMFs (see *MWN*, S/O89). The case—*Zappavigna v. New York Power Authority* (NYPA)—has come to be known for the claim of economic losses due to "cancerphobia."

The court also reversed a lower-court ruling ordering payment of "consequential damages" to one of the plaintiffs for visual and noise pollution from the power line (see *MWN*, J/F90), but it increased slightly the award for direct damages resulting from the condemnation for a right-of-way (ROW). The landowners' claims on cancerphobia were heard together, but damage awards are being decided individually, according to plaintiff lawyer Michael Gurda of Gurda, Gurda & Smith in Middletown, NY. Donald Zappavigna's case was the first the appellate division ruled on. Many of the other appeals are pending.

"We're very disappointed," said Robert Isseks, an attorney who worked with the plaintiffs on the appeal. "There's a reasonable basis for fear and the records show there's also sufficient basis for loss in property value." Isseks said he could not comment on whether the landowners would petition the state's highest court for a rehearing.

"There's no basis in this record to award damages based on cancerphobia, and the court agreed," Tom Watson of Crowell and Moring in Washington, who is representing the NYPA, told *Microwave News*. Watson noted that there is "a continual flow of new science" about the health effects of EMFs, but that the evidence presented in the Marcy-South case did not justify the plaintiffs' claims.

After the court first rejected the landowners' allegations in 1989, Gurda pointed out that the decision might have been different if he had been permitted to introduce the Savitz epidemiological study linking EMFs and cancer (see *MWN*, S/O89). "The fact is that ever since the claim was brought, people have been more concerned and there is more factual data available," he said recently.

The $66 million lawsuit was originally filed in January 1987 by 55 landowners who claimed that NYPA's 345 kV Marcy-South transmission line would reduce property values by creating a 206-mile-long "cancer corridor" (see *MWN*, M/A87). In September 1989, the New York Court of Claims rejected the cancerphobia charge but awarded direct and consequential damages to Donald Zappavigna. The NYPA appealed the decision, and plaintiff lawyers responded by filing a cross appeal, again raising the issue of EMF health risks.

The appellate court upheld the decision to award Zappavigna direct damages—and decided to increase the amount from $53,352 to $61,801—but disallowed the $41,215 awarded for consequential damages. The NYPA allocated a 150-foot ROW plus an additional easement of 50 feet on each side of the power line to protect against falling trees. The line, which has been energized, stretches south from Marcy to East Fishkill.

A landowner claim that was not heard with the cancerphobia cases was rejected in May 1991. John Cameron, an attorney in Goshen, NY, said that his clients, Harold and Jeanne Jonas, focused on direct loss of property value rather than on scientific evidence about EMF health risks. "We saw what happened with Gurda's clients. For every witness they had, NYPA had another saying the opposite. If people know about the controversy and are spooked by it, we're entitled to damages." Cameron filed an appeal in April of this year.

Trial Date Set for Zuidema Case

A closely watched EMF lawsuit involving a child with cancer is scheduled for trial in March. The plaintiffs in *Zuidema v. San Diego Gas & Electric* (SDG&E) claim that the utility should be held accountable for failing to warn its customers about the potential health effects of EMFs.

Ted and Michelle Zuidema allege that their daughter Mallory developed nephroblastomatosis and Wilms' tumors—kidney cancer—as a result of exposure to EMFs *in utero*. Their

Lawyers Seek To Show That EPRI Delayed Key EMF Studies

Attorneys representing a child with alleged EMF-related injuries and the Trial Lawyers for Public Justice (TLPJ) are seeking documents which they say will show that EPRI tried to avoid finding any EMF health risks. TLPJ is representing Citizens Concerned About EMFs, a California group.

The plaintiffs' lawyers in *Zuidema v. SDG&E* (see p. 7) have accused EPRI of selectively sponsoring studies that would show no link between EMFs and health risks. "The plaintiffs' charge is that EPRI...refused to fund... researchers whose studies might have shown a positive correlation between [EMF] exposure and biological effects...[and] funded only studies that it thought had a strong probability of not showing a correlation," according to a statement by the Washington-based TLPJ.

EPRI denies the charge. "Nonsense," said spokeswoman Barbara Klein. "EPRI's policy is to find out the truth about EMFs, and we do everything possible to achieve that."

In a legal skirmish, EPRI requested a protective order to shield its documents, disputing the "relevance and proper scope" of the Zuidemas' requests for information. TLPJ then filed a motion to intervene, but its request was denied by Superior Court Judge Judith Haller, who referred EPRI's motion to Judicial Arbitration & Mediation Services Inc. (JAMS) in San Diego.

"We are most interested in seeing a record of the basis for EPRI's decisions to fund or not fund studies," said Aaron Simon, one of the Zuidemas' lawyers. On October 27, Judge Ben Hamrick of JAMS granted EPRI's request, with certain exceptions. He required EPRI to release by November 10 a list of applicants for grants prior to 1990, and ordered that other documents requested by the plaintiffs be reviewed later by the California Superior Court.

"The EPRI–TLPJ dispute is a sideshow to the real issue—what science can tell us about the health effects of EMFs," said Greg Barnes, an SDG&E attorney.

claim was filed in California Superior Court in San Diego in May 1991 (see *MWN*, J/A91).

"By 1986 or so, the state of science and public concern was such that SDG&E knew or should have known about the dangers of EMFs," said Michael Withey of the Seattle law firm of Schroeter, Goldmark & Bender, adding that the utility should have done its own research independent of that done by the Electric Power Research Institute (EPRI). SDG&E Assistant General Counsel Greg Barnes stressed that the utility has abided by its commitment to keep its customers up to date on EMF research, and has urged the California Public Utilities Commission to encourage studies in addition to those sponsored by EPRI (see box). "It's disappointing that the attention we get is for the lawsuit, and not for our EMF center or anything else," Barnes said. SDG&E's EMF center, which arranges residential EMF surveys for customers, was established in April 1991.

During Michelle Zuidema's pregnancy and until Mallory was three, the family lived in a house in which EMFs were estimated to have been 3.5-17 mG. Withey said that doctors for the Zuidemas have ruled out other environmental factors and heredity as possible causes of the cancer. The results of the recently published Swedish study—which found that children exposed to magnetic fields of 3 mG or more in their homes had close to four times the expected rate of leukemia (see *MWN*, S/O92)—will be very important to the suit, said Dr. Richard Piccioni, an independent consultant who is working on contract for the Electromagnetic Radiation Case Evaluation Team (EMRCET). Plaintiff lawyers Withey and Aaron Simon, of the firm of Kazan, McClain, Edises & Simon in Oakland, CA, are both members of the group, which seeks cases with the potential to establish legal precedent (see *MWN*, M/A91). Withey acknowledged, however, that proving that EMFs caused or promoted the child's condition would probably be the toughest part of the case.

Withey said that if he cannot prove causation but does succeed in establishing SDG&E's liability for failing to warn its customers about a potential health threat, "It will establish an important legal precedent....I hope it will open the minds of people in the electric power industry to change their conduct and engage in a serious effort to mitigate and warn customers so there aren't future claimants."

The plaintiffs' expert medical witnesses will include Dr. Sam Milham, retired from the Washington State Department of Health, Dr. David Ozonoff of the Boston University School of Public Health and Dr. Peter Wright, an oncologist in Seattle. A spokesman for SDG&E declined to disclose who the utility's witnesses will be.

White House Report *(continued from p.1)*

reviews, EPA raised some of the most strenuous objections. In a letter to Young, EPA's Dr. William Farland and Margo Oge recommended that the report be accompanied by a cover letter indicating that the conclusions are those of the authors—an eleven-member panel under the direction of Oak Ridge Associated Universities (ORAU)—not those of the client agencies. The Public Health Service similarly suggested that CIRRPC should include a letter outlining the document's limitations.

"The report doesn't say that this is the view of the federal government," said Young, who is director of the office of agricultural biotechnology at the Department of Agriculture. The transmittal letter, sent to federal agencies on November 10, notes that the agencies "had no role in developing or reviewing the document prior to publication. The report therefore represents the viewpoints of the panel and does not necessarily reflect a consensus of the scientific community or of the federal government."

"I am not a bit surprised that some people are upset by this

Federal Agencies on the CIRRPC Report

The following are excerpts from the comments filed by federal agencies in response to CIRRPC's report on the potential health effects of ELF EMFs.

Department of Defense (DOD)

For many DOD individuals responsible for health and safety, the [report's] confirmation of the long-standing conventional view that commonly encountered ELF field levels are not sufficient to cause adverse human health effects is a reassuring conclusion....

Other DOD individuals associated with the electromagnetic biological research arena may [be concerned] that the report minimizes findings of positive effects, especially *in vitro* studies in cell lines, even though there is no clear extrapolation of these findings to a conclusion of causal links at the human level. Such *in vitro* findings do presuppose the existence of physical phenomena which may have important consequences beyond their intrinsic scientific interest. The [report's] basic conclusion for the absence of health effects should not be used for justifying the lack of importance for this line of research.

...Nevertheless, we consider the report to be a comprehensive and careful review of current knowledge, and support the conclusions and recommendations [of the authors].

—William Flor, Captain, U.S. Navy, Defense Nuclear Agency

Department of Energy (DOE)

Information and analyses presented...adequately support the report's conclusion that the published literature fails to provide convincing evidence that exposures to [various sources of ELF EMF] are hazardous....

We believe that the final paragraph of the report [concluding that a major expansion of the national research effort is not warranted] is susceptible to misinterpretation as failing to support any continued research on ELF EMF. Accordingly, CIRRPC should make it clear that it is appropriate to...attempt to resolve public concerns about potential dangers of ELF EMF to human health.

—Dr. Paul Ziemer, Assistant Secretary for Environment, Safety and Health

Environmental Protection Agency (EPA)

Based on our preliminary review, we believe that there is a lack of support for some of the conclusions reached in the Executive Summary. For example, the report reaches a conclusion that "ELF EMF does not appear to constitute a public health problem" and that "this review does not provide justification for a major expansion of the national research effort."...We believe that the basis for this statement is not adequately supported given discussions of research needs and the uncertainty of public health impacts stated in several chapters.

In view of the lack of a peer review and apparent errors and inconsistencies, the letter transmitting this report for public release should emphasize that the contractor report represents only the views of the panel of authors and *not* those of the federal agencies.

—Dr. William Farland, Director, Office of Health and Environmental Assessment, and Margo Oge, Director, Office of Radiation and Indoor Air

National Institute of Standards & Technology (NIST)

...NIST is aware of the years of research which have been conducted in this field....Although the focus of much of this research has been to provide convincing evidence as to whether or not there is a hazard, the most that these investigations have appeared to have been able to do is to rule out some processes and to demonstrate that the effects, if any, are not large. Thus, the report's conclusion is not surprising. For completeness, it should also be noted that there is no convincing evidence that these exposures are not health hazards.

—Robert Hebner, Deputy Director, Electronics and Electrical Engineering Laboratory

National Science Foundation (NSF)

...The executive summary of the section "Epidemiologic Studies of Cancer" does not mention the need for any further studies in this area, yet the chapter in the report devotes a page to "Future Studies."...The executive summary, in this case, seems to miss an important conclusion of the report.

We have not been able to read the report in all its details, given the time available for comment, but assume that we would have found more such problems given more time. We have no reason, however, to disagree with the major conclusions of the report.

—Dr. Philip Harriman, Program Director, Genetics

Public Health Service (PHS)

- The ORAU document is incomplete in important aspects such as the omission of numerous peer-reviewed citations.
- The Executive Summary is inconsistent with some of the detailed conclusions in the body of the report and the report indulges in speculation.
- The report recommends minimal additional research on unanswered health issues even though recent studies further suggest a problem and there is a great public demand for factual answers.
- The PHS recommends that this document be transmitted to the various agencies by CIRRPC for their own use with a cover letter recognizing the limitations of the document.

—Incorporating comments from the Food and Drug Administration, National Cancer Institute and National Institute for Occupational Safety and Health

report," Young said, explaining that a number of those who commented on it are dependent on a federal commitment to research in this field. He predicted, however, that the report, which cost about $500,000, "will be accepted in the government policy arena."

Many of the agency reviews struck a positive tone. The Department of Energy noted some "inconsistencies and errors," but it endorsed the conclusion that there is no convincing evidence that ELF EMFs are hazardous. The Department of Defense was also supportive, but it stressed the importance of further research. (For excerpts of responses from these and other agencies, see box above.)

The executive summary of the report emphasizes the uncertainties inherent in the scientific methods used to assess EMF health risks. The authors describe shortcomings of the epidemiological studies of EMFs and cancer, point to difficulties in identifying the origins of pregnancy complications, and object to the lack of "converging epidemiological and biological support for the occasionally reported adverse health effects...."

The report also gives weight to several general arguments against the possibility of adverse EMF health effects. Prominently discussed is the idea that even strong EMFs "would not

induce current densities [in human tissue] comparable to those naturally occurring in the body." This is a view championed by Dr. Robert Adair of Yale University in New Haven, CT, who reviewed the relevant section of the report—a chapter by Dr. William Bennett Jr., also of Yale.

Several agencies complained that this theory is presented uncritically. The National Institute of Standards and Technology (NIST), for example, pointed out that the only reference in this section is to a paper by Adair. This "denies the reader a more representative picture of the research efforts...that are under way," NIST wrote.

The executive summary also makes the case—laid out in more detail in Bennett's chapter—that cancer statistics run counter to the epidemiological evidence. Since "per capita electricity consumption increased exponentially in this century," this should be reflected in cancer rates for the general population if EMF exposure is a cancer risk, the report states. Barring strong countervailing trends in other risk factors, "we should be witnessing an observable epidemic of childhood cancers. However, there is little, if any, evidence of such an epidemic...." This theory was put forward most recently by particle physicist Dr. David Jackson of the University of California, Berkeley, and it has prompted objections from epidemiologists (see *MWN*, M/J92). Jackson was not part of the ORAU panel, but his assistance is acknowledged in the report. Contrary arguments are not presented (see *MWN*, J/F91, J/A91 and J/A92).

In his chapter on epidemiology, Dr. Dimitrios Trichopoulos, chairman of the department of epidemiology at the Harvard University School of Public Health in Boston, makes a similar point about cancer trends. Indeed, in January 1991, he presented his calculations to EPA's Science Advisory Board (SAB), which was reviewing the agency's draft EMF–cancer report. At that time, Dr. Genevieve Matanoski of the Johns Hopkins University School of Hygiene and Public Health in Baltimore, chair of the SAB panel, took exception, calling Trichopoulos's assumptions "extreme" (see *MWN*, J/F91).

The report's overall recommendation that research efforts need not be expanded prompted the most consistent objections. A report in the November 26 *Nature* sums up critics' views that this conclusion "seems to run counter to [the report's] individual chapters, which urge dozens of new studies." Indeed, the November 10 transmittal letter admits that, "The panel also noted areas of scientific interest that may warrant consideration for further research. These specific areas are described in the topical chapters, but may not be found in the Executive Summary."

A section on EMF effects on pineal gland function, for example, suggests "a critical need for more studies at both the *in vivo* and *in vitro* level related to the...exposure parameters...that may be important in inducing the observed changes." But Dr. Russel Reiter, coauthor of this section, told *Microwave News* that this should not be seen as a contradiction of the overall conclusions. The report merely opposes a "major expansion" of research, said Reiter, of the University of Texas, San Antonio. "You cannot imagine the length of time we deliberated over words and sentences in the executive summary and conclusions," he explained. "It was a consensus document....I like the final product."

The CIRRPC report was first requested by Sheldon Weiner of the Occupational Safety and Health Administration (OSHA) in 1989, but it gained importance in late 1990, when the President's science adviser, Dr. Allan Bromley, asked that formal release of the EPA report be delayed until CIRRPC could review it (see *MWN*, N/D90). CIRRPC provided an assessment of the EPA report in August 1991 (see *MWN*, S/O91). When ORAU was put in charge of the review, some suggested that the move was an attempt to avoid scrutiny; the panel's meetings were closed to the public (see *MWN*, J/A91).

Copies of *Health Effects of Low-Frequency Electric and Magnetic Fields*, June 1992, are available for $25.00 from: U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402, (202) 783-3238 (refer to publication 029-000-00443-9).

FROM THE FIELD

NCRP SC89 Membership

In our May/June issue we announced the formation of the National Council on Radiation Protection and Measurements (NCRP) Scientific Committee 89 (SC89) on "Non-Ionizing Electromagnetic Fields." This committee will serve as an umbrella group that will oversee three subcommittees: SC89-1 (formerly SC67), "Biological Effects of [Static] Magnetic Fields," SC89-2 (formerly SC78), "Practical Guidance on the Evaluation of Human Exposures to Radiofrequency Radiation" and SC89-3 (formerly SC79), "Extremely Low Frequency Electric and Magnetic Fields." For more on NCRP's work on non-ionizing radiation, see MWN, *D83, Ap84, J/F86 and M/J92. Members of the committees are as follows:*

SC89—Tom Tenforde (Chairman), Battelle Pacific Northwest Laboratory, Richland, WA; Ross Adey, VA Hospital, Loma Linda, CA; James Cleaver, University of California, San Francisco; Bill Guy, professor emeritus, University of Washington, Seattle; Everett James Jr., Vanderbilt University Medical Center, Nashville, TN; James Lin, University of Illinois, Chicago; Gilbert Omenn, University of Washington, Seattle; David Sliney, U.S. Army Environmental Hygiene Agency, Aberdeen Proving Grounds, MD; Jan Stolwijk, Yale University School of Medicine, New Haven, CT; Richard Tell, Richard Tell Associates Inc., Las Vegas, NV.

SC89-1—Dennis Mahlum (Chairman), National Research Council, National Academy of Sciences, Washington, DC; John Baum, Brookhaven National Laboratory, Upton, NY; John de Lorge, Navy Aerospace Research Center, Pensacola, FL; Karl Illinger, Tufts University, Medford, MA; Charlotte Silverman, FDA, Rockville, MD; Tom Tenforde, Battelle Pacific Northwest Laboratory, Richland, WA; Thomas Budinger (Adviser), University of California, Berkeley.

SC89-2—Richard Tell (Chairman), Richard Tell Associates Inc., Las Vegas, NV; Howard Bassen, FDA, Rockville, MD; Jules Cohen, Jules Cohen & Associates, Washington, DC; David Conover, National Institute for Occupational Safety & Health, Cincinnati, OH; Carl Durney, University of Utah, Salt Lake City; Ronald Petersen, Bell Labs, Murray Hill, NJ.

SC89-3—Ross Adey (Chairman), VA Hospital, Loma Linda, CA; Carl Blackmen, EPA, Research Triangle Park, NC; David Carpenter, NY State Department of Health, Albany, NY; William Feero, Electric

Research and Management Inc., State College, PA; Richard Lovely, Battelle Pacific Northwest Laboratory, Richland, WA; Richard Luben, University of California, Riverside; Martin Misakian, National Institute of Standards and Technology, Gaithersburg, MD; Mary Ellen O'Connor, University of Tulsa, OK; Richard Phillips, W/L Associates, Spokane, WA; David Savitz, University of North Carolina, Chapel Hill; Charles Ehret (Adviser), Argonne National Laboratory, Argonne, IL

HIGHLIGHTS

Technician Exposed to MW Radiation Files $5 Million Suit

A technician who was injured by microwave radiation from an illegal satellite uplink has filed a $5 million lawsuit against the owners of the transmitter. Keith Angstadt, an employee of Mutual Broadcasting Systems Inc. in Arlington, VA, is suing Multicomm Telecommunications Inc.—a subsidiary of Amway Corp., which is also named as a defendant. A trial is scheduled to begin next March in Arlington County circuit court. Parties in the case are in the process of deposing witnesses.

Angstadt was injured on May 31, 1990, during the course of routine maintenance of Mutual Broadcasting's rooftop transmitting and receiving equipment. When he went to investigate the source of an "unusual sound" he heard coming from one of the antennas, he was accidentally exposed to 6 GHz microwaves from an illegally rigged transmitter owned by Multicomm, according to his complaint. Multicomm had illegally converted a receiving antenna to a transmitter after being denied a permit from the Federal Communications Commission, said Roy Mason of the Baltimore law firm of Mason, Ketterman and Morgan, who is representing Angstadt.

Soon after the accident, Angstadt began to experience hot flashes and burning sensations on his skin and consulted doctors at Johns Hopkins University medical school's Wilmer Institute, a world-famous center for eye research. They deduced that the retinas of his eyes had sustained 5 mW/cm^2 of continuous wave radiation for two 15-minute periods, and they concluded that he had "suffered more microwave exposure than any human being ever studied by scientists," according to Mason. Angstadt is now color-blind and lacks night vision (see *MWN*, S/O91). A second technician, who worked with Angstadt and who was also injured by the radiation, has not filed a lawsuit.

"Multicomm knew or should have known of the particular risks and danger associated with the conversion and assembly of this makeshift microwave transmitting antenna....[and] that the plaintiff was likely to come in contact with leaking microwave radiation," Mason charged.

Multicomm, which is based in East Salt Lake City, UT, did not respond to repeated calls from *Microwave News*. Bert Hultink, litigation counsel for Amway, said that the subsidiary has filed for bankruptcy: "I think it was a direct result of the Angstadt suit." He declined to comment further. Amway is based in Ada, MI. Other defendants in the suit include Royal Communications Corp. of Urbana, IL, which installed the antenna, and Vertex Communications Inc. of Kilgore, TX, which manufactured it.

Dr. Jennifer Lim, Henry Kues and coworkers at the Wilmer Institute describe the results of their examinations of the two workers in a paper they have submitted for publication. A number of other microwave injury cases are currently pending (see p.13 and *MWN*, N/D90 and J/A92).

ANSI OKs RF/MW Standard; Questions Makeup of Committee

The American National Standards Institute (ANSI) has adopted the revised radiofrequency and microwave (RF/MW) radiation safety guidelines that were approved by the Institute of Electrical and Electronics Engineers (IEEE) in September 1991 (see *MWN*, N/D91). But before okaying the new limits, ANSI's Board of Standards Review (BSR) revived questions about the balance of the IEEE panel that developed them.

After meeting on October 1, the BSR requested more information from the IEEE about the makeup of Standards Coordinating Committee 28 (SCC28), which develops non-ionizing radiation health standards for the IEEE. At issue were charges, formally raised in early 1991 by Dr. Mays Swicord of the Food and Drug Administration's Center for Devices and Radiological Health in Rockville, MD, who wrote at the time that, "It is generally recognized that the current membership is not balanced in representing government, industry and the general public." (Similar objections had previously been raised; see *MWN*, S/O89 and J/A90.) "The BSR placed further action on hold pending resolution of these issues," the board's secretary, Beth Somerville, wrote in an October 2 letter to the IEEE.

SCC28's membership as of May 1990 "was determined to be balanced," according to a response prepared by Dr. John Osepchuk of Raytheon Co. in Lexington, MA, who is executive secretary of the committee. "There was concern, however, about the large representation...of the military and lack of a *breadth* of nonmilitary members" (his emphasis). A membership subcommittee chaired by Dr. Jay Brandinger, then of SRI International, "analyzed the problems and made recommendations," resulting in an expansion of the membership, Osepchuk wrote. Brandinger never issued a formal report, however.

The guidelines were formally approved by ANSI on November 18 and will be designated ANSI/IEEE C95.1-1992.

"I still think it's a problem," Swicord said in a telephone interview. "I'm not convinced that increasing the size of the committee is the answer." Swicord explained that the committee risks becoming too large to function well.

Separately, an objection that was raised by Hammett & Edison Inc. (H&E), an engineering consulting firm in San Francisco, about the standard's 100 MHz cutoff point for limiting

induced body currents did not delay the standard. H&E has argued—in letters to the IEEE in 1990 and to ANSI in February of this year—that the cutoff should not fall in the middle of the commercial FM broadcast band (see *MWN*, M/J92). The firm has lobbied for a 40 MHz cutoff, which would cover frequencies used by TV and AM radio but exclude FM radio entirely.

ANSI's BSR did not consider this issue. Dr. Om Gandhi of the University of Utah, Salt Lake City, cochair of SCC28's Subcommittee 4, which drafted the new rules, described it as "an objection after the fact," adding that the issue could be considered in the next revision of the standard. H&E's Dane Ericksen said his firm is considering filing an appeal of the BSR decision.

Commentary from San Diego *(continued from p.1)*

With all this priming, the Swedish studies were *the* topic of conversation in San Diego—from the opening cocktail party on Sunday night to Thursday morning, when the Swedes finally made their presentations. In addition to keeping up with the press coverage, most of those who came to the meeting already had copies of the full reports from Sweden. In fact, there was little else to talk about—except perhaps the Star Trek convention which greeted those checking into the hotel on Sunday afternoon. Because of the persistent scarcity of research funds, no one else had much new science to report.

A frequent topic of conversation was how the U.S. electric utility industry and public health officials will react to the Swedish government's decision to recognize the EMF–cancer risk and set health standards in the 2-4 mG range, a level that would have been unthinkable only a few years ago. And many speculated about how the industry would respond to the growing public anxiety over EMFs.

In interviews with the press, utility leaders generally praised the Swedish efforts, but cast some doubt over their reliability, due to the small size of the study populations. A few uninformed critics tried to make something out of the fact that the Swedes had failed to find an association between current spot measurements and past cancer incidence; those who resurrected this argument from the postmortems of the Savitz and Peters studies had not grasped the elegance of the Swedish study design.

"It is becoming more and more likely that there is something associated with living near high power lines," EPRI's Dr. Stan Sussman told *Time* magazine. And, in an interview in San Diego with the *San Francisco Chronicle* (November 13), Sussman said that the studies marked "important advances in our understanding of the issue." Richard Loughery of the Edison Electric Institute told the Associated Press (November 13) that, "Something is out there that cannot be explained away." But no one was suggesting the tough measures that are being embraced by the Swedes.

Utilities *are* reducing EMF exposures, albeit quietly, without conceding that there is a health risk. "It's being done, but no one is willing to admit it," said Dr. Kelly Gibney of BC Hydro, referring to large Canadian utilities such as Hydro Quebec and Ontario Hydro, as well as his own company. "We would look foolish if we didn't reduce EMFs," he said.

Similarly, Jack Sahl of Southern California Edison (SCE) said that his company has been using low-field designs for new power lines and substations for the last year and a half. "This is an important issue and we will continue to take it seriously," he said. But he maintained that there would be no policy shift as a result of the Swedish studies.

Even before the DOE meeting, Cindy Sage had tried to convince SCE to follow Sweden's lead. On October 29th, Sage, a consultant based in Montecito, CA and a member of the California Public Utilities Commission's (PUC) EMF Consensus Group, asked the PUC to "require reasonable-cost field reduction measures" when exposures at the edges of rights-of-way exceed 2 mG. The highest priority should be to reduce EMF levels in schools and day care centers, she stressed.

In his response, filed with the PUC on November 20th, Sahl noted that the Swedish studies "have not been completed" and "have not been published in the scientific literature, and the normal peer-review process has not been completed." For good measure, he added a professional rebuke: "Ms. Sage is not qualified to offer scientific reviews of these epidemiological studies."

Sahl has failed to learn a key lesson from his Swedish counterparts. By immediately announcing that they would tackle the EMF problem with new health standards and mitigation strategies, Rolf Lindgren of Vattenfall, the state utility, and Jaak Nõu of NUTEK, the government energy agency, avoided a predictable confrontation.

Sahl's comments come across as business as usual—precisely the perception the Swedes sought to avoid. Why should Americans wait for the studies to be peer-reviewed and published if the Swedish government and utilities felt no such need? Why not start drafting plans now to protect children and other high-risk groups? And why should the views of a utility manager like Sahl have any more authority than those of a consultant like Sage?

Sage's proposals for power lines in California are just the beginning. Activists across the country are demanding action on EMF risks—real or perceived—citing the Swedish studies in public hearings, newspaper columns and legal proceedings.

Concerns about cancer have spread to other sources of EMFs. In San Francisco, people are asking questions about the

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safety of the region's electric transit system, BART. And some in the computer industry are worried about video display terminals: "Just as black lung slowly but surely felled scores of coal miners, [EMFs] radiating from our [computer] systems may be killing us day by day," writes a columnist in the December issue of *PC Computing*.

And, of course, there are the EMFs from myriad appliances, such as hair dryers, dishwashers and electric blankets. The *Wall Street Journal* highlighted this problem in a front-page, second-section article on November 13th, under the headline "Study Suggests Electric Razor Link to Cancer." The story was based on a paper by Dr. Richard Lovely and coworkers from the Battelle Pacific Northwest Lab in Richland, WA, which was presented in San Diego shortly before the Swedes gave their talks. Using data collected in the mid-1980s for a study sponsored by the New York Power Line Project, Lovely found that men who used electric razors had twice the expected rate of leukemia.

The fact that the *Journal* devoted 20 column-inches to the preliminary Battelle findings—but only mentioned the Swedish studies in passing—shows once again that the press follows unpredictable rules in the way it covers EMFs. In this case, the *Journal* was no doubt looking for a news peg, but, in the process, it missed the more important story. In another display of peculiar news judgment, the *Journal* turned to Victor "I-bought-the-company" Kiam, the head of Remington Shavers, to rebut the Battelle study.

Writing in the *Seattle Post-Intelligencer* on November 20th, Dr. A.A. Afifi, the dean of the School of Public Health at the University of California, Los Angeles and a member of the advisory committee for EPRI's EMF program, summed up his position this way: "Most public health officials agree there is insufficient evidence to conclude that normal exposure to EMFs is hazardous or that there is a cause-and-effect relationship between cancer and exposure to EMFs."

Clearly, as long as public health and utility officials in the U.S. cling to the status quo, the EMF controversy will continue to rage unabated on this side of the Atlantic.

DOE and EPRI's *Annual Review of Research on Biological Effects of Electric and Magnetic Fields from the Generation, Delivery and Use of Electricity* took place in San Diego, November 8-12, 1992.

UPDATES

COMPATIBILITY & INTERFERENCE

Utility Suspects EMI from GWEN... Virginia Power has changed the frequency of the communications system used on two of its power lines after they picked up a radio signal from an outside source, according to the utility's Robert Morton. The signal was similar to that from the USAF's Ground Wave Emergency Network (GWEN), Morton said, but he stressed that he was unable to identify it. "There are a lot of things out there—it could have come from the Coast Guard or the Navy." Although the interloping signal, which appeared in April, did not disrupt electrical service, Virginia Power decided to make the adjustment as a precaution against future EMI, Morton told *Microwave News*. GWEN program officer Lt. Col. Stephen Martin said that he has never received complaints from power companies about EMI. But he did say that it is possible that the interference came from GWEN, which operates at 150-175 kHz. Virginia Power's communications system—which helps the utility check, prevent and correct problems in power transmission—uses some of the same frequencies (90-200 kHz). The GWEN communications system, which is designed to withstand the EMP from a nuclear attack, is tested for six seconds hourly, according to the USAF. There are 54 GWEN transmitters in operation, including one in Virginia; 42 more are planned but are on hold, pending a National Academy of Sciences study on the health effects of VLF radiation from GWEN that is expected to be released soon (see *MWN*, M/J90 and N/D90).

INTERNATIONAL

Israeli RF/MW Cancer Case... An Israeli man has filed a claim alleging that his prolonged and intensive work with RF/MW radiation transmitters caused him to develop eye cancer. Itzhak Glicksman, 42, was diagnosed with melanoma in his right eye in 1990, 14 years after he began working at Elisra Electronics Systems Ltd. in Israel. The exact nature of the transmitters and how long Glicksman worked with them could not be revealed due to concerns over national security, Glicksman's attorney, Dr. Richard Laster of the Jerusalem firm of Laster & Gouldman, told *Microwave News*. But he did say that the transmitters operated in the range of 0.2 to 18 GHz, with output powers between 200 W and 2 MW. For at least six years, Glicksman worked up to 14 hours a day with the equipment—he was often positioned only 20 cm away—and he was exposed to radiation levels of 20-40 mW/cm^2. "There is no reason...that shortwave radiation, which is suspected of being a carcinogen, cannot be included in the list...of materials that can cause melanoma in the eye," Laster said. He filed the claim with Israel's Social Security Department in January 1991. It was rejected and is now under appeal, he said. Laster also noted that another Elisra employee, who worked near antennas and high-intensity transmitters, had recently been diagnosed with cataracts in both eyes. Cases of eye cancer have also been found in police officers exposed to traffic radar (see *MWN*, M/A91).

POLICE RADAR

GE Named as Defendant... Attorneys for David Berndt, a police officer in Grand Rapids, MI, have added General Electric Co. as a defendant in Berndt's lawsuit, which alleges that use of hand-held radar guns caused his testicular cancer. Jack Sweeney, cocounsel for Berndt, explained that GE makes the Gunn-effect diode used by MPH Industries of Owensboro, KY in its radar devices. The diode is the source of the radar signal, Sweeney said. "All along, GE has had more knowledge of the hazards of

microwave radiation" than the small companies that market police radar equipment, he added. As far back as the early 1980s, GE faced lawsuits over alleged radar injuries (see *MWN*, Ap81 and D82). Two other defendants, Kustom Signals Inc. and Decatur Electronics Inc. have been dropped from the case, leaving just GE and MPH (see *MWN*, M/A92)....The trial date in another case Sweeney is handling—that of Officer Eric Bendure, formerly with the Petaluma, CA police department (see *MWN*, J/A92)—has been pushed back to January 4 from November 10, due to scheduling problems and the illness of a witness.

VDTs

Finnish Pregnancy Study... What would be considered prudent for pregnant women who work at video display terminals (VDTs)? That was the question Finland's Dr. Marja-Liisa Lindbohm faced at the *Work With Display Units '92* conference in Berlin, Germany, in early September, when she presented the final results of her study of miscarriages among women exposed to VDT EMFs. "When you use a VDT, it would be better to have the lowest possible magnetic field," Lindbohm replied, cautioning that the results of her and Dr. Maila Hietanen's study need to be confirmed. Lindbohm and Hietanen, both of the Institute of Occupational Health in Helsinki, found a threefold increase in miscarriages among women exposed to VDT magnetic fields of 3 mG or more (see *MWN*, M/A92 and M/J92). Dr. Kjell Hansson Mild of Sweden's National Institute of Occupational Health estimated, on the basis of surveys, that 25% of Swedish VDTs expose operators to more than 3 mG—and 50% expose them to more than 2 mG. There are no comparable estimates for the U.S. because of the lack of any systematic measurements in this country. Lindbohm and Hietanen's paper was published in the November 1 *American Journal of Epidemiology*.

CONFERENCES

1993 Conference Calendar

January 31-February 5: **1993 Winter Meeting of the IEEE Power Engineering Society** (PES), Columbus, OH. Contact: PES Special Services, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855, (908) 562-3881.

February 2: **Industry Update Seminar: Non-Ionizing Electromagnetic Radiation at Radiofrequencies**, Beltsville, MD. Contact: Rachel Riley, Biospherics Inc., 12051 Indian Creek Ct., Beltsville, MD 20705, (301) 419-7878.

March 2-4: **8th Annual Winter Convention of the Cellular Telecommunications Industry Association** (CTIA), Convention Center, Dallas, TX. Contact: Norman Black, CTIA, 1133 21st St., NW, 3rd Floor, Washington, DC 20036, (202) 785-0081.

March 9-11: **10th International Symposium & Technical Exhibition on Electromagnetic Compatibility** (EMC), Federal Institute of Technology, Zurich, Switzerland. Contact: EMC Zurich '93, ETH Zentrum-IKT, CH-8092 Zurich, Switzerland, (41+1) 256-2790.

March 18-19: **19th Annual Northeast Bioengineering Conference**, New Jersey Institute of Technology (NJIT), Newark, NJ. Contact: Dr. Stanley Reisman, Electrical and Computer Engineering Dept., NJIT, University Heights, Newark, NJ 07102.

March 20-25: **1993 Joint Meeting of the Radiation Research Society** (RRS) and the **North American Hyperthermia Society**, Dallas, TX. Contact: Laura Fleming Jones, RRS, 1891 Preston White Dr., Reston, VA 22091, (703) 648-3780.

March 22-23: **1993 EMF Conference**, Crystal Gateway Marriott Hotel, Arlington, VA. Contact: Jayne Mixon, *T&D* Magazine, Intertec Publishing Corp., PO Box 12901, Overland Park, KS 66282, (913) 967-1865.

March 28-April 2: **11th Symposium of the Bioelectrochemical Society**, University of Basel, Basel, Switzerland. Contact: Dr. Dieter Walz, Biozentrum, University of Basel, Klingelbergstrasse 70, CH-4056 Basel, Switzerland, (41+61) 267-2224.

March 30-April 2: **8th International Conference on Antennas and Propagation**, Heriot-Watt University, Edinburgh, U.K. Contact: IEE Conference Services, Savoy Pl., London WC2R OBL, U.K., (44+71) 240-1871.

April 2-3: **30th Annual Rocky Mountain Bioengineering Symposium**, Holiday Inn Market Square, San Antonio, TX. Contact: Dr. John Enderle, Dept. of Electrical Engineering, North Dakota State University, Fargo, ND 58105, (701) 237-7689.

April 7-8: **29th Annual Meeting of the National Council on Radiation Protection and Measurements** (NCRP), Crystal City Marriott, Arlington, VA. Contact: NCRP, 7910 Woodmont Ave., Suite 800, Bethesda, MD 20814, (301) 657-2652.

April 13-16: **1993 International Magnetics Conference**, Stockholm, Sweden. Contact: INTERMAG '93, c/o Congrex (USA) Inc., 7315 Wisconsin Ave., Suite 606W, Bethesda, MD 20814, (301) 469-3355.

April 18-22: **71st Annual Convention of the National Association of Broadcasters** (NAB), Convention Center, Las Vegas, NV. Contact: NAB Convention Registration, 1771 N St., NW, Washington, DC 20036, (800) 342-2460.

April 20-22: **1993 IEEE National Radar Conference**, Boston, MA. Contact: Fritz Steudel/DD-22, Raytheon Co., 430 Boston Post Rd., Wayland, MA 01778, (508) 440-6408.

April 28-30: **2nd Annual EMC/ESD International**, Sheraton Tech Center, Denver, CO. Contact: Gary Breed, *EMC Test & Design*, 6300 S. Syracuse Way, Suite 650, Englewood, CO 80111, (800) 525-9154.

May 4-6: **7th International Ionospheric Effects Symposium**, Old Town Ramada Inn, Alexandria, VA. Contact: Dr. John Goodman, SRI International, 1611 N. Kent St., Arlington, VA 22209.

May 8-12: **28th Annual Meeting & Exposition of the Association for the Advancement of Medical Instrumentation** (AAMI), Sheraton Boston Hotel & Towers, Boston, MA. Contact: Education Dept., AAMI, 3330 Washington Blvd., Suite 400, Arlington, VA 22201, (703) 525-4890, ext. 210.

May 16-20: **1993 National Conference on Radiation Control**, Westin St. Francis, San Francisco, CA. Contact: Conference of Radiation Control Program Directors Inc., 205 Capital Ave., Frankfort, KY 40601, (502) 227-4543.

May 17-21: **12th Annual Conference on Electricity Distribution**, International Conference Centre, Birmingham, U.K. Contact: IEE, see March 30 above.

May 18-20: **IEEE Instrumentation and Measurement Technology Con-**

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ference, Hyatt Regency Hotel, Irvine, CA. Contact: Robert Myers, 3685 Motor Ave., Suite 240, Los Angeles, CA 90034, (310) 287-1463.

May 24-25: **Edison Electric Institute (EEI), American Public Power Association and National Rural Electric Cooperative Association EMF Conference,** Omni Shoreham Hotel, Washington, DC. Contact: Gayle Novak, EEI, 701 Pennsylvania Ave., Washington, DC 20004, (202) 508-5654.

June 3-6: **10th Congress of the European Society for Magnetic Resonance in Medicine and Biology,** Rome, Italy. Contact: Scientific Secretariat & Organizing Office, Dept. of Radiology, University "La Sapienza," Policlinico Umberto I, I-00161 Rome, Italy, (39+6) 445-5602.

June 7-18: **6th Summer Institute in Environmental Health Studies,** Johns Hopkins University (JHU) School of Hygiene and Public Health, Baltimore, MD. Contact: Dr. J. Corn, JHU School of Hygiene and Public Health, 615 N. Wolfe St., Room 6001, Baltimore, MD 21205, (410) 955-2609.

June 13-17: **15th Annual Meeting of the Bioelectromagnetics Society** (BEMS), Biltmore Hotel, Los Angeles, CA. Contact: BEMS, 120 W. Church St., Frederick, MD 21701, (301) 663-4252.

June 14-18: **IEEE MTT-S International Microwave Symposium,** Atlanta, GA. Contact: MTT-Symposium 1993, 1218 Balfour Dr., Arnold, MD 21012.

June 16-18: **Annual Meeting of the Society for Epidemiologic Research,** Keystone, CO. Contact: Dr. Lorann Stallones, Dept. of Environmental Health, Colorado State University, Ft. Collins, CO 80523.

June 18: **Automatic RF Techniques Group Conference,** Atlanta, GA. Contact: Jonathan Schepps, David Samoff Research Center, MS 3-074, 201 Washington Rd., Princeton, NJ 08540, (609) 734-2185.

June 27-July 2: **1993 IEEE AP-S International Symposium and URSI Radio Science Meeting,** University of Michigan, Ann Arbor, MI. Contact: John Volakis, 1301 Beal Ave., Ann Arbor, MI 48109, (313) 764-0500.

July 11-15: **Annual Meeting of the Health Physics Society** (HPS), Atlanta, GA. Contact: HPS, 8000 Westpark Dr., Suite 130, McLean, VA 22102, (703) 790-1745.

July 12-14: **Quality Enhancements Using Microwaves,** Sheraton Center Hotel, Montréal, Canada. Contact: Robert Schiffmann, 149 West 88th St., New York, NY 10024, (212) 362-7021.

July 18-22: **1993 Summer Meeting of the IEEE Power Engineering Society,** Vancouver, Canada. Contact: Yakout Mansour, BC Hydro & Power Authority, 6911 Southpoint Dr., Podium A01, Burnaby, BC V3N 4X8, Canada.

July 26-29: **1993 SBMO International Microwave Conference,** São Paulo, Brazil. Contact: Paulina Cardoso, IMT–Escola de Engenharia Mauá, Estrada das Lágrimas 2035, 09580, S. Caetano do Sul, SP, Brazil, (55+11) 743-8988.

August 8-13: **5th International Conference on Human-Computer Interaction** (HCI) and **9th Symposium on Human Interface (Japan),** Hilton at Walt Disney World Village, Orlando, FL. Contact: Myra Leap, School of Industrial Engineering, Purdue University, 1287 Grissom Hall, West Lafayette, IN 47907, (317) 494-5426.

August 9-13: **1993 IEEE International Symposium on Electromagnetic Compatibility,** Grand Kempinski Hotel, Dallas, TX. Contact: Dr. Frederick Tesche, c/o International Compliance Corp., 1911 E. Jeter Rd., Argyle, TX 76226, (817) 491-3696.

August 30-September 1: **24th General Assembly of the International Union of Radio Science,** Kyoto, Japan. Contact: Dr. Y. Furuhama, ATR Optical and Radio Communications Research Laboratories, Seika-cho, Soraku-gun, Kyoto, 619-02 Japan, (81+77) 495-1511.

September 6-9: **23rd European Microwave Conference,** Madrid, Spain. Contact: Reed Exhibition Co., 90 Calverley Rd., Tunbridge Wells, Kent TN1 2UN, U.K., (44+892) 544027.

September 12-17: **1993 European Congress of Radiology** (ECR), Vienna, Austria. Contact: ECR, Neutorgasse 9/2a, A-1010 Vienna, Austria, (43+1) 533-4064.

September 26-October 1: **24th International Congress on Occupational Health,** Nice, France. Contact: Yveline LaGarde, "Les Miroirs," 18 avenue d'Alsace, Cedex 27, F-92096 Paris La Defense, France, (33+14) 762-3370.

October 11-14: **2nd International Scientific Meeting on Microwaves in Medicine,** Rome, Italy. Contact: Prof. Guglielmo D'Inzeo, Dept. of Electronic Engineering, University "La Sapienza," Via Eudossiana 18, I-00184 Rome, Italy, Fax: (39+6) 474-2647.

October 11-14: **13th Annual Meeting of the Bioelectrical Repair and Growth Society** (BRAGS), Dana Point Resort, Dana Point, CA. Contact: BRAGS, PO Box 64W, Dresher, PA 19025, (215) 659-5180.

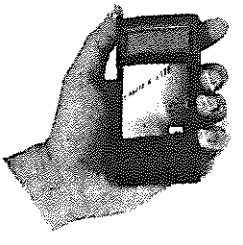
December 15-18: **4th International Symposium on Recent Advances in Microwave Technology,** New Delhi/Agra, India. Contact: Dr. Banmali Rawat, Dept. of Electrical Engineering, University of Nevada, Reno, NV 89557, (702) 784-1457.

Dates and/or Locations To Be Announced

2nd week in November: **Annual Department of Energy Contractors Review.** Contact: W.L. Associates, 120 W. Church St., Frederick, MD 21701, (301) 663-1915.

December (or January 1994): **2nd Scientific Congress of the European Bioelectromagnetics Association,** Ljubljana, Slovenia. Contact: Dr. Alessandro Chiabrera, Dept. of Engineering, University of Genoa, Via Opera Pia 11A, 16145 Genoa, Italy, (39+10) 353-2757.

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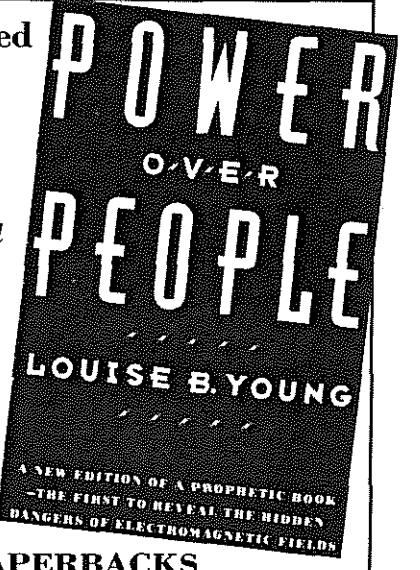
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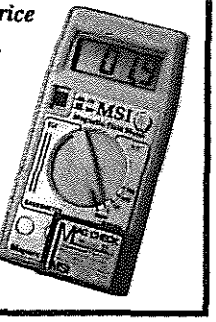


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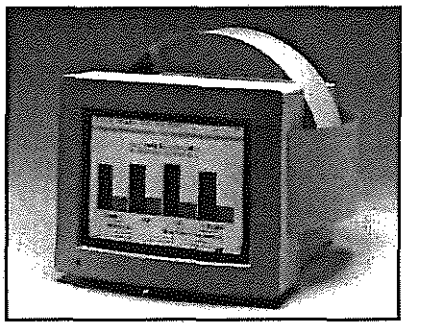
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Vol. XIII No. 6 A Report on Non-Ionizing Radiation November/December 1993

INSIDE...

EMF NEWS pp.2-8

Power Line Talk:
Law Firms Scramble for EMF Business • National Research Program Progress Report • Insurance Companies Warned To Brace for Lawsuits
Major Pennsylvania Power Line Canceled
NY Landowner Victory in Marcy-South Case
Legal Notebook:
Third Cancer Suit Set for Trial
Jordan Case Postponed
Utilities Sue DC over Power Plant Permit
Melatonin and Cancer Clusters
Pooled Nordic Data Support Leukemia Risk
IEEE Weighs Adopting ICNIRP ELF Limits
Recent Review Articles
CA PUC Issues Power Line Rules
U.K.'s NRPB Still Skeptical of Cancer Risk
NJ Seeks 50% EMF Reduction in New Lines
Long Island Breast Cancer Study p.12

HIGHLIGHTS pp.8-11

Neurological Complaints near Swiss Shortwave Transmitter
URSI Statement on Wireless Communications Research Needs
Military on RF Nonlethal Weapons: 'A Very Attractive Option'
Opposition to Cellular Towers on Schools

CONFERENCES pp.13-14

1994 Conference Calendar

UPDATES pp.14-18

Senator Protests EPA Cutbacks • Detailed Reports on EMI and Medical Devices • St. Louis Newsroom Cancer Study • Is the Taos Hum from Electromagnetic Noise? • RF Mitigating Fabric • CTIA Symposium • New Names for Old Organizations • People in the News

CLASSIFIEDS pp.16-20

Breast Cancer Risk Found for Female Electrical Workers

Women in electrical occupations had a greater chance of dying of breast cancer than those working at other jobs, according to a new study by Dr. Dana Loomis of the University of North Carolina (UNC), Chapel Hill. However, in a paper presented on November 4 at the Department of Energy's (DOE) annual meeting on the health effects of electromagnetic fields (EMFs), Loomis cautioned that while the results were "suggestive" of an EMF–breast cancer link, they were "far from conclusive."

Loomis reported that the female electrical workers had a statistically significant 40% higher mortality from breast cancer than women who worked in non-electrical jobs. For women aged 45 to 54, twice the expected number of breast cancer deaths was observed—this increase was also significant. Loomis's study is the first to show a link between occupational EMF exposures and breast cancer among women, though four previous studies have reported a similar association among men.

In an interview with *Microwave News,* Loomis said that the risk of breast cancer from EMF exposure could, in fact, be much greater. "We should expect a lot of dilution of the true risk," he said. He explained that because female breast cancer is a common disease and because so much of the population is routinely exposed to EMFs, one would expect many of those in nonelectrical jobs to have been EMF-exposed. "Conversely," Loomis added, "some of the women in electrical occupations might not have had any contact with EMFs. Each of these factors would lower the observed cancer risk." He also warned that, "In general,

(continued on p.12)

San Francisco Bans Cellular Antennas on School Property

Controversy over a proposal to put a low-power radio transmitter atop a public high school in San Francisco has prompted the city's school board to prohibit new mobile communications antennas on school property. The San Francisco Unified School District has also decided against renewing existing leases for four cellular antennas already on city schools. The board has not issued a formal policy, but school officials told *Microwave News* that the decision is final. "We didn't feel that the risk was warranted at all," said board member Leland Yee.

San Francisco is believed to be the first major city to embrace such measures. School officials nationwide are grappling with cellular transmitter safety issues (see p.11).

The board based its decision in part on the views of Dr. Raymond Neutra of the California Department of Health Services (DHS). "There would be no

(continued on p.10)

« Power Line Talk »

The EMF war is escalating and law firms that defend utilities are girding for battle. In November, **LeBoeuf, Lamb, Leiby & MacRae**, a leading utility defense firm, announced its new EMF litigation team—almost all of whom were hired away from **Crowell & Moring** in Washington, which made EMF law a big business. EMFs "will be an area of increased litigation for many of our clients," said Samuel Sugden, head of the utility practice at LeBoeuf, a 470-lawyer firm that represents nearly 40 utilities. **Tom Watson** of Crowell & Moring, who has defended EMF suits for more than 17 years, said the raid didn't hurt his firm much. "We did lose a staff scientist and an associate, but nobody with any partner-level experience," he said, referring to Dr. **H.B. Graves** and **Rob Manor**. "It's not a big event for us." But it does seem Crowell & Moring has had its share of difficulties lately. An article in the October issue of the *Electricity Journal* sheds some light on the politics of this business. Apparently, after San Diego Gas & Electric Co. (SDG&E) retained the San Francisco-based firm of O'Connor, Cohn, Dillon & Barr as trial counsel in the high-profile *Zuidema* case, Watson, who had been advising SDG&E during the early stages of the case, withdrew. According to the article, an observer covering the trial on behalf of Crowell & Moring wrote reports containing "negative characterizations of SDG&E's lawyers" that ended up in an Edison Electric Institute (EEI) advisory report to utility executives and attorneys. In response, SDG&E threatened to pull out of EEI unless it dropped Crowell & Moring as its EMF counsel. EEI denied receiving any threat but dismissed the firm, the article states. With LeBoeuf entering the field, some say there may not be any EMF business left over for other firms. According to Sugden, however, there is more than enough to go around. "If my perception of the volume of litigation is accurate, other firms will become involved," he said. **Tony Roisman**, a member of EMRCET, the Electromagnetic Radiation Case Evaluation Team, who is with the Washington law firm of Cohen, Milstein, Hausfeld & Toll, said that LeBoeuf's move has broad implications: "It signals the fact that more and more utilities are beginning to realize that this is serious business." Graves, who is based in Washington, is the environmental and health sciences director for the new LeBoeuf team. "Utilities have to track the science—as well as the public perception of the science—much more carefully," he said. **Mark Warnquist**, the team's lead attorney, who left Crowell & Moring several months before Graves and Manor, is based in Denver. Meanwhile, Crowell & Moring has hired Dr. Greg Jackson to replace Graves on its team, which has 10 members, including support staff, and is headed by Watson.

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Here is a progress report on the implementation of the **National EMF Health Research and Communications Program**: Members of the interagency committee that will set research priorities held their first meeting on November 15. Although President Clinton is by law supposed to appoint committee members—the President's busy schedule is often cited as the reason for the nearly one-year delay in assembling the committee—there is no official indication that he has in fact done so. Rather, his Office of Science and Technology Policy (**OSTP**), in order to get things moving and end the embarrassing delay, invited the nine participating agencies to send representatives to the Old Executive Office Building to hash out organizational details. The committee membership will be finalized and a chairperson appointed at the next meeting, which is scheduled for December 14, according to Cynthia Arnold-McKenna, an assistant to Dr. M.R.C. Greenwood, OSTP's associate director for science, who chaired the November meeting. The **DOE** is due to release its draft implementation plan for the EMF program ten days later, on Christmas Eve—exactly one year late. The **NIEHS** did not wait for DOE's plan, but began distributing requests for applications (RFAs) for research on cellular and *in vivo* effects of EMFs at the annual DOE research review in Savannah, GA, in early November. (Proposals are due by February 16, 1994, and awards are anticipated by September 30, 1994.) There has already been a huge response from the scientific community. "The phones are ringing off the hook," said **Dan Vander Meer**, one of the EMF program man-

New Jersey Ruling Derails Major Pennsylvania Power Line Project

Plans for a 268-mile, 500 kV transmission line in Pennsylvania have been dropped, handing a major victory to its opponents, who were concerned about EMF health risks.

As we went to press in early December, a decision by New Jersey's Board of Regulatory Commissioners (BRC) had derailed the project by ruling that it was an "expensive and risky venture" for General Public Utilities (GPU) and its Jersey Central Power and Light (JCP&L) subsidiary. The BRC was ruling on a long-term power purchase agreement between JCP&L and Duquesne Light Co., based in Pittsburgh, and the transmission line.

The proposed line had faced determined opposition from people who live near its route, including members of the York County Citizens' Action Group, based in Franklintown, PA, and Citizens Opposed to Unsafe Power, in Darlington, PA. The proposal was the subject of a series of hearings on EMF issues before the Pennsylvania Public Utilities Commission (see *MWN*, J/A92 and J/F93). But in the end, it was the New Jersey regulatory agency which killed the project. In a 3-0 decision on December 8, the BRC rejected an administrative law judge's recommendation that the project be allowed to proceed. "There was significant public and political opposition to the construction of the transmission line," the BRC stated in a press release, noting that without the line, "the entire project would have fallen through." The BRC argued that shorter-term power purchase options would better meet JCP&L's needs.

The line was to run from the Pittsburgh area to the Three Mile Island nuclear facility near Harrisburg, where it would connect with existing transmission facilities to reach New Jersey. GPU, in Parsippany, NJ, and its subsidiaries had invested $23 million in the failed project.

agers at NIEHS. Meanwhile, President Clinton signed into law on October 28 the energy appropriations bill that earmarks only $4 million, rather than the promised $6.5 million, for the first year of the five-year, $65 million national program—as well as $6 million for DOE's own program (see *MWN*, J/A93). On December 7, the DOE published its official solicitation for $4 million in matching funds from industry in the *Federal Register*, asking that contributions be made "as soon as possible." The DOE stated that no portion of the government's $4 million will be spent until at least half of industry's share is in hand. EEI's **Rick Loughery**, who is coordinating the utilities' contributions, said that "checks are starting to come in," and that, "We are confident that at least the $2 million needed to start the program will be transferred to the DOE by February." But there are still a few sticking points: First, it is not yet known how much of the $8 million the DOE will give to NIEHS for health research. Second, some utility representatives are now saying that their companies are only responsible for two-thirds of the matching funds—it is not clear where this idea originated. The utilities have pledged $21.67 million and the National Electrical Manufacturers Association has pledged $2 million for the program. The utilities want other companies and trade groups to chip in the remaining $8.83 million required to meet the nonfederal commitment of $32.5 million. At the second meeting of the EMF Program's advisory committee, held immediately following the DOE review in Savannah, committee member **Kate Brown Maracas** of the Salt River Project in Phoenix stressed the need for non-utility money. "This is not a utility issue—it's a health issue," she said. Speaking from the audience, **Madalyn Cafruny** of the American Public Power Association supported Maracas: "I think that everyone has always realized that [the electric utilities] hadn't made the 100% commitment." At that point, **Anne Strauss**, an observer from the New York Power Authority in New York City, tried to put the issue to rest: "There's absolutely no chance that every dollar of the [federal] appropriation won't be matched," she told the committee. In early December, Loughery was also reassuring. "There is no question that the $4 million will be matched," he said. Even so, one question does remain: What will the utilities do if Congress, as expected, fully funds the program in the next few years, and no one comes forward to write a check for the more than $8 million shortfall?

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Utilities should not be the only ones preparing to defend themselves against EMF lawsuits—**insurance companies** must also pay heed. "Insurers should begin to take preemptive measures" to lessen their potential liability in such cases, according to an October 28 memo to the insurance industry by the New York City-based law firm of **Kroll & Tract**. "Utility companies have a huge stake in pursuing EMF claims against their insurance carriers and in establishing favorable legal precedent in the courts," the 11-page memo explains. It focuses in part on the recent **Criscuola** case (see below), which it views as a sign of things to come. Even if a carrier is not ultimately responsible for an award, "vast resources may be spent to reach that determination," the memo notes. Kroll & Tract, a leading insurance industry defense firm, urges insurers to examine their policies—and offers its services in dealing with this "newly developing area of the law." The law firm's advice has gained a wider audience with a November 15 article in *National Underwriter*, "Insurers Warned To Lower Exposure to EMF Liabilities," which discusses it in detail.

New York Landowners Win Property Value Judgment —But How Much Will They Collect?

A recent decision by New York's highest court allows landowners to seek compensation for losses in property value due to perceived health risks from power line EMFs—whether or not those risks are real. The ruling breathes new life into 11 related cases still pending in the state, and could prompt similar claims in New York and elsewhere across the country.

On October 12, the New York Court of Appeals held that Joseph and Dominick Criscuola of Downsville, NY, have the right to sue for damages from the New York Power Authority (NYPA), which built a 345 kV power line on their property. Judge Joseph Bellacosa wrote, "Whether the danger is a scientifically genuine or verifiable fact should be irrelevant to the central issue of its market value impact."

The Criscuola brothers' claim was originally filed with more than 50 others in connection with NYPA's Marcy-South line. After a trial that attracted national attention, the NYPA was victorious. The Criscuolas lost their first appeal to the Appellate Division of the New York State Supreme Court last October, but won their final appeal to the state's highest court (see *MWN*, M/A87, S/O89, J/F90, N/D92 and S/O93). The case has now been returned to the New York Court of Claims, which will determine the amount of an award, if any. A new trial date has not been set.

The ruling brings New York in line with several other states —including California, Florida and Kansas—which have already decided that landowners need not show that there is a reasonable basis for fear of EMFs. While some lawyers say New York's decision could have an impact in other states, others are dubious.

"Criscuola will considerably embolden litigants around the country seeking to assert property damage claims for power lines, microwave towers and other feared facilities," said Michael Gerrard of the New York City firm of Berle, Kass & Case. He said that the decision could have a far-reaching effect because the New York Court of Appeals is highly regarded by other states. Gerrard, who edits his firm's newsletter, *Environmental Law in New York*, wrote an article about the Criscuola case with another partner at the firm, Stephen Kass, which appeared in the *New York Law Journal* on October 22.

On the other hand, Carlos Alvarez of Hopping, Boyd, Green & Sams in Tallahassee, FL, told *Microwave News* that the importance of New York's decision has been inflated: "I don't see what the big deal is." Similar rulings in other states have had little impact on utilities—or on people's decisions to file claims, he

Legal Notebook

Third Cancer Suit Set for Trial Next Spring

Lawyers for the plaintiff will seek to establish a link between magnetic fields and leukemia when the third EMF personal injury case goes to trial in New Jersey next spring. John Altoonian, who blames his illness on EMFs from a power line owned by the Atlantic Electric Co., said that he refused an offer by the utility to settle for $400,000.

In October 1990, at the age of 43, Altoonian was diagnosed with chronic myelogenous leukemia, two years after he moved into a house he built in West Wildwood, NJ, where an underground 69 kV power line operated by Atlantic Electric ran through the backyard. Altoonian told *Microwave News* that he was exposed to high EMFs when he built the house and the deck, which was constructed right over the line. Magnetic fields measured 300 mG in the yard, 60 mG on the deck and 29 mG in his bedroom, he said.

His lawyer, William Wolf of the Lakewood firm of Bathgate, Wegener, Dugan & Wolf, filed the suit against the Pleasantville-based utility in November 1991, claiming that it was liable for negligence, nuisance and trespass. The trial will begin on April 18 in the New Jersey Superior Court in Cape May County.

Altoonian said that in May 1992, after Atlantic Electric tried to settle, he got a court order to have the line moved. He said that the utility had "made a mistake" when it built the power line there—and not along a nearby right-of-way—20 years ago. Atlantic Electric ultimately paid $500,000 to have the line moved about 12 feet away, Altoonian said. EMFs in his house now measure between 4 and 8 mG.

Atlantic Electric's lawyer, Gerald Corcoran of Megargee, Youngblood, Franklin & Corcoran in Pleasantville, declined to comment. Lois Jennings, a spokeswoman for the utility, said only that, "We believe [Altoonian's] illness is not related to the situation he claims it is related to."

Wolf has engaged the following experts: Dr. Frances Arena, American Board of Internal Medical Oncology, Great Neck, NY; Richard Clapp, JSI Center for Environmental Health Studies, Boston; Dr. Stephen Cleary, Virginia Commonwealth University, Richmond; Dr. Andrew Marino, Louisiana State University, Shreveport; Joseph Martin, Martin, Benner & Associates, Lawrenceville, NJ; Samuel Sero, Smith & Robson, Pittsburgh; Dr. Roger Wilk-Raftery, psychologist, Manasquan, NJ; and Dr. Peter Wright, Poly Clinic, Seattle.

Jordan Trial Postponed

The trial of Nancy Jordan's case against two Georgia utilities has been postponed until next year. A new date has not been set.

The case was to have opened in Georgia Superior Court for Douglas County in Douglasville on November 29, but Dr. Peter Wright, one of Jordan's expert witnesses, became too ill to attend, according to Jordan's attorney, Bruce DeBoskey of Silver & DeBoskey in Denver. DeBoskey said that he elected to videotape Wright's testimony and use it at a later trial rather than begin without him. Wright testified for the Zuidemas in their case against the San Diego Gas & Electric Co. last spring (see *MWN*, J/A91, N/D92 and M/J93).

DeBoskey will also use videotaped testimony by Dr. David Carpenter, dean of the School of Public Health at the State University of New York, Albany, who would not have been able to appear at the November trial. Carpenter served as executive secretary of the New York State Power Lines Project's scientific advisory panel, which sponsored David Savitz's landmark study of childhood cancer and EMFs (see *MWN*, N/D86 and J/A87).

James Orr of the Atlanta firm of Sutherland, Asbill & Brennan, who is representing Oglethorpe Power Co., one of the defendants, said that he believes the delay will have no effect on the case.

Jordan, whose suit was filed on July 24, 1991, claims that her non-Hodgkin's lymphoma was caused by EMFs from power lines owned by Oglethorpe and Georgia Power Co. (see *MWN*, S/O91, M/J92, J/A92 and S/O93).

DC Sued After Denying Power Plant Permit

The District of Columbia (DC) and six of its officials face an $80 million lawsuit after denying a building permit to replace a power plant at Georgetown University. The officials cited their concerns over the possible health effects of EMFs from power lines leading from the plant. A trial date has not been set.

Dominion Energy Inc. of Richmond, VA, and TriStar Ventures Corp., a subsidiary of the Columbia Gas System Inc. of Wilmington, DE, filed the suit on November 1, claiming that district officials conspired to delay and ultimately destroy their project. The companies alleged that the officials ordered unnecessary reviews and made "intentionally misleading statements" about the proposed plant, which had met all of the building requirements for health, safety and environmental impacts, including those from EMFs—according to the complaint, which was filed in U.S. District Court in DC.

The six officials, who include the mayor of the nation's capital, declined to comment on the pending litigation. But an October 13 letter to the plant's project manager from Hampton Cross of the district's Department of Consumer and Regulatory Affairs states that, "Given this potential environmental threat to the citizens of our city, and given the mission of this department to protect the health, safety and welfare of the citizens of the District of Columbia, I must therefore deny environmental approval for the pending building permit application...until more is known about the possible health effects of EMFs." Cross is one of the officials named as defendants in the suit.

Under the plan, the DC-based Potomac Electric Power Co. (PEPCO) would purchase electricity generated by the plant, which would also provide steam for the Georgetown campus. The project would entail reactivating overhead and buried power lines—which have been idle since the mid-1980s—to feed the electricity from the plant to a PEPCO substation, according to utility spokeswoman Nancy Moses. The 69 kV overhead line runs near 80 houses in the Palisades section of the district, she said.

said. Alvarez defended Florida Power & Light Co. in the suit that led to the state supreme court's 1987 ruling on the issue, which is consistent with New York's (see *MWN*, S/O86).

Tom Watson of the firm of Crowell & Moring in Washington, who handled the EMF part of the original Marcy-South litigation for the NYPA, said that there is a big difference between a judge deciding that landowners may be compensated and their actually being paid. "I think we have to look at the practical effect of a decision like this, which is measured in terms of the damages recovered." Watson said that he doubts that the Criscuolas will recover damages, since landowners in previous eminent-domain cases have not been able to establish that fear of EMFs

actually decreases market value (see *MWN*, S/O93).

New York City attorney Michael Rikon, who is representing the Criscuolas, maintained that he will be able to show that the value of his clients' property has been diminished as a result of the power line. Rikon is asking for $50,000 in damages from the New York City-based NYPA. He explained that the figure is based on the value of the Criscuolas' property at the time the easements were taken in 1986. The NYPA used nine of the Criscuolas' 100 acres for the line and Rikon said that it will not be difficult to prove that, even then, people's fears about power line EMFs affected land sales. At the original trial in 1988, a real estate appraiser testifying for the landowners said that fear of cancer could lower property values near the Marcy-South line by up to 90% (see *MWN*, N/D88).

There are suggestions that concerns about EMFs are widespread. For instance, on July 11, 1993, the *New York Times* ran a story under the headline "Power Lines Raise Fears in Home Buyers," which reported that, "The fear has begun to affect the real estate market in the metropolitan area, and indeed, all over the country wherever houses are in close proximity to power lines." On December 8, as we went to press, the *Wall Street Journal* published an article, "Power Lines Short-Circuit Sales, Homeowners Claim."

The NYPA has raised the issue of whether claims of losses in property values can be firmly substantiated. "The big question is, can the plaintiffs support their claim with hard market data," said Arthur Cambouris, NYPA's assistant general counsel. "It's not good enough to have experts opine and say that they have read articles." At their Court of Claims hearing, the Criscuolas will need to produce "credible, tangible evidence" that fear of EMFs had an adverse impact on market value, according to Judge Bellacosa. The utility argues that property values around the Marcy-South line have not been affected. A study of land sales found that there was "no discernible or measurable difference" in sales prices for properties close to Marcy-South and those much farther away, according to an NYPA statement.

At least 35 of the 50 or so original plaintiffs have settled their cases out of court. But there are still 11 claims like the Criscuolas' pending before a New York Court of Claims judge in Binghamton. As a result of the recent decision, the landowners can seek consequential damages—that is, damage to the value of the property outside of the easement—according to Michael Gurda of Gurda, Gurda & Smith in Middletown, who is representing the claimants. Gurda said that another benefit of the decision is that now, property owners "will not need to spend lots of money" retaining expert witnesses to testify about the health effects of EMFs.

Reiter Points to a Different Way of Looking at Cancer Clusters

Epidemiologists have traditionally balked at combining different types of tumors when investigating cancer clusters, arguing that a single toxic agent can only be responsible for a single type of cancer.

Now Dr. Russel Reiter, long a proponent of the key role played by the hormone melatonin, believes that a variety of different cancers may be promoted by magnetic fields. In a paper presented at the Department of Energy meeting in Savannah, GA, in early November, Reiter explained that "the suppression of melatonin by magnetic fields could result in a higher incidence of cancer in any tissue." This effect could clear up "one of the mysteries of the magnetic field/cancer issue," that is, "the large number of different tumor types that have been reportedly increased," he suggested.

Researchers in Reiter's lab at the University of Texas Health Science Center in San Antonio have shown that melatonin is a very potent antioxidant and can therefore protect DNA against damage caused by free radicals.

If Reiter's intriguing hypothesis is correct, the analysis of cancer clusters will change completely. For example, in its report on the cancer cases at the Slater School in Fresno, CA, the California Department of Health Services argued that when evaluating a cluster, it is important to determine "whether the cancers are of the same type or of biologically similar types" (see *MWN*, J/A93). For a more detailed look at Reiter's hypothesis and experimental results, see the following papers from his group: *Cancer Letters, 70,* pp.65-71, 1993; *Endocrine Journal, 1,* pp.57-60, 1993; and *Journal of Pineal Research, 14,* pp.151-168, 1993.

Pooled Nordic Data Support Childhood Leukemia Risk

An analysis of the pooled data from three recent Scandinavian epidemiological studies adds new weight to the link between EMFs and childhood leukemia.

In a letter in the November 20 issue of *The Lancet,* the authors of the Danish, Finnish and Swedish studies concluded that, "Our results show that the three Nordic studies taken together support the hypothesis that exposure to magnetic fields of the type generated by transmission lines has some etiological role in the development of leukemia in children." But, they added, "For nervous system tumors and all childhood cancer the conclusion is less clear."

In their letter, Dr. Anders Ahlbom and Maria Feychting of the Karolinska Institute in Stockholm, Dr. Jørgen Olsen of the Danish Cancer Society, Dr. Pia Verkasalo of the University of Helsinki and their coworkers reported a significant doubling of the risk of childhood leukemia for long-term residential exposures greater than 2 mG.

The combined analysis also found a nonsignificant 50% increased risk for brain tumors and other types of central nervous system cancers. There was no increased risk for lymphoma. For all cancers combined, there was a 30% increased risk, which was just short of significance.

In a telephone interview from his office in Stockholm, Ahlbom said, "Our new analysis was an effort to overcome the small number of cases in each of the individual studies." He added that, "The results indicate a consistent leukemia risk over the three studies." The original Swedish study had seven leukemia cases. Combining the studies brought the total to 13.

Ahlbom and Feychting had originally found a nearly threefold, significant increase in childhood leukemia for long-term residential exposures above 2 mG (see *MWN*, S/O92). The Danes reported a significant fivefold increased lymphoma risk for such exposures above 1 mG, and a comparable but nonsignificant increased leukemia risk for exposures above 4 mG (see *MWN*, N/D92). In contrast, the Finns did not obtain any significant results, although they found a nonsignificant 50% greater incidence of leukemias as well as all cancers (see *MWN*, S/O93).

Despite some differences in design, the three studies were planned in concert with a view towards pooling the data. In addition, researchers in each of the studies estimated magnetic field exposures using historic current loads in the power lines, a novel approach not used in previous studies.

IEEE Weighs the Adoption of the ICNIRP ELF Standard

A subcommittee of the Institute of Electrical and Electronics Engineers (IEEE) has taken a step towards adopting the guidelines for exposures to extremely low frequency (ELF) EMFs endorsed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This standard, first adopted in 1989, limits magnetic field exposures for the general public and for workers to less than 1,000 mG and 5,000 mG, respectively. At present, there are no ELF EMF health standards in the U.S.

At a November 1 meeting of subcommittee 3 (SC3) of Standards Coordinating Committee 28 (SCC28) on Non-Ionizing Radiation, Joseph Koepfinger of Duquesne Light Co. in Pittsburgh put forth a motion asking for a formal vote on whether to adopt the ICNIRP limits. He made the motion, he told *Microwave News*, because, "It will take six to eight years to develop a [new] standard." He pointed out that the subcommittee had already been deliberating for a year and a half and nothing had happened. "The ICNIRP standard is a straw man," he said. "This way we'll find out what the problems are." Koepfinger, a member of the IEEE Standards Board, stressed that he was not speaking for Duquesne Light.

The vote touched off a storm of protest within the subcommittee because its own working group on epidemiology had only just begun a review of the literature on EMFs and cancer and because many members of the subcommittee were absent when the vote was taken. The SC3 meeting was held in Savannah, GA, at the same time as the Department of Energy's annual review of EMF health research.

Dr. Richard Lovely of the Battelle Pacific Northwest Labs in Seattle complained that the standard was being "railroaded" through the subcommittee. And Dr. Paul Héroux of McGill University in Montreal, Canada, an observer at the meeting, said, "I was stunned—they are voting before the epidemiologic review has been done."

Koepfinger's motion passed easily, by a vote of 21-3. Dr. Dennis Hadlock of Science Applications International Corp. in Germantown, MD, explained why he had voted with Koepfinger: "I don't see what the danger is in adopting something on an interim basis that has been researched by ICNIRP." He added that, "I don't think that the epi report will tell us anything that will really help." The three negative votes were cast by Dr. Thomas Budinger of the University of California, Berkeley, the chair of SCC28; Dr. Gregory Lotz of the National Institute for Occupational Safety and Health in Cincinnati; and Battelle's Lovely.

Recent Review Articles

• H. Berg, "Electrostimulation of Cell Metabolism by Low Frequency Electric and Electromagnetic Fields," *Bioelectrochemistry and Bioenergetics, 31*, pp.1-25, 1993.

• N. Guzelsu and W.R. Walsh, "Piezoelectric and Electrokinetic Effects in Bone Tissue–Review," *Electro- and Magnetobiology, 12*, pp.51-82, 1993.

• *Journal of Cellular Biochemistry, 51*, 1993. Included are articles by: Ross Adey on "Biological Effects of [EMFs]" (pp.410-416); Ivan Cameron and coworkers on "Environmental Magnetic Fields: Influences on Early Embryogenesis" (pp.417-425); Reba Goodman, Yuri Chizmadzhev and Ann Henderson on "[EMFs] and Cells" (pp.436-441); Jerry Phillips on "Effects of [EMF] Exposure on Gene Transcription" (pp.381-386); Russel Reiter on "Static and [ELF EMF] Exposure: Reported Effects on the Circadian Production of Melatonin" (pp.394-403); and James Weaver on "Electroporation: A General Phenomenon for Manipulating Cells and Tissues" (pp.426-435).

• J. Lee et al., *Electrical and Biological Effects of Transmission Lines: A Review*, Portland, OR: Bonneville Power Administration (BPA), 1989 (revised 1993), 107 pp. For a copy of the report, contact: BPA, PO Box 3621, Portland, OR 97208, (800) 622-4520. (BPA plans to revise the report completely over the next year.)

• H. Matsumoto, ed., *Modern Radio Science: 1993*, New York: Oxford University Press, 1993, 249 pp. Included is an article by Ross Adey on "Electromagnetics in Biology and Medicine" (pp.231-249). Available for $37.50 from: Oxford University Press, 2001 Evans Rd., Cary, NC 27513, (800) 451-7556.

• J. McCann et al., "A Critical Review of the Genotoxic Potential of [EMFs]," *Mutation Research, 297*, pp.61-95, 1993.

• T. McManus, *[EMFs]: A Review of Recent Developments in Research and Public Attitudes, and the Response of Authorities to These Developments*, Dublin, Republic of Ireland: Irish Department of Energy, 1992, 267 pp. For a copy of the report, contact: Dr. Thomas McManus, Irish Department of Energy, 25 Clare St., Dublin 2, Republic of Ireland, (353+1) 715233.

• M. Misakian et al., "Biological, Physical and Electrical Parameters for In Vitro Studies with ELF [EMFs]: A Primer," *Bioelectromagnetics, Supplement 2*, pp.1-73, 1993.

• J.C. Murphy et al., "Power Frequency [EMFs]: A Review of Genetic Toxicology," *Mutation Research, 296*, pp.221-240, 1993.

• A. Sheppard, *Epidemiologic and Laboratory Research on the Potential Human Health Effects from Exposure to Power Frequency [EMFs]*, St. Paul, MN: Minnesota Environmental Quality Board, August 1993, No.PB 94114485, 71 pp. Available for $19.50 from: National Technical Information Service, 5285 Port Royal Rd., Springfield, VA 22161, (800) 553-6847.

• W.R. Stone, ed., *Review of Radio Science: 1990-1992*, New York: Oxford University Press, 1993, 814 pp. Included are articles by: Stephen Cleary on "Biophysical Mechanisms of Interaction" (pp.717-735); J.W. Hand and R. Cadossi on "Therapeutic Applications of [EMFs]" (pp.779-796); James Lin on "Diagnostic Applications of [EMFs]" (pp.771-778); Lars-Erik Paulsson on "Human Exposure Assessment and Dosimetry" (pp.797-814); and a group from the U.K.'s NRPB on "Biological Effects of [EMFs] and Radiation" (pp.737-770). Available for $98.00 from: Oxford University Press, 2001 Evans Rd., Cary, NC 27513, (800) 451-7556.

Robert Curtis, the director of the Occupational Safety and Health Administration's Health Response Team in Salt Lake City, voted for the motion to "try to get things moving." But, he explained to *Microwave News*, "People ought to be informed when they are working in fields which result in whole-body exposures of more than 50 mG so they can adopt a strategy of prudent avoidance."

In an interview, Dr. John Bergeron of General Electric in Schenectady, NY, cochair of SC3, said that the members of the subcommittee would now be asked to vote on the adoption of the ICNIRP guidelines. "It gets the discussion going while the epidemiologists are working," he said, noting that, "At the moment, we are paralyzed" due to the ambiguous results of the epidemiological studies. The SCC28 review of the epidemiological literature is being sponsored by the Department of Defense.

Even before the meeting, Dr. Asher Sheppard, a consultant based in Redlands, CA, protested to the IEEE the simultaneous scheduling of the SC3 and DOE meetings, which forced him to miss the session. He wrote that he was "outraged" by the conflict and noted that it "violates the integrity of the standards process and may undermine confidence in its work."

Indeed, a number of SC3 members were attending the DOE scientific presentations at the time the SC3 vote was taken. Sheppard, Lovely and Dr. Mary Ellen O'Connor of the University of Tulsa, OK, president of the Bioelectromagnetics Society, are in the process of drafting a letter to the IEEE citing their objections to the scheduling of the subcommittee meeting.

ICNIRP adopted its exposure guidelines on an interim basis in 1989 and reaffirmed them earlier this year when it reiterated its position that research to date is inadequate to conclude that EMFs pose a cancer risk (see *MWN*, M/J89, J/F90 and M/J93). The guidelines, which seek to limit EMF-induced body currents, also specify standards for exposures to electric fields.

California PUC Issues Rules, Utilities Plan Mitigation Steps

The California Public Utilities Commission (PUC) has adopted an interim EMF policy that asks utilities to eliminate "unnecessary" exposures from new power lines if the mitigation costs no more than 4% of a project's total budget. Whether to reduce EMFs on existing lines will be addressed at a later date. The November 2 decision commits $7 million for spending on EMF research and education in the state. The policy also requires:

- that PUC staff hold public workshops to help utilities develop guidelines that specify techniques for reducing EMFs;
- that utilities develop a consistent policy for measuring EMFs in the workplace and at home, and that customers receive this service free of charge;
- that the Department of Health Services (DHS), which will manage the research and education programs, should determine how utilities, ratepayers, local government and the public can play a role in developing the programs;
- that utilities should contribute to experimental research conducted under the five-year, $65 million national EMF research and communications program—but does not specify how much they should contribute.

The order concludes a process that began nearly three years ago when the PUC opened its investigation of EMF health effects. A 17-member PUC consensus group made up of utility representatives, health officials and members of citizens groups and labor unions was charged with developing recommendations for interim EMF policies. The group issued its report in March 1992, and PUC Judge Michael Galvin presented a policy proposal last summer based on the group's conclusions (see *MWN*, N/D91, M/A92 and J/A93).

California is following the lead of other states in requiring EMF mitigation, though its plan is the most detailed and comprehensive to date. Two years ago, Wisconsin was the first state to order utilities to use low EMF designs in new or upgraded facilities (see *MWN*, J/F92 and M/J92). Soon afterward, Colorado asked utilities to design and locate facilities using methods to mitigate "involuntary" exposures to the public (see *MWN*, M/J92).

While some question the 4% cost cap specified in California's new policy, utilities say that they can mitigate magnetic fields significantly—in some cases up to 60%—at minimal expense. "A lot can be done to cut EMFs [by spending] on the order of 1 or 2%," said Joe Thompson, an engineer with the Los Angeles Department of Water and Power, who was part of the PUC consensus group.

Thompson said that the utility had reduced EMFs from 57 mG to 27 mG at the edge of a right-of-way (ROW) of a 500 kV line for little more than 1% of the project's cost. This was accomplished by raising parts of the line and by extending the ROW along a small section, he said.

In his July proposal to the commission, Galvin recommended that utilities be required to reduce EMFs by at least 4%. The PUC rejected this formula in its November order: "It would be inappropriate to adopt or set a specific numerical standard until there is a scientific basis for doing so."

Martha McNeal, EMF program director at the Pacific Gas & Electric Co. (PG&E) in San Francisco, another member of the consensus group, said that PG&E had originally proposed miti-

Still Skeptical of Cancer Risk in U.K.

Updating its 1992 report, an advisory group of the U.K.'s National Radiological Protection Board (NRPB) has concluded that evidence for an EMF–cancer link is very weak.

The group reviewed the Scandinavian occupational studies and reiterated its position: "Whether the hazard, if one exists, is due to exposure to [EMFs] or to some chemical associated with the work is impossible to decide at the present."

The group also evaluated the Danish and Swedish residential studies (see p.5) and stated that, while they were better than previous efforts, "Any evidence for an association between residential exposure to [EMFs] and cancer was weak and based on very small numbers of cases."

In its 1992 report, the group, chaired by Sir Richard Doll, saw "no firm evidence" of a cancer risk from power frequency EMFs but urged further study (see *MWN*, M/A92). The update, which appears in *Documents of the NRPB, 4*, pp.65-69, 1993, was prepared by the NRPB's Dr. J.W. Stather. The NRPB has also released its "advice" on human exposures to EMFs and RF radiation; details in our next issue.

gating EMFs by at least 15%, because it is a "significant" reduction that can be achieved for less than 4% of a project's cost. She said that the utility supports the 4% cost cap, calling it "a low, responsible financial commitment."

Citizens groups are less enthusiastic about the new policy. Ellen Stern Harris of the Fund for the Environment in Beverly Hills said that utilities should be required to spend whatever it takes to mitigate EMFs. She called the 4% cost cap "an effort at appeasement which should have been rejected by the commission." She did say that she was "hopeful" about PUC's decision to consider reducing EMFs on existing power lines. "There are far more people affected by these lines than by proposed ones," she said. Under the order, people will have 60 days after the ruling goes into effect on December 1 to comment on whether EMFs should be cut on existing lines.

Shirley Linde, who chairs the National EMF Advisory Committee and Citizens for Safer EMFs, a citizens group in Beverly Hills, said that, "At the very least they could have given interim relief to people [who live in] extraordinarily high fields." Linde said that she supported PUC's decision not to charge customers for EMF readings in their homes and workplaces. Linde and Harris were also members of the consensus group.

Diana Brooks of PUC's Division of Ratepayer Advocates said that overall the new policy is "a step in the right direction." She said that she would have liked the commission to authorize a "particular dollar amount" for contributions to the national EMF research and communications program instead of leaving it up to the utilities. In his July order, Galvin had proposed a maximum $4.1 million in contributions to the program.

The new policy calls for more than $7 million for EMF research and education in the state. This includes a four-year, $5.6 million nonexperimental and administrative research program and a four-year, $1.5 million education program. Dr. Raymond Neutra of the DHS in Emeryville, who will manage the programs, told *Microwave News* that the programs will focus on policy analysis, literature reviews, mitigation, epidemiology and exposure assessments.

The PUC's workshops—which are intended to involve the public in the utilities' task of writing EMF guidelines—will cover design, maintenance and operating practices to reduce EMFs. The utilities will also decide which projects do not need to incorporate low EMF designs, such as a new power line in a rural environment. PUC approval of the guidelines is not required.

Copies of PUC's 67-page policy on EMFs, *Decision 93 11 013*, cost $13.40 each, plus tax, from: PUC, Central Files, 505 Van Ness Ave., San Francisco, CA 94102, (415) 703-2045.

New Jersey Seeks 50% Reduction from New High Voltage Lines

A New Jersey panel has issued a draft of proposed rules recommending that EMFs from new power lines of at least 100 kV be cut by 50%. The group is looking at mitigation techniques that "may result in almost no additional cost," according to Deborah Wenke, a member of the state Advisory Committee on Non-Ionizing Radiation, which announced the proposal on October 6.

Wenke said that the advisory group is also concerned about distribution lines, but will most likely address them at a later date. Dr. Daniel Wartenberg of the Environmental and Occupational Health Sciences Institute in Piscataway, NJ, who chairs the advisory committee, told *Microwave News* that he hopes to issue final recommendations by January 19 to the state Commission on Radiation Protection, which will then decide whether to adopt them.

Citizens groups support the advisory committee's efforts, but say that requiring reductions on 100 kV lines will not accomplish very much. Paul Welch of the Committee for Safe Power Lines in Little Silver figures that, at most, one such line is built in the state each year. "More people are affected by distribution lines," he said.

Jersey Central Power & Light spokeswoman Donna Nowcid said that the Morristown-based utility is still evaluating the draft proposal and that she could not comment.

HIGHLIGHTS

Neurological Complaints near Swiss Shortwave Transmitter

Living near a shortwave transmitter can lead to complaints of sleep disorders, reduced concentration, high blood pressure and a general feeling of anxiety, according to a new Swiss government survey. Because there are so few epidemiological studies on the chronic effects of exposure to low-level radiofrequency (RF) radiation, confirmation of these results—detailed follow-up investigations are being planned—could force a major reevaluation of health standards.

A maximum of three 6.1-21.8 MHz transmitters with output powers of 150 kW operate simultaneously at the Schwarzenburg complex, approximately 20 km south of Bern, according to Robert Coray, an expert on electromagnetic compatibility and bioelectromagnetics at Swiss Telecom PTT (Post, Telephone, Telegraph) in Bern. The facility is owned by Swiss Telecom PTT and is programmed by Swiss Radio International.

Dr. Theodor Abelin of the Institute for Social and Preventive Medicine at the University of Bern and Dr. Heidi Howald of the Bern Institute for Industrial Medicine, who jointly ran the health study, asked 215 people, divided approximately equally among three zones around the Schwarzenburg station, to keep a diary of how they felt for an average of 25 days. The researchers tried to control for possible bias among those who knew the transmission schedules by periodically changing the direction of the signals and thereby varying the RF exposures.

The RF radiation levels were measured by Swiss Telecom PTT with the assistance of the Electromagnetics Group at the Swiss Federal Institute of Technology in Zurich, and the population's weighted 24-hour average exposures were estimated.

(The power densities below are the far-field equivalents.) The villagers who live within 900 meters of the transmitters were exposed to an average of 1.4 $\mu W/cm^2$, with a minimum and maximum of 21 nW/cm^2 and 164 $\mu W/cm^2$, respectively. Those living more than 900 meters from, but within 1.5 km of, the transmitters were exposed to 54 nW/cm^2 (4.9-300 nW/cm^2) and those who are more than 4 km away were exposed to 0.54 nW/cm^2 (0.4-0.8 nW/cm^2).

Villagers living close to the station reported more subjective health complaints than those living over 4 km away.

Coray told *Microwave News* that the planned follow-up studies include blood pressure and melatonin measurements in those exposed, melatonin assays of cows near the antennas and surveys of 50 Hz EMFs from power lines and substations. The health of children who attend a school near the transmitters will also be compared with that of youngsters at a school further away. Coray said that melatonin levels would be measured in about 40 people who live near the complex, and in 20 controls.

The complaints from those who live near the facility are similar to those reported by workers exposed to RF and microwave radiation on the job. For instance, in their classic 1976 text, *Biological Effects of Microwaves*, Drs. Stanislaw Baranski and Przemyslaw Czerski wrote: "The chronic overexposure syndrome is characterized by subjective complaints consisting of headaches, irritability, sleep disturbances, weakness, decrease of sexual activity (libido), pains in the chest and general ill-defined feelings of ill-being."

The Swiss study is one of the first epidemiological studies to investigate the health of people living near radio and TV transmitters. Indeed, a recent National Research Council–National Academy of Sciences report on the U.S. Air Force's Ground Wave Emergency Network (GWEN) concluded that the communications system, operating at 150-175 kHz, would have a minimal health impact; that judgment was based in part on the absence of complaints among those living near European low-frequency radio transmitters (see *MWN, M/J93*).

URSI Seeks Health Research on Wireless Communications

The resolution reprinted below was adopted by Commission K on Electromagnetics in Biology and Medicine at the International Union of Radio Science (URSI) meeting in Kyoto, Japan, in September. It was later ratified by the URSI Council, according to Commission K chairman Dr. Paolo Bernardi of the Department of Electrical Engineering at the University "La Sapienza" in Rome, Italy. Commission A is on electromagnetic meteorology. Commission B is on fields and waves.

Commission K, *Considering,*

(a) That there is a rapid development of new technologies such as wireless local area networks (LANs), cellular phones, low-earth-orbiting satellites (LEOS), communication networks (e.g., Iridium), personal communication services (PCS), cordless telephones and other devices, and their wide spread is anticipated;
(b) That there exists scientific uncertainty about potential impact of electromagnetic fields from wireless communication on human health;
(c) That there is public concern about health effects of all electromagnetic devices;

Recommends that broad-based research programs should be established nationally and internationally to address the key issues, namely:
1. What are the interaction mechanisms of weak electromagnetic fields of various characteristics with living systems;
2. What biological effects and particularly potentially harmful effects are caused, and under what exposure conditions;
3. How to evaluate the exposures through proper measurements and dosimetric modeling.

The Commission gratefully acknowledges the promised support of Commission A in the area of the measurements and Commission B in the area of the dosimetric modeling.

Military on Nonlethal Weapons: 'A Very Attractive Option'

Most research into nonlethal weapons takes place under a veil of secrecy, but now and then some clues about it do emerge —if only in the program notes for a research conference.

About 400 scientists who are developing nonlethal technologies—such as radiofrequency (RF) radiation, electromagnetic pulse (EMP), extremely low frequency (ELF) fields, lasers and chemicals—exchanged ideas at a classified meeting hosted by the Johns Hopkins University Applied Physics Lab in Laurel, MD, November 16-17. Presentations ranged from discussions of high-power microwaves (HPM) to a report on "sticky foams," which are proposed as a way of stopping enemy troops.

Dr. Clay Easterly of Oak Ridge National Lab in Oak Ridge, TN, led a session on the use of ELF EMFs. "My major point was that there seem to be some biological sensitivities or responses [to ELF fields] that could in the future be useful for nonlethal technology," Easterly told *Microwave News*. Noting that the conference was closed to anyone without a security clearance, he said he could not discuss the specific effects he referred to in his talk. But he emphasized that information in the open literature can be applicable: "There seem to be some phenomena not associated with thermal effects that could be useful."

Easterly said that, while the military is primarily interested in the use of non-ionizing radiation to disable enemy electronics, his presentation dealt with the possibility of developing measures that would affect people.

Dr. George Baker of the Defense Nuclear Agency in Washington titled his paper "RF Weapons: A Very Attractive Nonlethal Option." But it is difficult to know, based on unclassified information, whether or not this "option" has ever been used. Reports have circulated that the U.S. military has EMP and HPM weapons in its arsenal and that these may have been used during the Gulf War (see *MWN*, M/J92 and S/O92). There were also allegations that non-ionizing radiation was used against the women's peace activist encampment at Greenham Common in the U.K. in the mid-1980s (see *MWN, S/O86*).

The conference, sponsored by Los Alamos National Laboratory in New Mexico, focused on both military and law enforcement applications for nonlethal technologies. Dr. Edward Teller and Attorney General Janet Reno were scheduled as keynote speakers, though Reno was unable to attend and had David Boyd of the National Institute of Justice deliver her talk.

Noting the strong turnout, Los Alamos spokesman Jim Danneskiold said that there will likely be a follow-up conference. (For a report on a 1986 conference on HPM, see *MWN*, J/F87; see also, *MWN*, N/D86.)

Danneskiold also pointed out that Dr. John Alexander, Los Alamos' program manager for nonlethal defense and chairman of the conference, recently presented his ideas to the Council on Foreign Relations in New York City. The group was receptive, he said, and will soon issue a report favoring the development of these technologies.

San Francisco Bans Transmitters on Schools *(continued from p.1)*

clear health basis to proscribe such installations at schools," Neutra wrote in an August 18 letter to Dr. William Lee, director of the city's Bureau of Toxics, Health and Safety. But, he added, "Other than the rental income, why would a responsible public agency go out of its way to expose children to an agent which was not necessary for their education and was not thoroughly studied?" The letter drew sharp criticism from Stephen Carlson, executive director of the Cellular Carriers Association of California (CCAC) in Sacramento.

Smart SMR of California, a Lafayette-based subsidiary of Nextel Communications Inc., had offered to pay $16,800 per year for a lease to put a specialized mobile radio (SMR) transmitter on the roof of George Washington High School in the Richmond section of San Francisco. But at a school board meeting last March, opponents of the project, led by members of a group called the Committee to Investigate Electromagnetic Radiation, objected that the facility would endanger the students. The board delayed action on the proposal, referring the matter to its committee on buildings and grounds. The committee went to city officials for information on the health issues, and the city in turn sought assistance from Neutra, who is acting chief of DHS's environmental health investigations branch in Emeryville.

In his letter, Neutra referred to "some controversial laboratory tests which show changes in normal cell function" after exposure to radiofrequency (RF) radiation that was too weak to heat tissue. And he wrote that, "No one has specifically studied cellular phone exposure in humans." He did not discuss the Smart SMR proposal; rather, he addressed the more general issue of the safety of cellular phone transmitters.

"I find the lack of scientific foundation for the opinions expressed in your letter deeply troubling," CCAC's Carlson responded. In an August 26 letter to Neutra, he asked for a retraction and warned that, "If we have not received such a retraction by Monday, August 30, I will have no recourse but to pursue other avenues to correct the inaccuracies...in your letter."

Neutra did not back down. He responded to Carlson by telephone in September, asking for more information about CCAC's objections, and he sent a formal response on November 24. He appended the letter that Dr. Elizabeth Jacobson of the federal Food and Drug Administration wrote to the Cellular Telecommunications Industry Association (CTIA) last summer (see *MWN*, J/A93), criticizing the organization's "unremittingly upbeat" statements on the safety of cellular phones. Neutra wrote to Carlson that this letter suggested that "not everyone shares your view of the science or that of your consultants." He concluded: "Thus on many of the issues you have raised in your letter, we need to agree to disagree."

After receiving Neutra's response, Carlson was conciliatory. He said he was pleased that Neutra found "no clear health basis" to proscribe the siting of cellular facilities on schools—a statement that was in Neutra's orginal letter to Lee and in his letter to Carlson. Asked if he was satisfied even though Neutra did not make a retraction, Carlson said, "I want to put an end to this back and forth."

While SMR, which operates at 800-950 MHz, is used primarily for two-way radio at present, Nextel and several other companies are building digital systems using these frequencies that will compete directly with existing cellular phone services. The system began operating in Los Angeles last summer and is scheduled to be operational in San Francisco by early 1994.

With the creation of these new networks and the expansion and improvement of existing ones, hundreds of new mobile communications transmitters are being built each year. It is unclear how many face community opposition. CTIA in Washington estimates that in the first half of 1993 the number of sites grew by 12%, to a total of 11,551. In the Bay Area, Nextel is building about 80 new transmitter sites for its digital system, according to John Hayden, Nextel's vice president for marketing.

Carlson said he did not know how many cellular antennas had been sited on schools in California. "There is no clear health basis to proscribe a cellular facility anywhere," he maintained. But he acknowledged that, "from a public affairs and public relations perspective," cellular companies may choose to avoid schools. Indeed, Motorola Inc. of Schaumburg, IL, already has a policy of not siting radio antennas on school property, according to Dr. Quirino Balzano, vice president of the company's land mobile products sector. This policy applies to all two-way radio systems the company installs for its customers, Balzano said.

Smart SMR withdrew its proposal for George Washington High School in July, "because the debate was taking so much time to resolve," Hayden explained. The transmitter would have posed no health risk, Hayden said, but he added that, "You have to respect people's points of view on this."

Even after the Smart SMR proposal was dropped, however, the school board continued to examine the issue. After reviewing Neutra's letter, all members of the buildings and grounds committee agreed that proposals for transmitter facilities should be rejected, according to Yee, who is chairman of the committee. "We have come to the conclusion that it is not good for the kids," he said. Any new proposals would also come before his committee, he added.

Joe Simmons, a property management consultant who works for the schools and who handled the Smart SMR application, confirmed this stance. "We won't approve them," he said. The leases for the four cellular antennas already in place, held by Cellular One and GTE Mobilnet, cannot be broken, Simmons explained, but they will not be renewed. The first of them expires in January, he said.

Opposition Builds to the Siting Cellular Towers on School Property

In dozens of communities across the country, citizens concerned about health hazards are challenging plans for new cellular phone transmission sites, and where they are to be built on or near schools, grass-roots opposition is particularly heated. Here are some examples:

• GTE Mobilnet, a subsidiary of GTE Corp., signed a contract with the Los Gatos (CA) Union School District in January 1992 to erect a 35-foot tower in a utility yard at Fisher Middle School, but local activists opposed the company when it sought approval from the planning commission. The site is adjacent to a play field and about 300 feet from the nearest school buildings, according to Mark Portman, a San Jose attorney who has led the opposition. The city asked for an environmental impact report (EIR), which was prepared by Dr. Jerrold Bushberg of the University of California, Davis, and Dr. Don Justesen of the VA Medical Center in Kansas City, MO, and submitted in May 1993. "There is no scientific basis to contend that harmful effects will result to the environment and public, including schoolchildren, from the installation of the proposed facility," Bushberg and Justesen argued. Cellular transmitters are low-power facilities, they wrote, concluding that emissions from the proposed tower, "even during peak operation, are but a small fraction (approximately 1/200) of the permissible limit." Tower opponents were not satisfied. Though they had agreed to the selection of Bushberg and Justesen originally, Portman said, they learned later that the two had worked for the cellular industry. They "already had a firm opinion on this important issue," Portman wrote in a July 8 letter to the planning commission. Portman, of Westphal, Patrick, DiFranza & Portman, asked Dr. Asher Sheppard, then of the VA Medical Center in Loma Linda, CA, to review the EIR. Sheppard argued that the EIR "misrepresents the situation with respect to chronic exposure," since "almost no research" addresses long-term exposures from low-level sources such as cellular facilities. One study that does bear directly on possible risks from low-level exposures, Sheppard explained, is that done by Dr. Bill Guy and coworkers. They found an excess of primary tumors in rats exposed to weak RF radiation—levels deemed safe by the ANSI C95.1 standard (see *MWN, J/A84, Mr85, N/D86 and J/F93*). "Although the study is, in my opinion, inconclusive on the question of cancer, the questions it raises undermine the basis for the ANSI standard and therefore the position of the Bushberg-Justesen report," Sheppard wrote. In July, the planning commission rejected the EIR and denied the use permit GTE Mobilnet had sought, and in October the town council turned down the company's appeal. Now GTE Mobilnet, which has its West Coast offices in Pleasanton, is suing the town. "We feel that the town did not abide by the California Environmental Quality Act in judging the adequacy of the EIR," explained Peggy O'Laughlin, GTE Mobilnet's attorney. "I think GTE is willing to look at another site for this facility, to satisfy the neighbors and the town," said O'Laughlin, who is with Matteoni, Saxe & Nanda in San Jose. But the planning commission's "arbitrary" rejection of the EIR set a precedent that the cellular industry must challenge, she added. The case was filed November 30 in California Superior Court, Santa Clara County.

• In the small town of Merton, WI, midway between Milwaukee and Madison, opponents of Ameritech's plans for a cellular tower on a high school football field are claiming victory. But the company has not yet given up. Ameritech had offered to build a new press box—reportedly worth about $200,000—in Arrowhead High School's football stadium in exchange for permission to erect a 152-foot cellular tower there. The company had also agreed to annual lease payments. The school board approved the plan, but the Merton planning commission voted 5-1 against it in July, after hearing from Ameritech experts and from community activists, led by Susan McCrone. However, the company still hopes to gain approval for its plan, according to Ameritech spokeswoman Marybeth Johnson. "The school board wants to do it, and it is in a position to go back to the planning commission," said Johnson, who is at the headquarters of Ameritech's cellular division in Hoffman Estates, IL, outside Chicago.

• In Sarasota, FL, opponents of a Cellular One tower to be sited near an elementary school have won the first round. The company still hopes to gain approval, however. In a September 16 letter, the principal of Southside Elementary, John Spielman, called the tower a "wonderful opportunity," noting the proposed lease payments of $14,400 per year and other gifts promised by McCaw Cellular Communications Inc. of Kirkland, WA, which uses the Cellular One name. Opposition built quickly. The proposed tower would have been just a few feet away from a portable classroom and about 100 feet from the main school building, according to Guy Alland, editor of the *Sarasota Eco Report*. In November, Alland and several parents circulated a paper questioning the safety of the facility. Citing a "divisive" atmosphere, Spielman wrote in a November 29 letter that he had canceled an informational meeting scheduled for December 1 and had "ceased negotiating." But McCaw's site acquisition manager, Paul Rozeman, said the school board supports the proposal and the company will pursue it.

• School officials in Moreland Hills, OH, a Cleveland suburb, have also been enthusiastic about siting a cellular tower on school property. The school board voted in November 1990 to approve a request submitted by New Par, which uses the Cellular One name in Ohio and Michigan, for permission to place a transmitter on the grounds of the local elementary school under a long-term lease worth about $600,000. The company, a joint venture of PacTel Corp. and Cellular Communications Inc., also offered more than $50,000 in donations to the school. The proposed tower site was within 100 feet of the school's playground, according to David Goodman, a local businessman who has opposed the tower. The school board sent a letter to parents noting that "cellular communication towers have been placed on the roofs of hospitals, near recreation fields, and in other high-density population areas," but was unable to gain approval. The issue remained unresolved until recently, when the town council passed a nonbinding resolution stating that no application for the siting of a cellular transmitter in Moreland Hills should be considered by the council.

• When plans by a Nynex Mobile Communications Co. subsidiary to site a transmitter in Lincoln Park, NJ, were rejected by the town council, it was the company's second defeat on the same project, according to James Shepard, an attorney who represented the company's opponents. A year earlier, he had worked successfully with residents of nearby Boonton to force the company to withdraw plans for a tower there. But the need for a cell site did not go away, he said, so the company approached Lincoln Park. Here the proposed antenna was to go on a water tower "located smack in the middle of a children's playground" and in the immediate vicinity of an elementary school, Shepard said. The Nynex subsidiary, New York SMSA LP, signed a lease with Lincoln Park in December 1992. But opposition grew while the company sought approvals before the city's Board of Adjustment, and delays there allowed the town a way out. The contract gave either party an option to end the lease if necessary approvals were not received by July 1, 1993. At a meeting in early July, the town council voted unanimously to do just that. Nynex sued the town, but on October 11, Morris County Superior Court Judge Reginald Stanton ruled in favor of the town council. Having failed twice, Nynex "is going to start closing the loopholes" in its contracts, predicted Shepard, who is with the Parsippany firm of Fein, Such, Kahn & Shepard. Fighting these proposals is going to become more difficult, he added.

information from death certificates is a poor surrogate for actual exposure measurements."

Loomis expressed concern over the lack of information on the women's reproductive histories, a potential confounder. "It is likely that these women were not typical," he said. "After all, they were in traditionally male-dominated electrical occupations; they may have had fewer children and had them later—all of which would put them in the high-risk groups."

Nevertheless, the elevated risk seen in this study, and in previous studies on men, is "disturbing," Loomis said. "I think the issue should definitely be pursued." He added that he is looking for an opportunity to collaborate on an ongoing occupational study. Loomis has submitted his paper for publication.

Working with Dr. David Savitz and Cande Ananth, his UNC colleagues, Loomis used the public mortality records from 24 states for the years 1985-1989. Of the 27,882 women who died from breast cancer, 68 worked in electrical occupations. Each case was matched with four controls.

Loomis's presentation prompted a great deal of interest at the DOE meeting in Savannah, GA. Dr. Sam Milham, an epidemiologist formerly at the Washington State Department of Health and now a consultant in Olympia, WA, told *Microwave News* that he had similarly observed more cases of breast cancer among women in electrical occupations in the Washington State occupational data base.

And Dr. Richard Stevens of the Battelle Pacific Northwest Labs in Richland, WA, said, "This should motivate more rigorous exposure assessment of women in the workplace." Stevens is in the midst of a study on the possible association between female breast cancer and exposures to light-at-night and/or EMFs (see *MWN*, N/D91).

Four studies have shown an elevated risk of breast cancer in male electrical workers. In 1989, Dr. Genevieve Matanoski and coworkers at the Johns Hopkins University School of Hygiene and Public Health in Baltimore reported a cluster of breast cancer cases among male telephone technicians (see *MWN*, N/D89 and M/A91). Interestingly, Loomis also found that female telephone workers had a significantly increased mortality due to breast cancer—more than twice the expected rate.

Dr. Paul Demers of the Fred Hutchinson Cancer Research Center in Seattle found a significant sixfold increase in the expected breast cancer rate among male telephone linemen, electricians and electrical power workers (see *MWN*, J/A90). And researchers at the Cancer Registry of Norway in Oslo found that male electrical transport workers, such as railway and tram engineers, had four times the expected rate of breast cancer (see *MWN*, J/F91). In an earlier separate study, Loomis observed a nonsignificant doubling of breast cancer deaths among male electrical workers under the age of 65 (see *MWN*, J/A92).

Dr. Nancy Wertheimer and Ed Leeper were the first to see an EMF–breast cancer connection in their 1982 study of residential EMF exposures of adults (see *MWN*, J/F83 and N/D87). They uncovered a nearly threefold increase among women younger than 55 who lived near high current power lines. "Given that the epidemiological work is piling up, it's time to make a major effort to replicate the German work by Löscher because it seems to supply the first clear animal model showing a power frequency–breast cancer risk," Wertheimer told *Microwave News* in an interview after the Savannah meeting. Dr. Wolfgang Löscher's research team at the School of Veterinary Medicine in Hannover, Germany, found that EMFs could promote the growth of breast tumors in exposed rats (see *MWN*, J/A93).

The EMF link to breast cancer also received a boost when Dr. Robert Liburdy of the Lawrence Berkeley Lab in Berkeley, CA, announced that EMFs can compromise melatonin's ability to control the growth of human breast cancer cells (see *MWN*, J/A92). Indeed, what has become known as the "melatonin hypothesis" may finally provide a mechanism for understanding how EMFs promote cancer (see box on p.5).

Dr. David Blask of the Mary Imogene Bassett Hospital Research Institute in Cooperstown, NY, commented, "The animal, cellular and epidemiological data are all coming together and we have a potential mechanism. It all adds strength to the argument that there may be a breast cancer–EMF link. We need to follow it up."

Congress Orders Long Island Breast Cancer Study

Congress has mandated that the National Institutes of Health study the possible role played by a variety of environmental factors, including EMFs, in breast cancer risks in Nassau and Suffolk counties, New York. "There is still a great need for further research on breast cancer and this is a tremendous opportunity to do it comprehensively," said Dr. Iris Obrams, chief of extramural programs in the Epidemiology and Biostatistics Program at the National Cancer Institute (NCI) and director of the Long Island Breast Cancer Study Project.

NCI and the National Institute of Environmental Health Sciences (NIEHS) will jointly run the study, which will take five years and cost between $10 and $15 million, according to Obrams.

NCI has also awarded $1.25 million to Dr. Lee Caplan of the State University of New York, Stony Brook, to investigate the possible relationship between breast cancer among Long Island women and exposure to EMFs and/or pesticides. Caplan told *Microwave News* that he will examine 250 cases of breast cancer in women who have lived in the same house on Long Island for at least 15 years. "EMFs really have not been studied much in relation to breast cancer," Caplan said, but, "There has been some laboratory work and the biological hypotheses are very plausible." Caplan's four-year effort will begin early next year. Whether the two projects will be integrated has not yet been decided.

The NCI-NIEHS study is a victory for grass-roots activists disappointed by a report issued last year by the federal Centers for Disease Control and Prevention in Atlanta, which stated that the excess of breast cancer in Nassau County, which is 17% higher than in the rest of New York State, could be explained by known risk factors and that further study was not needed (see *MWN*, J/F93).