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INSIDE...

EPA's SAB Panel Seeks To Downplay EMF–Cancer Link

Members of the Environmental Protection Agency (EPA) Science Advisory Board's (SAB) panel on electromagnetic fields (EMFs) plan to recommend a weakening of the agency's finding that EMFs are a "possible, but not proven, cause of cancer in humans" (see *MWN*, N/D90).

The panel, officially known as the SAB's Non-Ionizing Electric and Magnetic Fields Subcommittee, held its second meeting, April 12-13 in San Antonio, TX, to review EPA's draft report, *Evaluation of the Potential Carcinogenicity of Electromagnetic Fields.*

Many panel members argued that the executive summary of the EPA report assumes an increased cancer risk, which is not supported by the rest of the document, and that, in general, the report reveals a bias toward a positive association between EMFs and cancer. Dr. Bary Wilson spoke for many of his colleagues on the panel when he recommended that the report should be made "a lot less inflammatory." Interestingly, the formal classification of the cancer risk, a hotly debated issue when the draft was first released in June 1990, was hardly mentioned (see *MWN*, M/J90).

Some EPA staffers, however, left the meeting believing that the panel's recommendation to include recent studies showing an EMF–cancer link—particularly the one by Dr. John Peters of the University of Southern California in Los Angeles, and several on male breast cancer (see *MWN*, J/A90, J/F91 and M/A91)—would strengthen the report's conclusion of an in-

(continued on p.12)

Congressional Panel OKs EMF Funds, Cautions EPA on Cancer Report

The U.S. House of Representatives' Committee on Science, Space and Technology has authorized $2.2 million for electromagnetic field (EMF) research. In the process, the committee warned Environmental Protection Agency (EPA) Administrator William Reilly that the credibility of the agency's draft assessment of EMF–cancer risks is being threatened by White House "intervention" and by industry-related lobbying.

The committee's Subcommittee on Environment, chaired by Rep. James Scheuer (D-NY), is planning a hearing on EMFs for late July, according to a congressional aide. It was originally scheduled for June 25 but was postponed to allow staff more time for preparation. The agenda has not yet been set. Last year, the Scheuer subcommittee held a hearing on EMF funding legislation (see *MWN*, J/A90).

On May 22, the committee approved without significant opposition an amendment by Rep. George Brown (D-CA), the committee chairman, giving

(continued on p.14)

« Power Line Talk »

The number of cancer clusters anecdotally linked to EMFs continues to grow (see *MWN*, S/O90), with three new clusters reported in California and one in Pennsylvania. In **Fresno, CA**, school officials have agreed to close part of an elementary school within 110 feet of a 230 kV power line. "Even though we don't have conclusive evidence, we are going to move ahead," the school district administrator told *The Fresno Bee* (May 15). The decision came after teachers and parents protested, charging that ten teachers and aides who worked in the ten classrooms closest to the line developed cancer—two have died—during the past decade. In **Garden Grove, CA**, 11 of 65 Pacific Bell employees who worked in a basement office developed cancer, while there were no cases among the 75 workers on the next floor. The basement office is adjacent to a room in which electricity brought into the building is converted to run telephone systems (see also letter from Richard Tell on p.12). VDTs are also used in the basement. "I do believe these [EMFs] could very possibly have something to do with it," one worker told the Associated Press's (AP) Lee Siegel, who reported on the cluster in a three-part, widely-syndicated story starting on May 5. Pacific Bell officials told Siegel that they never thought to measure EMFs from the power room or from the VDTs. A union official has suggested several possible causes of the cluster, including automobile emissions from waiting cars lined up near a basement office window. In **San Jose, CA**, county health officials are planning to study five cancer cases—four of which have been fatal—in an office building near a power line, according to an AP report appearing in *The Los Angeles Times* (May 23). Previous investigations addressed the building's air and water quality. In **Scranton, PA**, residents suspect that four cases of cancer and fives cases of Hodgkin's disease within one neighborhood were caused by a nearby 69 kV power line. "It's very frightening and there's too much for it to be a coincidence," the mother of a 10-year-old with lymphoma told the *Sunday Independent* (January 13) of neighboring Wilkes-Barre, PA. At the residents' urging, U.S. Senator Arlen Specter (R-PA) has asked the Centers for Disease Control to investigate. Pennsylvania Power & Light, which owns the line, has agreed to work with local residents on a panel to consider how to resolve the controversy. Scranton Mayor Jim Connors brought the local concern to a national audience when he testified in January before EPA's Science Advisory Board panel evaluating the agency's EMF report (see *MWN*, J/F91 and p.1).

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Rumors that the **National Cancer Institute** (NCI) has banned its scientists from appearing as expert witnesses on EMFs have been confirmed (see *MWN*, J/F91). Dr. **Elliott Stonehill**, NCI's chief ethics officer, told *Microwave News* that the NCI now has a policy of denying requests from staff members to testify in EMF cases. In 1988, three NCI scientists—Drs. Stuart Aaronson, Lucius Sinks and Margaret Tucker—violated NCI limits on outside income by testifying for the New York Power Authority and were later reprimanded (see *MWN*, S/O88, N/D88, J/F89, S/O89 and J/F91). "We misjudged the political sensitivity of the situation," Stonehill said. In an interview with *The Scientist* (May 27), Stonehill said that, "At the time, we thought we knew what the scientific evidence said about the issue. But it later became clear that we didn't know the answers."

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Two new EMF mitigation research projects are under way. **Power Technologies**, Inc. (PTI), of Schenectady, NY, submitted the winning proposal to the **Florida Department of Environmental Regulation** (DER). The one-year contract is not yet final, but sources say it is likely to be for several hundred thousand dollars. According to Dr. Kenneth Klein of Energetics in Columbia, MD, who is managing the project for the DER, PTI will review current and proposed mitigation line designs—looking at both overhead and underground options—and evaluate their effectiveness in Florida's environment of high salt spray and frequent lightning. (Klein used to run the DOE's EMF program.) PTI will recommend two mitigation designs each for 230 kV and 500 kV lines. Funding for the study will come out of $1 million provided by the **Florida Electric Power Coordinating Group**, a utility lobbying association. PTI is an employee-owned company formed more than a decade ago by former GE workers. On a much smaller scale, on March 11, **EPA** hired **ICF**, Inc., a Fairfax, VA, consulting firm, to assess which consumer product manufacturers are taking steps to reduce EMFs. So far, only VDT makers and electric blanket companies are changing their products because of perceived consumer concerns about EMFs, reports an EPA staffer who declined to be identified. The limited findings have led EPA officials to question whether the informal survey should continue, he said. At most, EPA expects to spend about $25,000 on the effort....On September 10, **Washington state's** EMF task force will hold a one-day **symposium** in Seattle to address EMF mitigation techniques. The meeting is free and open to the public. By January 1992, the task force, as required under state law, must recommend to the legislature ways to reduce human exposures to EMFs (see *MWN*, M/J90). For more information, contact Patti Waller at (206) 586-7663.

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Congressional clout rests in committee chairmanships, and two new chairmen have EMFs on their agendas. Rep. **George Brown** (D-CA), who is now running the House Science, Space and Technology Committee, has shown a continuing interest in EMF health effects and recently sponsored an amendment allocating $2.2 million for EMF research. Brown's staff report-

edly has met with other members of the committee interested in EMFs, including Rep. **James Scheuer** (D-NY), whose Subcommittee on Environment is planning a hearing on EMFs for late July (see p.1). The resignation of Rep. **Morris Udall** (D-AZ) has put Rep. **George Miller** (D-CA) in charge of the House Interior and Insular Affairs Committee. In 1987, Miller held a hearing on the health effects of power lines, promising that, "We are not going to let the issue die" (see *MWN*, N/D87). Miller had scheduled a hearing for mid-January to investigate charges that the White House had interfered with the release of EPA's draft review report on EMFs and cancer (see *MWN*, N/D90 and J/F91); it was canceled because of the start of the Persian Gulf war. A Miller aide told *Microwave News* that EMFs "are on our agenda. It's an issue that we will continue to look into." Among the Interior Committee's members are Rep. **Peter Kostmayer** (D-PA), who held a hearing on EMF research last spring (see *MWN*, M/A90). What all this adds up to is a growing likelihood that EMFs will attract unprecedented attention in the 102nd Congress.

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With the Cambridge, MA-based **Health Effects Institute** (HEI) emerging as the leading candidate to coordinate a major public–private EMF research program (see *MWN*, M/A91), the institute is drawing scrutiny from all sides. Some who argue that federal funds should be kept separate from industry support are circulating an article that is critical of the HEI's public–private program on asbestos, Health Effects Institute-Asbestos Research (HEI-AR). In "The HEI-AR: Who is Affecting Whom?" (*Asbestos Issues*, January 1991), attorney **Edward Westbrook** of the Charleston, SC, law firm of Ness, Motley, Loadholt, Richardson & Poole questions the project's closed-door operations, the use of paid asbestos industry witnesses on HEI-AR's scientific review panel and the project's "resistance to any criticism, even constructive criticism." Westbrook concludes that HEI-AR should face congressional scrutiny if it refuses to change its ways. Dr. **Andrew Sivak**, HEI's executive director, shrugs off the charges. "I am confident that when the HEI-AR report is released, the unbiased nature of the panel and the fair and balanced content of the report will be apparent," he told *Microwave News*. On another front, a New Jersey EMF activist is starting a letter-writing campaign "to legislatures throughout the U.S. to stop [the HEI] from becoming a middleman in the EMF arena." In a letter to fellow activists, **Eileen Kotter** of the Center for Public Information on Electromagnetic Radiation in East Brunswick, NJ, wrote that, "Allocating DOE and EPA EMF research monies to an organization with no previous experience in this area has many people wondering who staged this event."

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The **HEI** will hold the first meeting of its feasibility study group June 11-12 at the Bostonian Hotel in Boston, MA. In early May, Dr. **Richard Setlow** of the Brookhaven National Labs in Upton, NY, agreed to serve as chairman of the project's feasibility study committee. Setlow is best known for his work on ionizing radiation, though he previously chaired a National Academy of Sciences–National Research Council panel on ELF effects (see *MWN*, M/A89). The other committee members are: NCI's Peter Blumberg; Charles Ehret of General Chronobionics, Inc.; Theodore Litovitz of the Catholic University; Martin Misakian of the NIST; William Moloney of Boston's Brigham & Women's Hospital; Richard Nuccitelli of the University of California, Davis; Russel Reiter of the University of Texas Health Science Center, San Antonio; Jeffrey Saffer of the Jackson Laboratory; David Savitz of the University of North Carolina, Chapel Hill; Asher Sheppard of the VA Hospital in Loma Linda, CA; Thomas Tenforde of Battelle Lab; and James Weaver of MIT. The HEI has also set up an Observers' Study Committee, which includes representatives from the CDC, DOE, EPA, EPRI, FDA's CDRH, NCI, NIEHS, NIOSH, Southwest Research Institute and the House of Representatives' Subcommittee on Environment. According to HEI's Sivak, a draft research plan should be completed by November. The HEI has closed the meeting to the press because, according to Sivak, participants should have a "candid, open discussion." Sivak also said that the institute still has not received funding from EPA, though he is confident that it will come through any day.

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The **FDA's CDRH** has set up a working group to coordinate the agency's work on ELF fields. According to the center's Dr. **Alan Anderson**, five different offices at the CDRH handle at least one aspect of ELF EMFs and the working group will "ensure coordination." Another CDRH staffer participating in the working group noted that its formation is an indication that the center is paying "a little more attention" to EMFs.

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Residents of **Beckton**, in east London, **U.K.**, are campaigning to remove a 400 kV overhead power line which they believe has caused increased rates of cancer and a case of mild epilepsy, as well as headaches, depression and lethargy. There is "a buildup of tension and fear" around EMF effects, the Beckton Residents Association's chairman, Gordon Marcham, told *The Independent*, a daily newspaper. He added, "Nobody will buy your house." **National Grid**, the British electricity distribution company, estimates that it would cost as much as £60 million ($102 million) to bury the line. The company insists that the link between EMFs and ill health is unfounded. But **Powerwatch**, a British watchdog group, calculates that EMF exposure from the power line is almost 150 times greater than the threshold level at which health is affected, based on epidemiological studies. Concern in England over the health effects of EMFs made headlines a year ago, when Great Yarmouth, a city on the coast of East Anglia, rejected a proposed overhead transmission line (see *MWN*, J/A90).

NIH Seeks Proposals for EMF Research

Citing widespread public exposures to extremely low frequency (ELF) electromagnetic fields (EMFs) and growing concerns about their possible hazards, the National Institutes of Health (NIH) is soliciting proposals for research on ELF EMF bioeffects. The request was issued "to encourage and foster investigator-initiated basic and applied research on the possible health effects of EMFs" from power lines and appliances, according to the program announcement.

The National Institute of Environmental Health Sciences (NIEHS), the National Institute of Neurological Disorders and Stroke (NINDS) and the National Institute of Child Health and Human Development (NICHD) published a joint request for EMF proposals from individual researchers (R01) and from young investigators (R29) in the May 17 *NIH Guide*.

"We are trying to solicit the scientific community to become more involved in this area," NIEHS's Dr. Michael Galvin told *Microwave News*. He stressed that, even though NIEHS closed down its internal research effort a few years ago, the institute is "very interested in receiving applications" (see *MWN*, J/A87).

Galvin's call for proposals was echoed by NINDS's Dr. Eugene Streicher. "There is a feeling that NIH is not sympathetic to EMF proposals, but that is not necessarily so. We are genuinely interested," he said in a telephone interview. However, Streicher noted that there is no money earmarked for EMF research and that applicants will have to compete with all those submitting proposals for all other research areas. He attributed the impetus for the NIH initiative to congressional interest.

"It's a good sign, but it would be even better if NIH set aside a pot of money exclusively for EMF research," Dr. George Harrison of the University of Maryland School of Medicine in Baltimore told *Microwave News*.

Some researchers are expressing concern that most of the review panels do not have expertise in EMFs and therefore may not be in a position to judge proposals adequately.

Nevertheless, there already are signs that the climate for EMF research at NIH is changing. NIEHS recently awarded a five-year, nearly $2 million grant to Drs. Ann Henderson of Hunter College and Reba Goodman of Columbia University, both in New York City, for a study titled, "Does Exposure of Human Cells to EMFs Cause Cancer?"

In addition, Dr. Stephen Cleary of Virginia Commonwealth University in Richmond has received an $834,000, four-year grant from NIEHS to study "Radiofrequency (RF) Radiation Cellular Mechanisms." Cleary told *Microwave News* that he will use the money "to determine the mechanism of RF-induced cell proliferation" (see *MWN*, M/A90).

In its May 17 announcement (PA-91-53), NIH called for basic research proposals which are designed to:

A. Determine the effects/mechanisms of action of EMFs on cellular responses such as DNA synthesis, modulation of ion binding and interaction with hormones and growth factors.
B. Determine the effects on cancer processes in vivo and in vitro.
C. Determine the effects of EMFs on reproductive/developmental and nervous systems in vivo and in vitro.
D. [Develop] well-characterized EMF exposure systems for assessing biological effects.

When asked to compare the NIH program to that of the Electric Power Research Institute and the one being developed by the Health Effects Institute, Galvin said that the NIH program will have a "broader focus," adding that, "We are going to let the scientific community determine the areas we address."

In late 1988, the National Cancer Institute (NCI) announced that it would sponsor an epidemiological study of the possible link between childhood cancer and EMFs (see *MWN*, J/F89). At that time, a number of NCI scientists dismissed EMF health risks as paid witnesses, later prompting NCI ethics officials to bar NCI staff from consulting on EMF issues (see p.2).

Last year, the National Toxicology Program, in which NIEHS is a participant, announced plans for a $6-10 million program for animal studies on the reproductive, developmental and carcinogenic effects of ELF EMFs (see *MWN*, S/O90).

Inquiries should be directed to: Dr. Michael Galvin, Program Administrator, Scientific Programs Branch, NIEHS, PO Box 12233, Research Triangle Park, NC 27709, (919) 541-7825; Dr. Eugene Streicher or Dr. Watson Alberts, Division of Fundamental Neurosciences, NINDS, Federal Building, Room 916, Bethesda, MD 20892, (301) 496-5745; and Dr. Felix de la Cruz, Chief, Mental Retardation and Developmental Disabilities Branch, NICHD, EPN, 631, Bethesda, MD 20892, (301) 496-1383.

Three States Consider Power Line Moratoriums

State legislators in Michigan, Rhode Island and Tennessee have introduced bills to ban power line construction temporarily. The proposed moratoriums are part of a flood of state and local actions to regulate EMF exposures (see opposite page).

The Rhode Island Senate and House of Representatives are expected to vote on moratorium legislation before the current session ends in June, while the Michigan and Tennessee proposals will probably not move out of committee, sources say.

Rhode Island Bills out of Committee

The Rhode Island legislation, introduced by Senator Michael Lenihan and Rep. Steve Hernandez, both Democrats, would impose a three-year ban on new power lines above 60 kV, to allow time for research efforts "to establish whether exposures to [EMFs] caused by electrical utility generating and transmission facilities present a risk to the health, safety and welfare of the citizens of Rhode Island." The legislation has been passed by the Senate and House Health, Education and Welfare Committees and is awaiting further action. "The fact that the evidence is inconclusive is enough to warrant a moratorium," Hernandez told *Microwave News*.

The Narragansett Electric Company, which will be forced

Other State and Local EMF Actions

Cities and states across the nation are moving to study, regulate and mitigate electromagnetic fields (EMFs), creating a flood of state and local legislation. At the same time, utility regulators are responding variously, funding research and requiring changes in transmission line designs, among other moves. Mohammad Harunuzzaman of the National Regulatory Research Institute (NRRI), writing in the *NRRI Quarterly Bulletin (12*, pp.47-56, March 1991), concludes that, "The public concern over health risks due to EMFs continues to grow and is likely to become one of the important environmental/public health issues of the nineties." Described below are a number of recent actions taken in response to the growing public concern over EMFs. (See also *MWN*, M/J89 and p.4.)

California...Senator Herschel Rosenthal's SB 920, introduced March 8, would require the Public Utilities Commission (PUC) to conduct a $4 million research and education program on EMF health effects, with up to $200,000 coming from the state and the balance to be paid by utilities. The research would determine whether EMF-exposed workers or children attending schools close to high voltage power lines are at risk. The bill would also direct state-owned utilities to develop mitigation techniques and programs to respond to customer EMF inquiries. The Senate Energy and Utilities Committee amended and approved the bill by a vote of 6-0 on April 23.

Colorado...On March 12, the Public Service Company (PSC) of Colorado announced that it will fund a $55,000 literature review on EMF health effects. Five experts from the University of Colorado, Colorado State University and the University of Denver will direct the independent analysis, according to PSC spokesman Mark Stutz.

Connecticut...Senate Majority Leader Cornelius O'Leary is sponsoring SB 633, which, as amended, would require public utilities to contribute $150,000 to an existing EMF task force for a literature review to set state EMF research priorities and to hire experts to develop a policy of prudent avoidance. The bill was reported out of committee and will now be considered by the full Senate.

Illinois...On April 12, Senator Arthur Berman introduced the Safe Power Transmission Act, SB 1436, which would require utilities to relocate any high voltage transmission line that is within 500 feet of an elementary or secondary school and which would set a 2 mG power line EMF limit for residential property. No action is expected this legislative session, according to a spokesman for Berman....On February 5, the town of Wilmette passed an ordinance limiting EMFs from a new Chicago Transit Authority substation to 2 mG at the edge of the property.

Maine...On February 20, Rep. Conrad Heeschan introduced LD 703, which would require EMF warning signs on all pad-mounted transformers and utility substations. The bill would also require the Department of Health and Human Services to survey ELF exposures in and around elementary schools and to report back to the legislature by March 1, 1992. The bill was approved by the House but has run into opposition in the Senate, according to a legislative aide.

Massachusetts...On March 25, six members of the House of Representatives announced the formation of the Legislative Task Force on Electromagnetic Radiation Hazards to study EMFs and to consider legislative initiatives....Several bills pertaining to EMFs were introduced into the legislature: Rep. Barbara Gardner's H 4331 would direct the Energy Facilities Siting Council to investigate EMF health effects, mitigation techniques and possible siting guidelines with up to $2 million from public utilities. Rep. Robert Koczera and Senator Robert Durand's H 2629 would "enhance public participation in energy planning decisions." Rep. Lida Harkins's H 3528 would empower the commissioner of the Department of Labor and Industry to establish video display terminal (VDT) EMF standards and would require employers of more than 25 people to offer pregnant women alternative work.

Missouri...On January 15, citing fears of EMF health effects on people and animals, the Linn Creek Board of Aldermen passed an ordinance prohibiting the construction of any 161 kV transmission lines, thereby blocking the construction of a 3.2-mile line, 700 feet of which would have passed through the town.

Oregon...Senator Grattan Kerans's SB 861 would require utilities to consider mitigation techniques when building high voltage power lines and would direct the Energy Facility Siting Council to set up a committee to monitor EMF research. The bill has been approved unanimously by the Senate. A companion bill, HB 3282, was proposed by Reps. Bill Dwyer and Lisa Naito. Naito also introduced HB 3363, which would require that the results of any study of EMF health effects by a state-funded organization be reported to the legislature. Rep. Thomas Mason's HB 3227 would require the Department of Human Resources to study the effects of EMFs from, among other sources, television, radio, cellular, microwave and satellite communications transmitters.

Washington...Six bills addressing concerns over power line siting and EMF health effects were introduced during the legislative session, which ended in April. Rep. Bill Grant's HB 1613 would have given jurisdiction over power line siting to the Energy Facility Site Evaluation Council. It also may have annulled the power line siting initiative approved by Whatcom County voters in November (see *MWN*, N/D90). Rep. Bruce Holland's HB 1547 would have prohibited increases in EMF levels from new or upgraded lines. Both bills, along with SB 5877, SB 5680, SB 5714 and HB 1198—all addressing EMFs—died in committee. Meanwhile, House Joint Memorial 4007, urging the President of the United States and the U.S. Congress to provide "additional funding to...resolve the growing concern about possible health effects from [EMFs]," was passed....In February, the Bonneville Power Administration (BPA) placed a two-year moratorium on approving new uses for transmission line right-of-ways (ROWs)—e.g., for playgrounds. In a press release, the BPA explained that, "The change is being made due to the controversy over whether exposure to EMFs from the operation of high voltage electrical equipment is a health hazard."

Pennsylvania PUC Ordered To Hold Hearing on 230 kV Line

Pennsylvania's top court has ordered the state's Public Utilities Commission (PUC) to hold a hearing within 90 days to consider the possible electromagnetic field (EMF) health effects of a 230 kV high voltage line that the PUC approved in February 1990.

On May 24, Judge Madaline Palladino ruled that the PUC should have considered the Philadelphia Electric Company's (PECO) application for the 12.8-mile Heaton–Woodbourne line as a request for a new use of an existing right-of-way (ROW) and not as an upgrade, as PECO had sought. Until 1986, Conrail operated a 138 kV line on the ROW to power its trains, according to a PECO spokesman. The utility began construction on the Heaton–Woodbourne line in the summer of 1990 and expects to complete work by this fall.

The PUC's review procedures for new lines are more thorough, and the siting requirements are more stringent, including a wider ROW. The Heaton–Woodbourne line, which would cross parts of Bucks and Montgomery Counties, north of Philadelphia, will have an ROW as narrow as 60 feet in some areas.

Parents Against an Unsafe Environment (PAUSE), the citizens' group that challenged the PUC's actions, wants the PUC to consider possible EMF health effects on people living near the ROW. Earlier this year, the PUC rejected, by a 3-2 vote, PAUSE's petition to reconsider its February 1990 decision and to hold a public hearing. In its ruling, the PUC majority concluded that the scientific evidence on EMFs is inconclusive and did not justify reopening the Heaton–Woodbourne docket. In May, the PUC rejected an appeal by PAUSE.

The PUC and PECO have not yet decided whether to appeal Judge Palladino's ruling.

to postpone plans for a new 115 kV line if the moratorium is adopted, "firmly believes that transmission lines are not a public health problem," according to Robert McCabe, the company president. "The legislation is an overreaction," he said in an April 9 letter to members of the Senate.

The moratorium, proposed in identical bills in the House and the Senate, is modeled after an East Greenwich, RI, town ordinance that was enacted in November (see *MWN*, N/D90 and J/F91). Following East Greenwich's lead, power line bans have been enacted in the towns of Coventry and Foster, and are being considered by the West Warwick and North Kingstown town councils. Rhode Island Superior Court Judge Patricia Hurst recently nullified the East Greenwich ordinance, ruling that the town council lacked jurisdiction over power line siting. Though the decision will be appealed to the state Supreme Court, the issue will be "moot" if the proposed statewide moratorium becomes law, Amato DeLuca, the town's attorney and the author of the ordinance, told *Microwave News*.

Michigan Ponders Study Committee

In Michigan, Republican Rep. Glenn Oxender has proposed a two-year ban on construction of power lines of 100 kV or more. The bill would prevent the construction of a $105 million, 115-mile, 345 kV transmission line from Battle Creek, MI, to Akron, IN, sought by the Consumers Power Company. "The government needs to get involved with this issue because people cannot handle it themselves," Oxender told *Microwave News*. While it is unlikely that the moratorium will be enacted this year, the state legislature will probably pass a resolution to set up a joint House–Senate committee to study power line EMF health effects and to issue recommendations to the legislature by December 31, 1992, according to Oxender.

At least eight towns and counties along the proposed Consumers Power line route have passed resolutions opposing the project, and Residents Against Giant Energy (RAGE) have asked the Federal Energy Regulatory Commission (FERC) to block the line, citing "dozens of scientific studies indicating that the emissions from high tension power lines...may be harmful to humans and livestock." Two U.S. congressmen from the state, Democrat Howard Wolpe and Republican Fred Upton, have voiced support for RAGE in letters to FERC.

Tennessee Town Sets 4 mG Limit

Companion bills, proposed by Tennessee Senator Keith Jordan and Reps. Beth Halteman and Clint Callicott, all Republicans, would ban the construction of high voltage power lines within one-half mile of any occupied dwelling or proposed subdivision. The bills would also require the state Department of Health and Environment to review EMF health effects data, conduct studies, if necessary, and report back to the Assembly by January 1, 1995. The bills were referred to a study committee and will probably not be passed this year.

On April 8, the town council of Brentwood, TN, passed the strictest power line EMF limit in the nation, prohibiting EMF "spillage" from power lines of 120 kV or greater from exceeding 4 mG at the edge of a right-of-way (ROW). The action came in response to Tennessee Valley Authority (TVA) plans to construct a 161 kV line alongside an existing 161 kV line that runs through the town.

The 4 mG limit was based on TVA estimates of EMF levels at the edge of the ROW if the new line were to be erected on the same set of poles as the existing line, Brentwood Mayor Joe Sweeney told *Microwave News*. The TVA, however, will continue with its plan to erect a new set of poles for the line, which it hopes will be operational by July, TVA spokesman Frank Cason said in a telephone interview.

"We'll have to wait and see what happens once the line is energized," Cason said when asked if the TVA will challenge the ordinance, adding that, "A lot of people down here think that it's unenforceable." New York State has an interim 200 mG edge-of-ROW magnetic field limit, while Florida has a 150-250 mG limit (see *MWN*, J/A90 and p.7).

Power Line EMFs Scrutinized in Australia

In Australia, two new surveys of electromagnetic field (EMF) health effects data have fueled controversies over power line siting and EMF exposures.

A research review commissioned by the New South Wales (NSW) government concluded that no firm EMF–cancer link has been established but advised caution with regard to public exposures, while a meta-analysis sponsored by the Victoria Health Department linked power frequency fields to a statistically significant increased risk of childhood cancer.

In February, former High Court Chief Justice Sir Harry Gibbs, director of the NSW *Inquiry into Community Needs and High Voltage Transmission Line Development*, released the survey results, concluding that, "It has not been established that electric fields or magnetic fields of power frequency are harmful to human health, but since there is some evidence that they may do harm, a policy of prudent avoidance is recommended." Gibbs also advocated "actively involv[ing] the community" in power line siting decisions.

In the course of his investigation, Gibbs contacted academics and community activists throughout Australia, reviewed a broad sampling of published studies and met with utility representatives and EMF researchers in Canada, Japan, the U.K. and the U.S. Though the investigation was originally intended to cover "the range of community concerns" about high voltage transmission lines, the 163-page report focuses principally on the EMF issue—of the 177 submissions considered by the investigators, 122 addressed EMF health effects.

The Victoria meta-analysis, released in December, identified a statistically significant doubling of the risk of cancer among children exposed to high levels of 50-60 Hz fields. The analysts, Ian Gordon, Milena Motika and Dr. Terry Nolan, were unable to arrive at any conclusions on residential or occupational EMF exposure and cancer in adults (see p.8).

Following the release of the meta-analysis, Maureen Lyster, Victoria's health minister, announced the formation of an independent panel to advise the government on power line EMF health risks. "This is an area in which much work is yet to be done before any conclusions can be drawn," Lyster said, adding that, "It is an issue that must be seen globally, not just locally."

Panel chairman Hedley Peach of Melbourne University, W.J. Bonwick of Monash University in Clayton and Roslyn Scanlan, a community health worker, will review relevant data both from Australia and overseas, consult with scientists and meet with local action groups and community organizations before issuing recommendations in late 1992. The group will also compile a pool of educational material and strive to promote a better public understanding of EMFs and possible health risks.

A spokesman for the State Electricity Commission of Victoria (SECV) denied a public health risk, stating that, "From our understanding, there is no association between exposure to magnetic fields and any health effects at any level," according to *The Age* (January 29), a Melbourne daily. On February 3, Melbourne's *Sunday Herald* reported that, after meeting with trade unions, the SECV softened its stance and was launching an investigation into the potential EMF health risks faced by its 18,000 workers.

The EMF health debate is not new in Australia. In 1989 Dr. Ken Joyner of Telecom Australia Research Laboratories in Clayton, Victoria, called for further research into the issue and recommended that "no group in the community should be exposed to environmental levels of ELF magnetic fields significantly in excess of those already experienced by other groups in the community." Also in 1989, Dr. Vincent Delpizzo of the Australian Radiation Laboratory in Yallambie, Victoria, published a critical review of literature on the subject, concluding that further investigation was warranted (see *MWN*, M/J89 and S/O89).

A number of Australian communities have organized against transmission lines. According to *The Advertiser* (June 2, 1990) of Adelaide, NSW, one public protest in West Australia resulted in a violent confrontation between demonstrators and police. Part of a transmission line scheduled to run from Brunswick to Richmond, in Victoria, was buried following a storm of community objections (see *MWN*, J/A86, S/O86 and J/F87).

Florida To Revisit ROW EMF Limits

The Florida Department of Environmental Regulation (DER) will reevaluate, but not necessarily revise, the state's electromagnetic field (EMF) exposure limits for new power lines as part of an agreement reached on March 25 with Hillsborough County. The limits, which were the first state right-of-way (ROW) levels ever adopted in the U.S., set maximum magnetic field exposure levels of 150-250 mG at the edge of ROWs.

In exchange, the county has withdrawn the legal challenge it initiated when the limits were issued in 1989 (see *MWN*, M/A89). In a December 1989 suit, county lawyers stated that the levels were "approximately 100 times greater than the intensity of magnetic fields, which are suspected to increase the incidence of all childhood cancer by 30 percent and to double the risk of contracting childhood leukemia" (see *MWN*, J/F90).

The reevaluation would, however, have occurred anyway under Florida law, leading an attorney for the department to call the agreement "a little less than a quid pro quo."

Buck Oven of the DER told *Microwave News* that the department will lower the exposure levels if it changes the limits at all. The DER's review will be closely watched by other states and localities that are weighing possible ROW limits (see pp.4-6). New York is the only other state with an ROW limit—an interim standard of 200 mG (see *MWN*, S/O90).

"I expect the DER's decision making will be rational, as it has been in the past," Carlos Alvarez said in a telephone interview. Alvarez, who works for the Tallahassee law firm of Hopping, Boyd, Green & Sams, is representing the Florida Electric Coordinating Group (FCG), a power utility lobby, in the Hills-

Annual DOE EMF Review

The Department of Energy's (DOE) annual review of research on the bioeffects of extremely low frequency (ELF) electromagnetic fields (EMFs) will be held November 3–7 in Milwaukee, WI. The meeting will be cosponsored again this year by the American Public Power Association and the Edison Electric Institute.

Objectives of the meeting are to review current research, identify areas requiring further study and encourage international coordination of research programs. As in the past, the meeting will be open to the public and there will be no registration fee. For further information, contact: W/L Associates, 120 West Church St., Frederick, MD 21701, (301) 663-1915.

borough case.

The attorney for Hillsborough County, Michael Skelton of the Tampa firm of de la Parte and Gilbert, declined to say whether he expects the limits to be lowered. However, he told *Microwave News* that, "There is a much more open mind at DER" than in the past.

Nancy Flemming, chairwoman of Concerned Citizens for Power Line Safety, which is based in Tampa (in Hillsborough County), said in a telephone interview that she is "encouraged because the DER is willing to work with us on this issue. We would rather work something out without litigation." But, she added, "If the DER does not come up with adequate safety standards, we will encourage the county to go back to court." Asked to define "adequate," she suggested a limit of 1.5 mG at the edge of ROWs.

The March 25 agreement is sealed and confidential, but a copy was obtained by *Microwave News*. It states that all of the parties agreed that their resources "would be more productively expended" in reviewing the DER rule than in litigation.

The department must complete its review by June 1, 1992, at which time Hillsborough County can reinstate its legal challenge if it is not satisfied with the outcome. Oven said the department will recommend a work plan to the state Environmental Regulation Commission in July. In addition to the DER and Hillsborough County, the agreement was signed by the Florida Power Corp. (FPC) and the FCG.

The DER's 1989 limits for new lines are 150 mG for lines carrying up to 230 kV, 200 mG for most 500 kV lines and 250 mG for certain double-circuit 500 kV lines, all applied at the edges of ROWs. For electric fields, there is a 2 kV/m limit at the edges of the ROWs at all three line loads and 8, 10 and 10 kV/m limits, respectively, for the three types of lines, *on* the ROWs.

There are separate limits for the 500 kV Lake Tarpon–Kathleen transmission line, part of which runs through Hillsborough County, as a result of negotiations between the state Siting Board and the FPC: daily maximums of 35 mG and 24 mG under normal load conditions where the ROWs are 100 feet and 190 feet, respectively. Levels as high as 229 mG at 100 feet and 154 mG at 190 feet are permitted for up to 15 hours per year.

The levels are controversial, partly because they are significantly higher than limits the DER had proposed a year earlier. In June 1988, the DER recommended daily *average* and *maximum* magnetic field levels of 50 mG and 100 mG, respectively (see *MWN*, M/J88). At the time of the release of the final standards, DER officials explained that the limits were based on engineering—not health—factors (see *MWN*, M/A89).

The 1989 limits resulted from a 1983 law directing the DER to develop public safety requirements for transmission lines following several siting disputes (see *MWN*, J/A83). In 1986, the Siting Board refused to approve the Lake Tarpon–Kathleen line, in part because the DER had not yet adopted EMF limits (see *MWN*, M/A86). That decision was overturned on appeal (see *MWN*, N/D87).

Hillsborough County first filed suit challenging the state limits in March 1989—charging that the levels were "not protective of public health" (see *MWN*, M/A89)—but temporarily withdrew the suit soon after. The suit was reinstated in December 1989. In mid-1990, the county sought and won a postponement of the scheduled administrative hearing to April 1, 1991.

Meta-Analyses Point to EMF–Health Effects Link

Dozens of individual studies point to an electromagnetic field (EMF) health risk, but others do not. Now, five teams of researchers have combined the data from similarly designed studies and have found that these meta-analyses do support a link between EMFs and adverse health effects.

An Australian meta-analysis of epidemiological studies, commissioned by the Victoria Health Department and directed by Dr. Terry Nolan of the Royal Children's Hospital in Melbourne and statisticians Ian Gordon and Milena Motika, both of Melbourne University, found that children exposed to fields as low as 3 mG were more than twice as likely as controls to develop cancer—a statistically significant increase. The researchers, who released a series of analyses in December, could not come to any conclusions for adult residential or occupational EMF exposures (see also p.7).

In a similiar effort, Edward Washburn and researchers at the Harvard School of Public Health in Boston, MA, along with colleagues from the Mount Sinai School of Medicine in New York City and from the University of Pennsylvania in Philadelphia, found that living near power lines was linked to higher risks of all the types of cancer that they examined, according to science writers Barbara Culliton and Robert Pool in the February 21 issue of *Nature*. The association was statistically significant in two cases—a doubling of the risk of central nervous system cancer and a 50% increase in the risk of lymphoma. The researchers also found increased risks for leukemia, childhood leukemia and childhood lymphoma. Washburn presented preliminary results on February 15 at the annual meeting of the American Association for the Advancement of Science (AAAS), in Washington, DC.

Dr. George Hutchison, retired from the Harvard School of

Public Health and now based in Louisville, KY, presented his own meta-analysis at the February Electric Power Research Institute (EPRI) epidemiology workshop in Carmel, CA. He concluded that evidence for a causal association between EMF exposure and cancer is generally weak (see p.13). Hutchison found a statistically significant EMF–cancer link in nearly every group he analyzed—including an overall 33% increased risk of leukemia for children with residential exposures and a 24% increased risk of central nervous system and brain cancers for adults with occupational exposures. Nevertheless, Hutchison downplayed these results, singling out a 144% increase in the risk of central nervous system cancer among children with residential EMF exposures as the only result which "points to a possible association." Hutchison's paper will appear in the proceedings of the Carmel workshop to be published by EPRI.

In a meta-analysis of laboratory studies, Dr. Kay Kimball "found some statistically significant changes in blood chemistry for small animals exposed to [extremely low frequency] ELF fields," she said in a telephone interview from her office at the Baylor College of Medicine in Houston, TX. Kimball, who also presented preliminary results of her work at the February AAAS meeting, combined data from 40 different experiments by six researchers. Of the seven effects she examined, she observed a statistically significant association between electric field exposure and decreases in total blood protein, as well as a "borderline" statistically significant association with eusenophil decreases.

Dr. Andrew Marino of the Louisiana State University Medical Center in Shreveport combined data from eight different multi-generational experiments conducted in the last 15 years and found that mice exposed to power frequency electric fields had a 30% chance of altered development. In a paper recently published in the *Journal of Bioelectricity* (*9*, pp.213-231, 1990), Marino also revealed that the exposed mice were 36% more likely to exhibit an increased variance in development—indicating that extremes in body weights, both high and low, were more likely in the exposed animals. (See *MWN*, M/A86 and N/D87.)

HIGHLIGHTS

U.S. Computer Makers Push for VDT EMF Limits

American computer manufacturers are leading a drive to establish U.S. and European computer industry guidelines for electromagnetic field (EMF) emissions from video display terminals (VDTs). The effort comes in response to consumer demand for low emission VDTs and a growing concern that unless the industry develops its own emissions guidelines, other, stricter limits may be widely adopted. Apple Computer, Digital Equipment Corp. (DEC) and IBM are the campaign leaders.

The computer industry is feeling pressure to write guidelines it finds acceptable because Sweden's VDT EMF limits specify electric field levels that the industry feels are too strict and because proposed New York City Board of Education purchasing guidelines for VDTs may be based on magnetic field levels that are even lower than the Swedish emissions limits. John Chubb, who in late April left IBM to join Apple in Cupertino, CA, said that the industry must realize that, "If we don't come up with something soon, we're going to pay the consequences."

In a telephone interview, Chubb said the Swedish guidelines are "becoming a de facto standard in the U.S." because they are "the only thing that customers can quote." The Swedish guidelines were developed by the National Board for Measurement and Testing, known as MPR—its name was recently changed to the Swedish Board for Technical Accreditation, or SWEDAC (see *MWN*, S/O88, M/J89 and S/O90). U.S. computer industry officials contend that the Swedish electric field levels are unachievable using current technology.

The move toward U.S. VDT guidelines is progressing despite a setback in March, when the Institute of Electrical and Electronics Engineers' (IEEE) P-1140 working group rejected EMF limits that specified the same magnetic field levels as MPR/SWEDAC but less stringent electric field limits (see *MWN*, M/A91). Those levels are now appended to the draft P-1140 measurement protocol for VDT extremely low frequency (ELF) and very low frequency (VLF) fields. Final IEEE action on the document is expected in mid-June.

The emissions limits may be taken up by another IEEE working group, according to Dheena Moongilan of AT&T in Holmdel, NJ, the chairman of P-1140.

At a May 9 meeting in Washington, DC, initiated by IBM and DEC, the Computer and Business Equipment Manufacturers Association, a Washington, DC, trade group, decided to poll its members on whether to endorse the P-1140 draft document. In addition, IBM has asked the European Computer Manufacturers Association (ECMA) to adopt the P-1140 limits. ECMA's Technical Committee 20 on Electromagnetic Compatibility, scheduled to meet by early June, has asked Chubb to submit a paper explaining the rationale for the guidelines.

The P-1140 protocol will be issued as either a one-year or two-year trial-use standard, which requires a less extensive IEEE review process than would a regular standard. In addition, a trial-use standard is easier to revise, according to P-1140 member Don Heirman of AT&T, also in Holmdel, NJ. The document is "on a fast track," he said.

The U.S. Food and Drug Administration (FDA) is watching to see whether the industry can agree on guidelines, according to Dr. Alan Anderson of the FDA's Center for Devices and Radiological Health in Rockville, MD. If it cannot, "then we will have to consider doing something," he said.

The P-1140 working group's draft guidelines for VDT emissions measurements call for magnetic flux density readings, not time-rate-of-change readings, as we reported in our last issue (see *MWN*, M/A91).

Over-the-Horizon Radars Almost off the Scope

U.S. Navy and Air Force proposals for a network of over-the-horizon (OTH) early warning radars have been curtailed in the face of diminished superpower tensions, budget constraints and local opposition. This spring, the Navy canceled its plan for an OTH radar in Wales, U.K., and the Pentagon announced that the only operational Air Force OTH system will run at reduced capacity.

The Navy originally intended to build 12 relocatable over-the-horizon radars (ROTHR). The project has been scaled back to four radars. One ROTHR became operational on Amchitka Island in the Aleutians in 1989. Another is to be based in Norfolk, VA, in September 1992. Two more were to be sited at St. Davids airfield in Wales and on the island of Guam in the South Pacific (see *MWN*, M/A88), though they will now be put in storage in Wales and on Guam due to local opposition. Welsh-Americans were particularly active in lobbying Congress against the program. Raytheon in Lexington, MA, is the prime contractor for the ROTHR system. (In August 1989, the Navy issued *A Study of Electromagnetic Environmental Effects Associated with the [ROTHR].*)

During the late 1980s, the Air Force built over-the-horizon backscatter (OTH-B) radars near Moscow, ME, and Christmas Valley, OR, and was planning to build two more in Alaska and North Dakota (see *MWN*, J/F86, M/A86 and M/A88). Earlier this year, the Air Force said that it would mothball the Maine and Oregon OTH-Bs and cancel construction of the Alaska and North Dakota radars because of budget cutbacks and "a change in the perceived threat," according to an Air Force spokesman.

The Air Force has now decided to keep the Maine radar open forty hours a week, after appeals from Senators George Mitchell (D-ME) and William Cohen (R-ME), according to a report in the May 28 *New York Times*. The OTH-Bs were manufactured by General Electric of Syracuse, NY, and cost more than $1 billion to develop.

OTH radars bounce signals off the ionosphere to provide an effective range of up to 2,000 miles—reportedly almost ten times farther than conventional ground-based radars.

BENER Is Back

Information Ventures will publish an update of *Biological Effects of Non-Ionizing Electromagnetic Radiation* (BENER), a quarterly abstracting service. The first issue of the *BENER Digest Update* will appear in June and will include abstracts of 106 papers and 258 conference presentations.

Information Ventures suspended publication of the digest in September 1989 when the Office of Naval Research (ONR) cut funding for its electromagnetic radiation program (see *MWN*, N/D89). Under ONR sponsorship, the BENER digest was distributed at no charge to 650 readers around the world.

The *BENER Digest Update* will cost $75.00 and will cover papers released since 1989. Other issues will follow if there is sufficient demand, Dr. Robert Goldberg of Information Ventures told *Microwave News*.

Goldberg said that Information Ventures is also now marketing a computerized BENER literature database with more than 8,600 abstracts on IBM-compatible computer diskettes. The data base, which covers the complete 13-year BENER digest abstracts, some additional abstracts and the new update abstracts, is available for $3,500.00.

Contact: Information Ventures, Inc., 1500 Locust St., Suite 3216, Philadelphia, PA 19102, (215) 732-9083.

ELF and RF/MW Measurement Notes

Residential Surveys

Because power frequency electromagnetic fields (EMFs) inside homes can be far weaker and considerably more complex than those near power lines, the American National Standards Institute (ANSI) 1987 standard for measuring power frequency fields may be inappropriate for residential environments. The standard "has certain shortcomings if used alone as a guide for characterizing residential magnetic fields," according to a task force of the Institute of Electrical and Electronics Engineers' (IEEE) Power Engineering Society (PES).

In a paper in the *IEEE Transactions on Power Delivery, 6*, pp.901-911, April 1991, the PES's Magnetic Fields Task Force reported that in-home field levels can be two orders of magnitude lower than those near power lines and can "contain large percentages of harmonics, e.g., in excess of 30%." The task force found that small, personal exposure meters give "more realistic exposure estimates" for individuals than do fixed-location units.

In general, the task force recommended case-by-case strategies for making residential surveys. "The number and types of measurements will increase as the measurement goals become more comprehensive," it reported. The paper's principal authors are Dr. Martin Misakian of the National Institute of Standards and Technology in Boulder, CO, Michael Silva of Enertech Consultants in Campbell, CA, and Rod Baishiki of Pacific Gas & Electric in San Francisco, CA.

The PES Magnetic Fields Task Force is an offshoot of the AC Fields Working Group of the Corona and Field Effects Subcommittee of the Transmission and Distribution Committee. The 1987 standard referred to by the task force is *ANSI/IEEE Standard 644-1987, IEEE Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines.*

EPRI Dosimetry Workshop

Many of the leading EMF measurement specialists from Canada, Sweden, the U.S. and the U.S.S.R. participated in a four-day dosimetry workshop in Carmel, CA, in March. The workshop, which was sponsored by the Electric Power Research Institute (EPRI), included 22 presentations on macroscopic and microscopic dosimetry, background fields and signal-to-noise issues and extrapolations across biological systems. The event concluded with a panel discussion on research needs led by Dr. Bill Guy of the University of Washington in Seattle; panelists included Dr. William Kaune of Enertech Consul-

tants in Campbell, CA, Dr. Charles Polk of the University of Rhode Island in Kingston, Dr. Thomas Tenforde of Battelle Lab in Richland, WA, EPRI's Dr. Howard Wachtel and Dr. James Weaver of MIT in Cambridge, MA. The proceedings will be published in an upcoming issue of *Bioelectromagnetics*, according to Dr. Richard Phillips of W/L Associates in Spokane, WA, who organized the workshop.

Low-Cost ELF Meters

The growing demand for low-cost extremely low frequency (ELF) magnetic field meters is being met by a surge in new products. There are now 33 ELF meters on the market costing less than $1,000. Here are the latest entrants in this increasingly competitive market:

• F.W. Bell has introduced the model 4060 for 60 Hz measurements from 1 mG to 5 G. It sells for $179.00. To locate the nearest distributor, call the company's "ELF Hotline": (407) 678-7308; or contact: F.W. Bell, Inc., 6120 Hanging Moss Rd., Orlando, FL 32807.

• Holaday Industries has introduced two ELF magnetic field meters. The HI-3624 can measure fields from 0.2 to 20 mG in the frequency range of 30 Hz to 2 kHz. It costs $389.00. A modified version, the HI-3624A, is sensitive down to 5 Hz, and can therefore be used in accordance with the Swedish video display terminal (VDT) guidelines. It costs $459.00. Holaday already sells two high-end magnetic field meters: The HI-3603 ($1,095.00) can measure very low frequency (VLF) magnetic and electric fields, and the HI-3604 ($1,195.00) can measure ELF magnetic and electric fields; they were previously sold as the HI-3600-01 and the HI-3600-02, respectively. For more information, contact: Dave Baron, Holaday Industries, Inc., 14825 Martin Dr., Eden Prairie, MN 55344, (612) 934-4920.

• Memtec Corp. is offering the ELF-DETEC, with a frequency response from 50 Hz to 1 kHz for measurements from 0.22 mG to 50 mG. It is available for $49.95 from: Memtec Corp., Keewaydin Dr., Salem, NH 03079, (603) 893-8080.

• Teslatronics of Alachua, FL, is marketing the ELF Alert, a magnetic field meter for the 30–300 Hz frequency range and for fields of 1 mG to 2 G. It costs $99.95. For more information, contact: Michael Koch, Teslatronics, Inc., One Progress Blvd., #25, Alachua, FL 32615, (904) 462-2010.

New RF/MW Meters

• Several new radiofrequency/microwave (RF/MW) meters are now available from Loral Microwave-Narda. The Model 8840B Nardalert Personal Monitor can check RF/MW exposures in the 2–18 GHz range. It provides continuous readings for workers in potentially hazardous areas where high-power radar, communication or electronic warfare systems are in use. The meter can be purchased with a factory-set sensitivity threshold of either 1 mW/cm^2 or 5 mW/cm^2. Narda has also introduced the SMARTS area monitor to measure 0.5-18 GHz microwaves with a factory-set sensitivity threshold of 1 mW/cm^2. The Nardalert is available for $695.00 plus shipping, and the SMARTS costs $2,495.00 plus shipping. Contact: Loral Microwave-Narda, 435 Moreland Rd., Hauppauge, NY 11788, (516) 231-1700.

• Holaday has introduced a new broadband RF/MW meter to take readings at the proposed ANSI C95.1 levels. The HI-3012, which is intended to replace Holaday's HI-3002 meter, has both electric field and magnetic field probes with sensitivity from below 0.05 mW/cm^2 (10 V/m and 0.03 A/m) to above 250 mW/cm^2. It can be used at 500 kHz-6 GHz for electric fields and at 5–300 MHz for magnetic fields. The HI-3012 costs $4,395.00 plus shipping (see above for contact information).

• The EMI-Control Center of the Asea Brown Boveri in Baden-Dättwil, Switzerland, has developed a meter for measurements from 75 kHz to 30 MHz. It uses a single probe to take simultaneous electric and magnetic field readings. For more information, contact: Asea Brown Boveri AG, EMI-Control Center, CH-5404, Baden-Dättwil, Switzerland, (41+056) 76 83 07.

Microwave News has updated its list of available gaussmeters published last year (see *MWN*, J/F90). For a copy of the current list, send a self-addressed, stamped envelope and $1.00 (U.S.) to: *Microwave News*, PO Box 1799, Grand Central Station, New York, NY 10163.

EMF Testers Group

Eleven EMF measurement specialists have banded together to create the National Electromagnetic Field Testing Association (NEFTA), representing independent non-ionizing radiation testing firms. Founding members are: John Banta and David Bierman of SafeEnvironments in Berkeley, CA; Dr. Robert Becker, author of *Cross Currents* and many other books and articles on EMFs; Dr. David Brodeur, who operates a testing firm in Manchester, MA, and whose brother, Paul, has written extensively on EMFs; Dr. William Lee of Alphalab in Salt Lake City, UT; Ralph Pinto of Healthy Habitats in Sedona, AZ; Ward Rapp and Patricia Clark of Environmental Management and Field Testing in Evanston, IL; Joseph and Leah Riley of Healthwaves in West Orange, NJ; and Peter Sierck of Environmental Testing & Technology in Encinitas, CA. Rapp told *Microwave News* that the group represents companies testing at all non-ionizing radiation frequencies, although most of the work currently is done at ELF. For more information, contact: Ward Rapp, NEFTA, 628-B Library Pl., Evanston, IL 60201, (708) 475-3696.

Measurement Resources

• Two meter companies are also providing resource publications. Magnetic Sciences International (MSI) in Berkeley, CA, has updated its *Magnetic Field Guide*, a 51-page handbook published to accompany its MSI magnetic field meters. Following a short section on operating instructions, the handbook covers basic magnetic field information, suggestions for in-home and on-the-job measurement protocols, prudent avoidance tips and other topics. It is available for $12.50 from: Karl Riley, MSI, Box 489, 2425B Channing Way, Berkeley, CA 94704, (415) 486-1024.

• Electric Field Measurements (EFM) in West Stockbridge, MA, has started publishing the *EFM Newsletter*. Each issue includes information on technical applications, a list of current products and other information for EMF measurement specialists. A one-year subscription in the U.S. costs $20.00. For more information, contact: Don Deno, EFM, Route 183, West Stockbridge, MA 01266, (413) 637-1929.

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FROM THE FIELD

Magnetic Field Exposures Among Office Workers

To the Editor:

I would like to call your readers' attention to a common source of exposure to 60 Hz magnetic fields which may not be apparent to others. During several years of measurements, I have found that people in commercial office buildings who work near conductors carrying high currents may be exposed to strong magnetic fields. Ironically, those individuals who work in the strongest magnetic fields may be those who know nothing about their potential for exposure.

In the course of my investigations, I have found people working in offices where large power conductors cross the floors, walls and ceilings. These conductors are associated with the distribution of electrical service to various parts of a building from the primary electrical switchgear room. They are commonly present in large commercial buildings and may carry thousands of amperes of 60 Hz current.

Depending on the layout of the wiring and whether it consists of cables or bus bars, the ambient magnetic fields in offices may be as high as 3,000 mG. For example, I have measured flux densities in the range of 400 to 900 mG throughout the entire accessible area of some offices and up to 3,000 mG within 30 cm of concealed power conductors. Electrical conductors, then, can be responsible for very high whole-body magnetic field exposures among office workers without their knowledge.

According to the most comprehensive study of occupational exposures to 60 Hz magnetic fields, conducted by Dr. Dan Bracken for the Electric Power Research Institute (EPRI), electrical workers who are primarily employed in power distribution have the greatest exposures.* For example, EPRI found that only 5% of electrical distribution workers had average workday magnetic field exposures greater than 42 mG. The greatest median workday exposures were among substation workers and were, on average, only 7 mG. The distribution workers had a median workday average exposure of just 2 mG.

My measurements and Bracken's assessments suggest that some office employees may be more highly exposed than electrical workers —even though the areas of highest magnetic fields in commercial buildings are generally small and those affected may only be a fraction of the total work force. Mobility of office workers will of course affect magnetic field exposures, but the limited mobility of some workers may keep them in the areas with the highest fields. For example, an office worker remaining eight hours in an office with a general, ambient flux density of 400 mG would have a workday mean exposure of 400 mG.

If the magnitude of magnetic field exposures is related to biological effects, these observations suggest that epidemiological studies of office workers may be of greater interest than studies of electrical utility workers. I have found that one can very easily identify those areas within commercial buildings where magnetic fields are greatest simply by reviewing architectural plans.

It is possible that, while our initial interest in electrical worker exposures was logical, we may have been searching only near the proverbial streetlight because that is where the light is.

Sincerely,
Richard Tell, President
Richard Tell Associates, Inc.
6141 West Racel St., Las Vegas, NV 89131

* T. Dan Bracken, Inc., *The EMDEX Project: Technology Transfer and Occupational Measurements*, Volumes 1-3. EPRI Report No. EN-7048, Palo Alto, CA: EPRI, November 1990.

SAB Panel on EMFs *(continued from p.1)*

creased cancer risk, according to *Inside EPA* (April 26), a Washington newsletter, which does not disclose its sources.

By the end of the meeting, the panelists were optimistic about reaching a consensus. "It sounds like there's the making of a document that we all can agree on," said Dr. Granger Morgan. The SAB's Kathleen Conway noted that the panelists were "more in agreement on issues than I had anticipated at this point."

The future of the EPA report was thrown into doubt, however, when Dr. Genevieve Matanoski, the chair of the SAB panel, revealed near the close of the meeting that there was intense opposition to the report from some members of the panel's parent committee, the SAB's Radiation Advisory Committee (RAC). To the surprise of many panelists, Matanoski, who is also an RAC member, said that the committee expected a justification for the release of the cancer report, in addition to recommendations for revising it.

The RAC's support for the report increased after Matanoski and Dr. Kelly Clifton presented possible mechanisms of interaction that could explain low-level EMF effects, at a May 20-22 meeting in Montgomery, AL. "The committee now seems to be less inclined to discount the EMF issue," the SAB's Conway told *Microwave News*. Members of the RAC decided that they will review the panel's report at a public meeting tentatively scheduled for mid-September.

The San Antonio meeting was called to review SAB reports—on epidemiology, on physics and on in vivo and in vitro studies—that were prepared by three groups of panel members following the SAB subcommittee's first meeting in January in Washington, DC (see *MWN*, J/F91).

While praising the "thorough nature" of EPA's review, the epidemiology group found that there was "too much unwarranted speculation about causal interpretation...giving emphasis to positive findings while de-emphasizing negative ones." Dr.

SAB Subpanel Members

Epidemiology Group: David Bates, Vancouver, BC, Canada; Patricia Buffler, University of Texas, Houston; Robert Harris, University of North Carolina, Chapel Hill; Clark Heath,* American Cancer Society, Atlanta, GA; Nan Laird, Harvard University, Boston, MA; Genevieve Matanoski, Johns Hopkins University, Baltimore, MD; and Donald Pierce, Oregon State University, Corvallis. *In Vivo, In Vitro Group:* Craig Byus, University of California, Riverside; Kelly Clifton, University of Wisconsin, Madison; John DiGiovanni, University of Texas, Smithville; Granger Morgan, Carnegie-Mellon University, Pittsburgh, PA; Mary Ellen O'Connor, University of Tulsa, OK; and Bary Wilson,* Battelle Pacific Northwest Lab, Richland, WA. *Physics Group:* William Feero, Electric Research and Management, State College, PA; Charles Susskind,* University of California, Berkeley; and Richard Wilson, Harvard University, Cambridge, MA. *Free Agent:* Karim Ahmed, Princeton, NJ.

* Head of the subpanel.

Clark Heath, who drafted the group's report, concluded that, "There needs to be considerable rewriting of the epidemiology section."

Heath's group recommended that EPA add a separate section on exposure assessment. "It's a pretty good suggestion," EPA's Dr. Robert McGaughy, the project manager for the EMF–cancer assessment, told *Microwave News*.

The epidemiology group stressed the need for more emphasis on published, peer-reviewed studies and on those of greatest importance—which Heath declined to identify. Instead, he referred to an unpublished meta-analysis of 59 EMF–cancer studies by Dr. George Hutchison, presented last February at an Electric Power Research Institute epidemiology workshop (see p.8).

Dr. Charles Susskind provoked a lively exchange among the panel's epidemiologists when he asked whether they thought there had been any real progress since the publication of the landmark 1979 Wertheimer–Leeper study. On one side, Matanoski argued that, "We've come a long way considering how short a time it's been." She pointed to the "consistency" among studies, particularly the recent reports on male breast cancer and the residential childhood cancer studies. Dr. David Bates, the vice chair of the panel, agreed, noting that, "It is now much more difficult to dismiss the evidence out of hand." Indeed, Matanoski, who has often remarked on her own initial skepticism about EMF effects, said before the San Antonio meeting, "I went in with a completely negative attitude; I've changed my opinion."

On the other side, Dr. Patricia Buffler said that she was "somewhat frustrated" as an epidemiologist: "I don't think we've made a lot of progress." Buffler said that she was troubled by the "inconsistencies," especially in the occupational studies, although she conceded that the positive findings could not easily be dismissed.

Members of the physics group were at odds over a section of their report concerning testimony by Dr. Robert Adair, a Yale University physicist, who argued that EMF effects below 100 mG would violate the laws of physics. William Feero challenged the report's emphasis on Adair's opinion, arguing that the credibility of the entire EPA report should not depend on whether the agency can show that Adair is wrong. Susskind, who wrote the physics report, asked the panel to delete the references to Adair.

There was general agreement that the section on proposed mechanisms of interaction, especially cyclotron resonance, be reduced to a simple listing of the various models.

Following suggestions made at the January meeting, the in vivo and in vitro group advised treating extremely low frequency (ELF) EMFs and radiofrequency and microwave (RF/MW) radiation in separate sections. The group also asked for a shortening of the review of Dr. Bill Guy's experiment on the long-

White House's Allan Bromley in His Own Words

Over the past year, President Bush's science advisor, Dr. Allan Bromley, has been an active behind-the-scenes participant in the debate over the health effects of electromagnetic fields (EMFs). Last November, Bromley, who heads the White House's Office of Science and Technology Policy (OSTP), asked the Environmental Protection Agency (EPA) to delay the release of its report, Evaluation of the Potential Carcinogenicity of Electromagnetic Fields *(see* MWN, *N/D90). The reason, he told* Time *magazine (December 24, 1990), was that EPA's "findings of a 'positive association' between EMFs and childhood cancer are 'quite incorrect' " and would unnecessarily frighten "millions of parents." Below is an excerpt from an interview with Bromley on the public television program* TechnoPolitics *in which the host, Tim White, asked Bromley about his role in the negotiations that preceded the release of the EPA report. The show aired April 23.*

White: We mentioned that you're more involved in...the legislative and administrative process than science advisors have been heretofore. One of the things that stirred some controversy was a report coming out of EPA on EMFs that you had a big role in squashing. Why did you do that, Dr. Bromley?

Bromley: First of all, I would have to correct that. I did not squash the report. I simply required that an introduction be written that put the report in somewhat better context. The report addresses an area that is of importance because a great many of our citizens are interested. The question is, does the presence of electrical wiring have health effects on humans? That's the simplest form. The research that's been done is spotty, it has not been complete, much remains to be done. EPA did a very workmanlike job of pulling together the work that had been done, pulling it all together in one place. No problem with that; it was a fine report. There was then an executive summary which perhaps went a little farther toward drawing out a causal relationship between the presence of EMFs and human cancer.

My role as science advisor to the President is to be sure that statements that come out of this administration are based on sound science. And so my only contact in fact with this report was to insist that a presentation that had been made to me and to various other people, which included that statement that evidence had been adduced for a causal relationship was not supported by the science.

White: By the science as presented by EPA.

Bromley: That's correct.

White: Let's stay with this issue, if we may, for just a moment, because clearly EMFs, if in fact they do have negative health effects for human beings, could affect all of us. You and I are sitting in profound—

Bromley: Of course.

White:—EMFs right here in this studio. How do you as the science advisor assess your role when there are competing interests?

Bromley: My role is simply to be sure that we use the best science, the best technology, that is available anywhere in the world and that our statements are based on sound science and technology.

White: Is that the kind of decision to be made in the White House science office, or is that the kind of decision to be made in laboratories or perhaps on Capitol Hill?

Bromley: The decision eventually, in cases of this kind, where the laboratory data are anything but complete, will necessarily be made at a political level, and that implies eventually, if it isn't resolved somewhere else in the bureaucracy, it comes to the White House.

term carcinogenic effects of RF/MW radiation (see *MWN*, J/A90).

With respect to ELF EMFs, the group recommended that EPA make it a priority to determine the "relevant" exposure parameters responsible for EMF effects, particularly in light of Peters's results. The group stressed the need to address intermittent and fast-changing EMFs as well as effects on animals with known sensitivities to the geomagnetic field (see *MWN*, M/A91).

The SAB panel heard invited talks by Drs. Arthur Pilla, Russel Reiter and Asher Sheppard. Pilla, of the Mount Sinai School of Medicine in New York City, presented data on the beneficial effects of pulsed low frequency EMFs on bone growth. The panelists were particularly interested in using these data to counter Adair's criticisms.

Reiter, of the University of Texas Health Science Center in San Antonio, showed that quick changes in magnetic fields can depress the pineal gland's production of the hormone melatonin (see *MWN*, J/A90). Bary Wilson told the panelists that he and other researchers at Battelle are beginning to replicate some of Reiter's findings. Sheppard, of the VA Hospital in Loma Linda, CA, spoke on ELF effects on cellular systems.

Unlike the Washington meeting, the San Antonio session attracted little public and media attention. Indeed, there were only three speakers from the audience. Four experts submitted written comments on behalf of the Utility Health Sciences Group (see *MWN*, J/F91).

Drawing on his long experience of serving on advisory boards, Bates suggested that the panelists give a "written endorsement" of the group's final report—to prevent their later renouncing sections of the document under public pressure. "There are people out there who are paid to discredit the [EPA] report as a whole," he said.

The subcommittee's next public meeting will be held in Washington, DC, July 23-25. A smaller group consisting of Matanoski, Bates, Dr. Karim Ahmed and the three study group leaders—Heath, Bary Wilson and Susskind—assembled in Washington June 3-4 to draft a document incorporating the recommendations in the groups' reports. The subcommittee plans to complete its report soon after the July 23-25 meeting.

EPA Funding *(continued from p.1)*

$2 million to EPA and $200,000 to the National Institute of Standards and Technology (NIST) for fiscal year 1992, which begins October 1, 1991. The measure would increase EPA funding for EMF research to $3 million annually for 1993 and 1994.

The allocation more than doubles the $940,000 requested by President Bush, according to a committee staffer. Before the funds can be appropriated, however, the $2.2 million must be approved by both the House and the Senate.

The bulk of EPA's funding—$1.5 million—is specifically provided for "a grant to the private sector" for EMF health effects research. The committee's report accompanying the legislation explains that the panel expects the Department of Energy (DOE) to match the $1.5 million, bringing the total federal contribution to $3 million. The report also suggests for the first time that the federal government's contribution could be less than half of the total project budget. The committee wants the NIST to develop measurement technology and protocols that can contribute to health effects research.

During the debate on Brown's amendment, a question was raised as to whether the private sector provision refers to the Health Effects Institute (HEI), the Cambridge, MA, group which is beginning a feasibility study for a possible EMF research program funded jointly by public and private sources (see *MWN*, M/A91 and p.3). A committee aide said that Brown has no specific recipient in mind.

In its report, the committee pressed EPA's Reilly to prevent political interference in the agency's analysis of EMF–cancer risks (see *MWN*, M/J90, N/D90 and J/F91):

> The questions raised in the EMF controversy are profoundly disturbing to the American public. This is evident from the growing number of legal actions filed around the United States relating to the siting and construction of electrical transmission lines. Thus, the development of a scientific consensus, based on rigorous, well-designed and replicated investigations, is critical to our understanding of the actual risks posed to populations by EMF exposure. The committee is profoundly concerned, therefore, by the events surrounding the publication of the report *Evaluation of the Potential Carcinogenicity of Electromagnetic Fields* and its review by the Science Advisory Board [SAB]. Unexpected intervention by the science advisor to the President in November 1990 delayed publication of the report. A number of witnesses before the January 1991 hearings of the [SAB] were supplied by a law firm which represents a number of utilities and which has in the past litigated cases relating to EMFs for utilities. In an issue already inflamed in the public mind, this committee expects that the evaluation of scientific evidence and the transmission of expert consensus to the administrator by the [SAB] will take place in a climate unaffected by political considerations. Interference with the proceedings of the board raises grave threats to the credibility of its findings and recommendations. This committee reminds the administrator of his responsibility to shelter the [SAB] from undue outside influence.

UPDATES

MEETINGS

EMF Sensitivity... Swedish Minister of Labor Mona Sahlin is taking an active interest in hypersensitivity to EMFs. On April 9 in Stockholm, Sweden's leading experts briefed Sahlin and an overflow crowd on the latest findings on EMF allergies. At the outset, Sahlin made clear that she is concerned. "I want these questions to be handled seriously," she said in her opening remarks. "The important question is not, 'What caused a person's disability?' It is, 'How can we intervene at an early stage?'" Hypersensitivity is becoming a major issue in Sweden. As of

April 1991, the Union of Those Injured by Electricity and VDTs numbered 1,200, up from just 220 in April 1988. Among the speakers at the briefing were NIOH's Dr. Bengt Knave, NBOSH's Dr. Kjell Hansson Mild, SWEDAC's Merih Malmqvist and NIRP's Lars Erik Paulsson. Knave dismissed claims that hypersensitivity is solely a psychological illness, though he allowed that it, like other health problems, does have a "psychosomatic aspect." He said that EMF hypersensitivity can be triggered by many factors, including personality (ambition may be a risk factor) and job design. He estimated that the debate on this issue is about where the debate on chemical solvents was 15 years ago. (For more on EMF sensitivity, see *MWN*, M/A87.)

Battelle EMF Seminar...Battelle, DOE and EPRI will host an August 1–2 conference at the Battelle Pacific Northwest Lab in Richland, WA, on *Electromagnetic Fields and Public Health Concern: A Knowledge Base for Informed Decision Making*. Speakers will include: Battelle's Drs. Bary Wilson and Larry Anderson, EPRI's Greg Rauch, Dr. William Kaune of Enertech Consultants, Dr. Ray Neutra of the California Department of Health and Dr. Granger Morgan of Carnegie–Mellon University. The cost is $395.00. For more information, contact: Carla Belcher, Battelle Pacific Northwest Lab, PO Box 999, Richland, WA 99352, (509) 375-3615.

PEOPLE

After almost ten years as the editor of the *Journal of Bioelectricity*, Dr. **Andrew Marino** will hand over the reins on June 1 to Dr. **Stephen Smith**, a professor of anatomy and neurobiology at the University of Kentucky in Lexington. In a telephone interview, Smith said that Marcel Dekker, Inc., of New York, NY, will publish one issue in 1991 and two in 1992, and plans to go to a quarterly schedule in 1993. From his office at the Department of Orthopaedic Surgery at Louisiana State University Medical Center in Shreveport, Marino explained that he could not sustain his research interests and continue editing the journal....EPA's Office of Radiation Programs (ORP) has a new acting director, **Margo Oge**, formerly director of EPA's radon division. In April, ORP's former director, **Richard Guimond**, was named the agency's deputy assistant administrator for solid waste and emergency management.

VDTs

Newspaper Avoids EMFs...*The Boston Globe*, New England's largest daily newspaper, is redesigning its offices to keep at least three feet between workers and the backs and sides of VDTs. The move was announced in an April 2 letter from Dr. Terrence O'Malley, the paper's medical director, who acknowledged that the action would "result in some disruption and inconvenience, but the overall result will be less exposure to weak magnetic fields." O'Malley explained that, "There is sufficient reason to take steps to reduce exposure until such time that research establishes the absence of significant biological effects from VDT fields."

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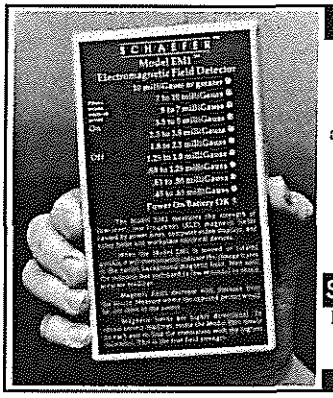

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