MICRO WAVE NEWS

Vol. XII No. 1 A Report on Non-Ionizing Radiation January/February 1992

INSIDE...

Possible Radar Link in Florida Hodgkin's Disease Cluster

A cluster of Hodgkin's disease cases has been identified in an ocean-front neighborhood in Florida adjacent to an air traffic control radar on Patrick Air Force Base (AFB).

A recent Florida Department of Health and Rehabilitative Services (DHRS) study included the cases of eight people diagnosed with Hodgkin's, a lymphatic cancer, between 1967 and 1983 in South Patrick Shores, which is about 20 miles south of Cape Canaveral. Seven of the eight lived within 400 yards of the radar, which is used by both the Federal Aviation Administration (FAA) and the U.S. Air Force; the eighth lived just slightly farther away from the radar.

Additional cases have been identified in the area—bringing the total to almost twice the number in the DHRS study. A local newspaper reporter, Jim Ash, has found 15 cases, including two men who work at Patrick AFB. DHRS researchers did not include the base in their study area.

Initially, community concern focused on toxic chemicals. Articles Ash wrote in July for *Florida Today*, a paper based near Melbourne, examined whether pesticides and other chemical wastes from a closed military dump had contaminated residents' drinking water. The possibility that toxic pollution caused this cluster has largely been dismissed, however.

In the DHRS study released in September, state epidemiologist Dr. Richard Hopkins of Tallahassee wrote that the cause of the cluster "is unknown." He concluded that the "most likely explanation...remains an infectious agent, circulating in the community in the mid-sixties through the late seventies."

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Bioelectromagnetics in Europe: A New Era of Collaboration

Bioelectromagnetic research is flourishing as Europe moves toward economic unity. In a new climate of collaboration, initiatives are being shaped to coordinate research, to set common exposure standards and to establish a European research laboratory.

At the close of the *First Congress of the European Bioelectromagnetics Association* (EBEA), held in Brussels, Belgium, January 23-25, EBEA President Dr. Jocelyne Leal predicted that the links being forged among researchers would usher in a new era of cooperation. "Our meeting was a success, not only because we had 160 participants and good papers, but also because it will open the way for productive collaboration in the future," she told *Microwave News*. The EBEA now has 367 members from 35 countries.

Some of the emerging research arrangements are informal. Others are

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« Power Line Talk »

A new trend is developing among utilities facing opposition to power lines and substations because of EMF health concerns: power companies are agreeing to move controversial facilities as long as others foot the bill. In Canada, **BC Hydro** recently indicated that it is willing to bury two kilometers of a 230 kV power line in Vancouver, if the $20 million tab is paid by the city or by a private group. In a July 10, 1991 letter to the Vancouver City Council, Thom Thompson, BC Hydro's manager of government and public affairs, stated that, "BC Hydro would not oppose [a move to bury the lines] made by another party," provided that the company is not required to fund the project. Members of the activist group **Citizens Against Transmission Towers** have pointed to possible EMF health effects in calling for the move. Readings taken by the utility show peak fields of about 12 mG on the right-of-way (ROW), and levels of about 5 mG on immediately adjacent property, according to Dr. Kelly Gibney, BC Hydro's EMF project manager. "We don't feel that the evidence shows that this line presents a health risk," Gibney told *Microwave News*....The **Sacramento (CA) Municipal Utility District** (SMUD) has agreed to move several controversial substations *if* an acceptable alternative site is available and *if* the opponents of the original site pay for the move, according to a policy statement issued in December. Residents near three SMUD substations have cited EMF concerns as a principal objection to the sites. Developers of land in the area are interested in sponsoring the relocations but no definite plans have emerged, Mike Deis, an SMUD spokesman, told *Microwave News*. SMUD's EMF specialist, Ron Scott, said in a telephone interview that he wouldn't be surprised if the policy becomes a standard way of dealing with EMF concerns: "If it's not costing the utility any money and everyone agrees, then I don't see why not."

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One of the recommendations that came out of DOE's November 20-21 EMF workshop was to hold **JASON**-type meetings to help set research goals. JASON refers to a team of scientists who consult primarily with the DOD on defense issues. Wasting no time, the DOE contacted the MITRE Corp. in McLean, VA, which runs the JASON Program Office (JPO), and an EMF seminar was held on January 24 for the "JASONs" in La Jolla, CA. They heard presentations by Drs. **Ross Adey** of the VA Hospital in Loma Linda, CA, **Ted Litovitz** of Catholic University in Washington, DC, and **Duncan Thomas** of the University of Southern California in Los Angeles. Robert Henderson, the director of the JPO, did not return calls for comment.

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A planned upgrade of transmission facilities in northern Washington State will comply with a law aimed at reducing public exposure to EMFs by confining new power lines above 115 kV to industrially zoned areas, according to officials of **Puget Power and Light Co.** and the **Bonneville Power Authority** (BPA). Voters in Whatcom County, WA approved the restrictions by a nearly two-to-one margin in a November 1990 referendum (see *MWN*, N/D90). The upgrade involves rebuilding facilities to increase the capacity of lines on existing Puget Power and BPA ROWs and adding a new 115 kV line. "Reliability in the area and power transfer are still the two key issues here," Ray Trzynka, a Puget Power spokesman, told *Microwave News*. **Neighbors Opposed to Power Encroachment** (NOPE), the citizens group which initiated the referendum, will probably not challenge the new project. "Officially, we're still exploring all the ramifications, but, to some extent, we're pleased," NOPE's Clare Fogelsong said in a telephone interview. "The new plan is much more in keeping with the utility plan for the county, much less damaging to the environment and the community," he added. However, Fogelsong indicated that NOPE supports conservation measures to reduce the need for such projects entirely: "We're still concerned...it seems that the industry would much rather pursue old paths than embark on new ones," he said.

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EPRI has invited 10-15 experts to a workshop on ***Magnetic Field Transients*** to be held in Palo Alto, CA on February 19. The purpose of the meeting is to learn more about the transient environment, its biologically significant parameters and methods for characterizing exposures in future studies, according to Thanh Dovan of **Enertech Consultants** in Campbell, CA, which is organizing the workshop for EPRI. Enertech is in the process of developing equipment to measure EMF transients, under an EPRI contract.

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In **Florida**, after a short truce, **Hillsborough County** and the state Department of Environmental Regulation (DER) seem to be headed for another showdown over DER's power line EMF limits. The limits—150-200 mG at the edge of a ROW, depending on the voltage of the line—were immediately challenged in court by the county when they were adopted in 1989 (see *MWN*, M/A89). In March 1991, county officials agreed to withdraw the lawsuit in exchange for what they believed was a promise from the DER to reconsider the limits during a rules review that will begin with a February 20 meeting in Tallahassee (see *MWN*, M/J91). The DER says it never made such a commitment, however. DER's Buck Oven told *Microwave News* that revising the limits was "never our intention" and "would not be considered during the review." Nancy Fleming, the chairwoman of **Concerned Citizens for Power Line Safety**, which is based in Tampa, said that the DER is reneging on a deal: "They promised to take a very serious look at the limits, and that is why we dropped the suit. In my mind, this is the worst form of government," she told *Microwave News*. Fleming also said that she intends to go before the Hillsborough County Board of Commissioners and ask that the suit be refiled. Michael Skelton of

DOE Seeks 50% Increase in 1993 EMF Research Budget

The DOE has requested $7.5 million for EMF research in fiscal year 1993 (FY93), a 50% increase over FY92, according to Marvin Gunn, a senior DOE official who is overseeing the EMF effort.

Before Congress named the DOE as lead agency for EMF research, department officials had planned on a $5 million budget (see *MWN*, N/D91). The request was increased late last year because, "We recognized the relative importance of the topic," Gunn told *Microwave News*. The DOE had considered asking for as much as $15 million for FY93 before settling on half that amount, according to sources close to the agency. FY93 begins on October 1, 1992.

The DOE submitted its request to Congress at the end of January as part of the President's budget. In the explanation accompanying the budget, the DOE stated that public concern about EMFs "is limiting the siting and capacity of transmission and distribution systems...."

Gunn said that the DOE EMF program is moving forward. "We expect that by the end of June we should have a pretty comprehensive plan," he said.

de la Parte & Gilbert, the Tampa law firm representing the county, confirmed that if the limits are not revised, the county will "seriously consider" refiling the suit. Oven defended the current limits, stating in a telephone interview that, "The scientific evidence does not exist to warrant a change."

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In response to growing concern about EMF health effects, a number of electric utility organizations are now publishing EMF newsletters. The newest player is Central Maine Power Co.—the utility's Center for Energy Information recently began offering its in-house, biweekly, ***EMF Keeptrack***, to the public. "We were creating a fairly large EMF resource and the demand was there," the center's director, Alan King, told *Microwave News*. In early 1991, the Edison Electric Institute began publishing the biweekly ***EMF News***. Though the newsletters are available by subscription only, EPRI offers its ***EMF Research Review***, published three times per year, for free.

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In **Rhode Island**, Governor Bruce Sundlun's **EMF task force** could not reach a consensus on the proposed three-year ban on new power lines above 115 kV, which was considered by the state legislature last year (see *MWN*, J/F91, M/J91 and J/A91). A bill setting forth the moratorium will be reintroduced in the 1992 legislative session, according to Rep. Steve Hernandez, the sponsor of last year's bill. The task force's interim report, dated December 1991, recommends that the governor adopt and distribute to the public an EMF health policy statement, and create an ongoing commission to track EMF developments. The task force has also commissioned an $82,000 study of the cost-effectiveness of power line EMF mitigation techniques. The research—paid for by state utilities—is being conducted by a Jackson, MI firm, Commonwealth Associates, and is due to be completed this spring. "It is by far the most far-reaching aspect of the task force's work," Scott Wolf, an aide to the governor and the chairman of the task force, said of the study. The task force will wait for the results of the project before issuing final recommendations, Wolf said in a telephone interview.

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Recent data linking electric blanket users to high EMF exposure and adverse health effects is sending many people in search of an old-fashioned down quilt, and at least one company is glad the public is finally waking up. Cuddledown, a Portland, ME mail order distributor of natural fiber quilts, blankets and other textiles, has placed a **"Radiation Free Bedding"** badge on its catalogue to indicate that its products do not emit EMFs. The badge features a nuclear "mushroom cloud" with a red line drawn through it.

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The **National EMF Research Program** (NERP) has selected **Energetics Inc.** of Columbia, MD to provide staff support through February 1993 and has named **Wendell Holland**, a member of the Pennsylvania Public Utility Commission, to its steering committee. He replaces **Michael Wilson** of Florida, who resigned. The committee, which is developing a formal response to the EMF research legislation introduced by Rep. **George Brown** (D-CA), plans to hold its next meeting March 24-25 in Washington, DC.

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The city of **Wheaton, IL** has taken on **Commonwealth Edison Co.** with an ordinance to block the upgrade of a power line. On January 20, the city council amended Wheaton's zoning rules for residential areas so that new or upgraded substations with a capacity of greater than 34 kV will require special use permits. The city's action was spurred by the utility's plans to upgrade a power line in the area from 34 kV to 138 kV, according to Wheaton resident John Bengel, who led the drive for the zoning change. The line, which runs along a greenway called the Illinois Prairie Path, feeds a substation in Wheaton that would have to be upgraded at the same time. "The city has chosen not to address power lines directly," since they are under the jurisdiction of the Illinois Commerce Commission, Bengel told *Microwave News*. A spokesman for Commonwealth Edison, Michael Kelly, said the utility is working with DuPage County, where Wheaton is located, to get land on a forest preserve for a new substation. But he would not rule out a legal challenge to the zoning rules. Bengel said Wheaton was the first municipality in Illinois to pass legislation concerning power line EMFs, adding that, "Other, neighboring communities are very interested in what we are doing." The nearby city of **Aurora** considered—but failed to enact—an ordinance that sought to limit power line EMFs.

Two Brain Tumor Victims Sue Connecticut Utility

Two residents of Meadow Street in Guilford, CT have sued Northeast Utilities and its affiliate, Connecticut Light and Power Co., claiming that their brain tumors were caused by electromagnetic fields (EMFs) from power lines and from a nearby substation. Melissa Bullock, a 19-year-old with a malignant brain tumor, filed her claim on December 19. Jack Walston, who lived next door to Bullock, filed a similar suit on January 14.

Bullock has lived on Meadow Street since 1979; Walston lived on the same block for most of the time between 1947 and 1983. In 1990 Paul Brodeur, a staff writer at *The New Yorker*, argued that EMFs were the probable cause of four brain tumors—including Bullock's and Walston's—and other health problems among residents of the one-block street, making it a focal point in the power line controversy (see *MWN*, S/O90, N/D90 and M/A91).

In their complaints, filed in state Superior Court in New Haven, CT, the plaintiffs charge that the utility knew—or should have known—of potential EMF health effects, and failed to use "every effort possible" to warn and protect the public against the danger, as is required by law.

Both suits ask for unspecified monetary compensation for physical injury and emotional distress, as well as for a court order forcing the utility to "cease and desist the emission of dangerous levels of [EMFs]" from their electrical equipment and to disclose any information on EMF health risks to the public. Bullock's parents are also requesting compensation for the loss of value of their house, which they put on the market in December 1991.

"We expect to vigorously defend ourselves against the contentions of the lawsuits. We are preparing for a long, hard court battle," Emmanuel Forde, a spokesman for Northeast Utilities, told *Microwave News*. Forde added that the cases could "stretch out for years."

Michael Koskoff of Koskoff, Koskoff & Bieder in Bridgeport, CT, and John Ward of Quinn, Ward and Kershaw in Baltimore, MD, are the lead attorneys representing both Bullock and Walston.

Michael Withey of Schroeter, Goldmark & Bender in Seattle, WA is acting as a legal consultant to the plaintiffs. Withey's and Ward's law firms are founding members of the Electromagnetic Radiation Case Evaluation Team (see *MWN*, M/A91). Also assisting the plaintiffs' lawyers are attorneys from the Washington, DC-based Trial Lawyers for Public Justice. Last year, Withey filed suit on behalf of a San Diego, CA couple who allege that their daughter's kidney cancer was caused by power line EMFs (see *MWN*, J/A91).

"The tragedy of Melissa's cancer is the result of decades of neglect by the power companies. Melissa deserves compensation, and the public is entitled to know the risks of electromagnetic radiation," Koskoff said. Her case is an opportunity to set a strong precedent which could pave the way for other victims of EMF injuries, he told *Microwave News*. Ward agreed: "The remedy we're seeking would also involve protecting other people from this hazard."

In 1989 Bullock was diagnosed as having an astrocytoma, a malignant brain tumor. Walston was first diagnosed as having a meningioma, a nonmalignant tumor, in 1979.

Koskoff expects the utility to try to invalidate Walston's claim using the state's strict laws limiting suits to two years from the time an injury is discovered and to three years from the time of exposure. "Because a victim can't very well sue for an injury that he doesn't know he has, there is some question about the constitutionality of these statutes," he said.

Brodeur described the history of the Bullock and Walston families in a July 9, 1990 *New Yorker* piece titled "Calamity on Meadow Street." He filed a follow-up in the November 19, 1990 issue. The articles were a continuation of his "Annals of Radiation" series; the original three parts were published in his book, *Currents of Death*.

"[B]efore the physicians and the scientists feel free to acknowledge that substations and high current power lines constitute a serious public health hazard, it will undoubtedly be necessary to identify some additional Meadow Streets," Brodeur wrote in the July article. He then went on to blame EMFs for high cancer rates in neighborhoods in North Carolina and California.

In an interview with *Microwave News*, Brodeur reaffirmed this view: "Meadow Streets exist from one end of the United States to the other and I will show this to be true in future articles for *The New Yorker*."

Northeast Utilities officials disputed many of Brodeur's claims in a series of letters to *The New Yorker*. They also argued that he failed to ask them about his charges.

Rep. Brown Sees Quick Approval of $70 Million EMF Program

Rep. George Brown (D-CA), sponsor of the principal EMF research legislation in Congress, is confident it will pass this year. "My anticipation is that we'll have this bill enacted," he told *Microwave News*.

His measure, H.R.3953, budgets $60 million for research and $10 million for public information over ten years—and calls for as much as half of the research funding to come from nonfederal sources (see *MWN*, N/D91).

In an extensive telephone interview, Brown commented on the actions of White House Science Advisor Dr. Allan Bromley, the ongoing role of the Environmental Protection Agency and his own vision of the federal EMF research effort. Excerpts from the interview appear on pp.12-13.

The chairman of the House Committee on Science, Space and Technology, Brown has tentatively scheduled a hearing on the legislation for March 10.

Wisconsin Mandates Low EMF T&D Systems

The Wisconsin Public Service Commission (PSC) has ordered state utilities to use the "best available control technology" to reduce EMF emissions from new and upgraded transmission lines. The PSC, which issued the ruling at its January 16 meeting, also directed the utilities to report on the availability of low EMF distribution line systems and to use such systems as soon as possible.

"The commissioners feel that minimization is the way to go," Dan Dasho, a PSC aide, told *Microwave News*. The PSC did not set specific exposure limits or guidelines, however.

The question of EMF health effects is unresolved, the PSC stressed. Commissioner John Coughlin said that the PSC "cannot conclude that there is a sufficient demonstration of scientific peer-reviewed findings to conclude that there is a causal relationship between EMFs and adverse human health effects." He cautioned, however, that controversy over EMF effects "could have a considerable societal impact." Coughlin is also chairman of the steering committee of the National EMF Research Program.

The commission rejected a proposal for a three-year moratorium on new transmission lines of at least 60 kV, which was requested by a citizens group, Promoting Options for Wise Energy Regulation (POWER). "The moratorium...could well be contrary to their stated goal," Coughlin said. If utilities were prohibited from building new lines, they would have to increase the current on existing transmission lines to meet the demand for power, he explained, adding that this would generate stronger magnetic fields and increase the exposure of nearby residents. A bill pending in the Wisconsin legislature also calls for a three-year moratorium (see *MWN*, N/D91).

The PSC ruling was based on two sets of hearings held last October: five days of technical hearings in Madison and public hearings in Eau Claire, Stevens Point, Green Bay and Madison. Among the 14 witnesses at the technical hearings were Dr. Abe Liboff of Oakland University in Rochester, MI, Dr. John Moulder of the Medical College of Wisconsin in Milwaukee, Dr. David Savitz of the University of North Carolina, Chapel Hill and Dr. Michael Silva of Enertech Consultants in Campbell, CA.

The PSC ruling, which is scheduled to be issued as a formal order in late February, stipulates that:

• Utilities planning transmission lines must consider the number of people exposed to EMFs as well as the intensity and duration of exposures. This information must be included in siting proposals to the PSC. The commission will "take a hard look at the alternatives" to siting a line near residential areas, PSC Chairwoman Cheryl Parrino said, according to the January 17 *Wisconsin State Journal*.

• Utility and PSC staffers will work together to set up a uniform protocol for measuring EMFs on request. They will also develop a system for managing the data.

• Utilities must include EMFs in the demand-side planning already required by the PSC. Dasho said that the commission will use the EMF issue to press for greater conservation efforts.

• The best available control technology requirement for transmission lines may be modified on a case-by-case basis, particularly to ensure that worker safety and a reliable power supply are not put at risk.

• Utilities that lack the capability to use low EMF technology are not excluded; they must develop it.

The PSC also urged the state's utilities to support further EMF research programs, in addition to those at the Electric Power Research Institute (EPRI), according to Dasho. This was done due to a "perception" that EPRI's research is tainted by a pro-utility bias, he said. "No one on the commission has a problem with the research, but every time you bring up EPRI research, the public dismisses it." The utilities will prepare a report on possible alternatives to EPRI.

The final PSC order, including compliance deadlines, will be available from: Jackie Reynolds, Secretary to the Commission, Hill Farms State Office Building, PO Box 7854, Madison, WI 53707, (608) 266-8097.

Children Allowed Transfers in Florida School Settlement

Parents who have been battling school officials over EMFs at the Sandpiper Shores Elementary School in suburban Boca Raton, FL have won the right to transfer their children to other Palm Beach County schools. In their settlement of a three-year-old lawsuit, the parents and the county school board agreed that a request for a transfer must be accompanied by a note from a physician—simply indicating that the doctor was consulted on EMF health concerns. Midyear transfers have been requested for 32 students, according to Sharon Rausch, a plaintiff in the suit; transfers can also be requested next fall, she pointed out.

The class action suit, which was filed before the school opened, "is effectively over now," said Lawrence Marraffino, attorney for the parents. When the school was under construction, a number of parents became concerned about high voltage power lines nearby and sought an injunction to keep the school closed (see *MWN*, S/O88 and J/F89). It opened on schedule, but the court ordered that areas with the highest magnetic field measurements not be used (see *MWN*, M/J89 and J/A89).

The court also required EMF measurements: during the 1989-90 school year, teachers sported EMDEX gaussmeters. The levels recorded averaged under 2 mG, but some parents were not reassured (see *MWN*, M/J90). Marraffino told *Microwave News* recently, "We're going to keep checking on the levels," especially in the summer, when power consumption is at its peak due to the use of air conditioners.

Mitigation Roundup

Washington State Task Force Report

A Washington State task force charged with recommending research priorities and legislative options for reducing power line EMFs has called for a "systematic assessment of the proximity of Washington State residents and structures to power lines and other sources of EMF."

Among the other types of study the panel suggests are: a comparison of field measurements with computer projections of distribution system EMFs; a comparison of the performance of underground and overhead transmission lines; and an examination of the feasibility of reducing EMFs through energy conservation and load management.

Established by the legislature in March 1990, the Electric Transmission Research Needs Task Force concluded in its final report that, "It would be shortsighted not to research and refine techniques to reduce public exposure to power frequency fields, given the lead time to implement solutions...."

The panel also found that:

• For 230 kV transmission lines, burial provided the best EMF mitigation. An underground cable in fluid-filled steel pipe had a magnetic field of 0.2 mG and an electric field of less than 0.1 kV/m, at 40 feet from the center line. These levels compared with 29.7 mG and 1.9 kV/m from the commonly used horizontal design, 6.7 mG and 0.9 kV/m from a multiphase, six-conductor system and 4.8 mG and 0.6 kV/m from a double circuit/split-phase design.

• For distribution systems, increasing voltages or using a double circuit design was the most effective means of reducing magnetic fields. A flat, horizontal 12.5 kV overhead line yielded 7.7 mG. Doubling the voltage cut the magnetic field to 3.1 mG, but increased the electric field slightly, to 0.04 kV/m. A double circuit, split-phase overhead design produced 2.5 mG and 0.04 kV/m.

The 88-page report, *Electric and Magnetic Field Reduction: Research Needs*, is available at no charge from: Washington State Department of Health, Office of Epidemiology, PO Box 47813, Olympia, WA 98504, (206) 753-5935.

Six-Phase Power Distribution Patent

A Florida engineer, Dr. Robert Ashley, has received a patent for a six-phase power distribution system designed to reduce EMFs and improve power line efficiency. According to computer calculations, field cancellation from Ashley's arrangement of six conductors can reduce magnetic fields to a level that is one-fifth of that generated by existing three-phase systems.

By doubling the number of conductors, the current in each is reduced, which in turn cuts line losses. "This is a significant reduction in distribution system losses, which could pay for the additional wire in some ten years," Ashley told *Microwave News*.

Patent number 5,070,441, approved December 3, 1991, outlines ways of connecting six-phase distribution lines to existing three-phase transmission lines at the substation and to standard single-phase and three-phase loads at the service drop. Ashley has additional related patents pending.

Ashley described his distribution system as an "economically attractive alternative method of resolving [a] political problem." He said that he does not believe power line EMFs are a health risk but does see demand for low EMF distribution systems. "I would like to be a millionaire," he said, with an eye on possible royalties.

New Papers

• Three papers presented at the *1992 Winter Meeting of the IEEE Power Engineering Society*, January 26-30 in New York City, review the potential for magnetic field mitigation using six- or twelve-phase high voltage transmission lines—known as high phase order (HPO) systems. In "Magnetic Field Reduction Using High Phase Order Lines" (92 WM 284-0 PWRD), Steinar Dale of Oak Ridge National Laboratory in Oak Ridge, TN, Kenneth Klein of Energetics Inc. in Columbia, MD and James Stewart of Power Technologies Inc. in Schenectady, NY report results from work at an HPO test facility in Malta, NY. The researchers conclude that, "It is possible to develop [HPO] alternatives to three-phase lines with comparable power-handling capacity, significantly smaller size, and the same or reduced ground level fields." Stewart told *Microwave News* that this paper is the last in a series based on work at the Malta facility. He said work on HPO transmission systems will now be focused on a demonstration project in the Binghamton, NY area. In the next few months, a 1.5-mile, six-phase line will go into service as part of New York State Electric and Gas Corp.'s transmission system. Stewart said the Binghamton line should provide practical knowledge about system protection and integration of HPO lines into existing power grids. For more on this project, see R.V. Rebbapragada et al., "Selection and Application of Relay Protection for Six-Phase Demonstration Project" (92 WM 199-0 PWRD) and "Design Modification and Layout of Utility Substations for Six-Phase Transmission" (92 WM 226-1 PWRD). The papers are available for $3.50 each for IEEE members and $6.50 each for nonmembers, plus $4.00 postage and handling, from: Single Publication Sales Department, IEEE Service Center, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855, (908) 981-0060.

• James Burke of Power Technologies Inc. reviews the pros and cons of a number of mitigation ideas in "Controlling Magnetic Fields in the Distribution System" in the December 1991 *Transmission and Distribution*. He addresses grounded versus ungrounded, and single-phase versus three-phase, distribution systems, in addition to underground cables, higher primary voltages and line compaction. Burke concludes that, "The mitigation of magnetic fields can be achieved, but at a high cost and with a potential reduction in system reliability."

Power Line & Substation Cancer Links Studied on Cape Cod

A long-awaited environmental epidemiological study of elevated cancer rates in five Cape Cod, MA towns implicates high voltage power lines and substations. The link to electromagnetic fields (EMFs) was only a small part of the three-year, $500,000 study, however.

"The results suggest that EMFs may be biologically active. There is a need for continued investigation," Dr. Ann Aschengrau of the Boston University (BU) School of Public Health, the lead investigator, told *Microwave News*. The study was sponsored by the Massachusetts Department of Public Health (see *MWN*, M/J88).

Among the other findings were increased cancer risks for people exposed to aerially sprayed pesticides, airborne pollutants from airport runways and military facilities and contaminated drinking water. Aschengrau and her coinvestigator, Dr. David Ozonoff, also of BU, looked at the possible influence of the PAVE PAWS radar at the Massachusetts Military Reservation, formerly the Otis Air Force Base, but the findings were inconclusive.

"Our results suggest that there is some association with environmental factors, although our study was unable to estimate its magnitude," Aschengrau said, but she cautioned that environmental exposures "explained only a small part of the elevated rates of cancer on the Upper Cape." She added that, "It's clear that there was a tremendous amount of pollution on the Upper Cape....We're saying that there was ample reason to be concerned, but we couldn't find a link to most of the cancers we studied."

Aschengrau and Ozonoff found that people who lived within 500 feet of a 115 kV transmission line had an adjusted relative risk (RR) of 1.57 of developing lung cancer; the risk rose to 1.8 for those living within 300 feet. They also found increased rates of bladder cancer (RR=2.57) among those living within 500 feet of the line. For all cancers combined, the relative risk was 1.37. None of these findings was statistically significant.

For those living within 500 feet of a substation, the relative risk for lung cancer was 2.78, which bordered on statistical significance. The researchers also observed a nonsignificant elevated rate (RR=1.69) of female breast cancer. (There were no cases of male breast cancer on the Cape, according to Ozonoff.) Within 250 feet of a substation, the relative risk for all cancers combined was 2.84.

Ozonoff noted that the lung cancer finding showed up twice, which, he said, was "kind of suspicious." He explained that the cases near substations were not the same ones as those near power lines. In November 1989, Dr. Genevieve Matanoski of the Johns Hopkins University School of Public Health reported higher rates of lung cancer and other types of cancer among EMF-exposed telephone cable splicers (see *MWN*, N/D89).

The BU researchers did not find elevated rates of brain tumors or leukemia near power lines and substations, but did observe a statistically significant increased risk (RR=3.98) of brain tumors among people living within 1.9 miles of runways at military installations and a moderately elevated, nonsignificant risk (RR=1.50) for those within 1.9 miles of the Barnstable Municipal Airport. When asked if radar might be a contributing factor, Aschengrau said that the idea was "intriguing" but that the municipal airport results were confounded by the population's exposure to Barnstable's contaminated water supply: "If I had to bet on anything, I'd say maybe it was the water."

With regard to the phased array radar, the team stated, "While no association was seen for PAVE PAWS, the available exposure data were inadequate. We strongly recommend that systematic power density measurements be taken throughout the area scanned by PAVE PAWS so that useful exposure data will be available for future analyses of its potential health impact."

Environmental exposures were estimated by geographic proximity and length of residence. A limited number of magnetic field measurements were taken in front of some residences; power line wire codes were not used to assess exposures.

The researchers investigated 1,042 cases of cancer diagnosed among residents of Barnstable, Bourne, Falmouth, Mashpee and Sandwich between 1983 and 1986 and matched them with 1,285 controls. The study focused on lung, breast, colon/rectum, bladder, kidney, pancreatic, brain and liver cancers and leukemia.

U.K. Biological Effects Review

A report issued by the U.K.'s Institution of Electrical Engineers (IEE) concludes that, "At present there is no widely accepted experiment which can demonstrate any biological effect of low-level electromagnetic fields [EMFs]." The report endorses guidelines based only on thermal effects and induced currents.

"Sensationalist" reports in the media are to blame for the recent upsurge in public awareness of potential EMF health effects, according to the review panel, chaired by Dr. A.T. Barker of the Sheffield Health Authority, that wrote the July 1991 report. Other panelists are: Dr. R.A. Cartwright of the University of Leeds, Dr. O.C. Jones of the National Physical Laboratory, Dr. C.L. Lopez-Cacicedo of National Power, Dr. J.C. Male of the National Grid Research and Development Centre and Professor P.A. Payne of the University of Manchester.

The reviewers endorse the guidelines issued by the National Radiological Protection Board (NRPB), which state that there are "insufficient biological and epidemiological data to make a health risk assessment or even to determine whether there is a potential hazard" with regard to athermal EMF effects (see *MWN*, J/A89). The NRPB guidelines are based on "reference levels" for thermal effects issued by the International Radiation Protection Association (see *MWN*, M/A87 and J/F88).

Epidemiological studies "do not provide a firm link with electric or magnetic field exposures and may be observing some other occupational factor," according to the IEE report. However, the panelists conclude that a number of epidemiological studies scheduled to be completed in the next three years should "add significantly to our knowledge of the effects of human

exposure to low frequency fields."

"Laboratory studies have yet to prove reproducible for low-level fields and none of the hypothetical mechanisms proposed in the literature can be regarded as proven by experiment," according to the reviewers. Ion cyclotron resonance research is cited as "the most promising area" for discovering EMF–health effects mechanisms.

The Possible Biological Effects of Low-Frequency Electromagnetic Fields is available for £5.00 from: IEE, Savoy Pl., London WC2R OBL, U.K., (44+071) 240-1871.

HIGHLIGHTS

Seattle and King County Set RF Exposure Limit at 200 μW/cm²

Motivated by concern that broadcast facilities could present a health risk, Seattle and King County, WA (where Seattle is located) have adopted identical limits for public exposures to radiofrequency and microwave (RF/MW) radiation. The new standards, which are modified versions of those recommended by the National Council on Radiation Protection and Measurements (NCRP), limit exposures to 200 μW/cm² in the 30-300 MHz range (see *MWN*, M/J86).

The standards cover the frequency range from 100 kHz to 300 GHz. The limit rises to 20 mW/cm² at 3 MHz and to 1 mW/cm² above 1.5 GHz—tracing out the now common well shape that appears in both the NCRP and the American National Standards Institute (ANSI) guidelines.

"It is an important first step," City Councilwoman Sue Donaldson, who pushed for the new standards, told *Microwave News*. She pointed out, however, that the available data are "not adequate" to ensure that the 200 μW/cm² level is safe. Clifford Marks of the city's Office of Long Range Planning (OLRP) agreed: "Though the intention is to lower the risk, no one can guarantee that the limits are safe." The city council will continue to review health effects literature and could revise the standards at any time.

The King County Council adopted the limits on July 8, 1991, and the Seattle City Council followed by unanimously approving the standards on January 27, 1992. The joint Seattle/King County Health Department is in charge of enforcing the limits.

City and county officials had been working to develop the new standards for several years. Originally, Seattle's OLRP had proposed a 100 μW/cm² limit, but it was opposed by the mayor and the National Association of Broadcasters (see *MWN*, J/A88, J/A89 and S/O89). The recommendation was later revised upward to 200 μW/cm². "If there were ever a legal challenge to the limit, the mayor thought we would have a much easier time defending a 200 μW/cm² standard because this is more in line with what other bodies are recommending and adopting," Marks explained in a telephone interview.

In March 1991, Donaldson convened an advisory committee of representatives from both local citizens groups and the

SCC-28's Response to Seattle

Last fall, Seattle City Councilwoman Sue Donaldson wrote to Dr. Tom Budinger of the Lawrence Berkeley Laboratory in Berkeley, CA, the chairman of the IEEE's Standards Coordinating Committee 28 (SCC-28), which has revised the 1982 ANSI RF/MW safety limits, expressing concern over the adequacy of the draft standard (see MWN, *S/O91). Excerpted below is Budinger's November 15, 1991 reply. (For more on the new ANSI standard, see* MWN, *N/D91.)*

...The basis for the guidelines for [RF/MW] frequencies is the known reversible changes in behavior of subhuman primates in repeatable experiments with an absorbed power of 4 W/Kg. Based on these data, the committee took a prudent approach of a factor of 10 to arrive at a maximum whole-body averaged specific absorbed power of 0.4 W/Kg for controlled environments and 0.08 W/Kg for uncontrolled environments. The standards are based on a further assumption that the individual would be in a worst-case situation: the incident electric field is uniform over the extent of the human body, is parallel to the human body, the person is standing barefoot and in contact with a wet, highly conductive ground. After consulting with Dr. [Om] Gandhi, I am satisfied that to the present knowledge of RF dosimetry, the specific absorbed power is only a small fraction of the above-quoted values if all the worst-case conditions do not occur in a particular electric and magnetic field exposure situation. Thus, if we computed from the information given in the revised standards that an individual might receive 0.4 W/Kg averaged over the whole body and that individual was wearing shoes or standing above dry ground, the actual specific absorbed power would be very much less than the expected 0.4 W/Kg. In short, the [specific absorption rates] encountered in real life are likely to be as much as two orders of magnitude lower than the 1 to 4 W/Kg [range which is cited as dangerous and possibly lethal] in your letter.

With regard to literature since 1986 on lethal effects and non-thermal effects, I would like to emphasize two perspectives. First, data reported in the reviewed literature are not being ignored. Some experiments are under keen scrutiny at this very moment as Subcommittee 4 is still charged with the task of revising the revised standard. Experiments involving animals in healthy and normal environments wherein the data are not confounded by hypoxic conditions or parasite infestation are specifically garnered from the literature for close scrutiny. Experiments show some effects in animals which have been in an unnatural state either through their environmental conditions or the presence of some pathology. Secondly, I have also learned through many years of experimental work that data from cell systems cannot be extrapolated to the integrated biological systems.

With regard to the 7 watts exclusion (less for higher frequencies), we sought a prudent level below the whole-body allowed power of 28 watts (0.4 W/Kg x 70 Kg) and a desire to keep a local SAR below 8 W/Kg....

broadcast industry to review the scientific data—the group recommended the 200 μW/cm² limit. "I think everyone just needed to sit down and talk to get things moving," Donaldson said.

The limit was a "compromise," according to Tom Buchanon, who served on the advisory committee and is a member of the Central Area Neighborhood Association in Seattle. Though some residents would have preferred a lower limit, the new policy "is the start of something that is very important for people in dense urban areas...it signals a consciousness of the possible RF health risks and an awareness that broadcast emissions need to be taken into account," Buchanon said.

Industry officials had argued against a 100 μW/cm² limit, and they are generally pleased with the new standards. "The radiation issue was one of the prime concerns when drafting the policy....There is always a group that says 'not in my back yard,' but, in general, I think that the citizens decided that this policy was the best that they could hope for," KING Broadcasting's Ken Hermanson, who also served on the advisory committee, said in a telephone interview.

Jim Hatfield a Seattle-based RF consultant who has followed the health effects issue closely, told *Microwave News* that, "Actual ambient fields do not approach the levels of the standard," adding that, "We can't say what is safe or unsafe, but we can put it in context."

Nevertheless, some still feel that the 200 μW/cm² limit is too lenient. "It protects us against getting singed, but not against cancer and other chronic effects," Joanne Lenox of the Cougar Mountain Residents Association, a group formed to oppose a cluster of broadcast towers in King County, said in a telephone interview (see *MWN*, J/F86). In the past, county residents have also voiced concern over a number of satellite communications towers located on Vashon Island (see *MWN*, M/A86 and M/J86).

NY Police Union Surveying Members on Cancer and Radar

The union representing New York state troopers has launched a survey of police officers to examine a possible link between police radar and cancer. The Police Benevolent Association of the New York State Troopers (PBA/NYS) mailed a one-page questionnaire to 6,000 members last November. It was sent to active and retired officers but not to the families of deceased officers, said Trooper Maureen Tuffey, a PBA/NYS spokeswoman.

Although the questionnaire was developed informally and was not originally intended for scientific analysis, Drs. John Violanti of the Rochester Institute of Technology (RIT) and John Vena of the State University of New York at Buffalo, who have collaborated on previous epidemiological studies, will review the data.

A former New York state trooper, Violanti first learned of the PBA/NYS health survey when he received a questionnaire in the mail. He told *Microwave News* that he had regularly used police radar devices during 23 years as a police officer. A preliminary analysis should be completed by this spring, Violanti said.

SAB Completes Review of EPA Cancer Report

On January 31, the Environmental Protection Agency's (EPA) Science Advisory Board (SAB) forwarded its review of the agency's EMF–cancer report to Administrator William Reilly. As expected, the SAB is seeking a complete rewrite of the report to correct "serious deficiencies." The final SAB recommendations are very similar to those circulated last summer (see *MWN*, J/A91).

The SAB is continuing to work on EPA's EMF research strategy. The SAB Executive Committee has asked its EMF subcommittee to rework its report on this document.

A limited number of copies of the SAB review are available at no cost from: Lori Gross, SAB (A-101), EPA, 401 M St., SW, Washington, DC 20460, (202) 260-4126.

In 1986, a team led by Vena and Violanti conducted a study of 2,376 police officers in Buffalo, NY. It reported that officers who worked 20-29 years had 3.64 times as many brain cancer deaths as expected based on the observed rates among U.S. males, 1950-1979; officers who worked 10-19 years had 3.75 times the expected colon cancer rate and 4.0 times the expected blood cancer rate. In "Mortality of a Municipal Worker Cohort: III. Police Officers," *American Journal of Industrial Medicine, 10*, pp.383-397, 1986, the team suggested exposure to police radar signals and radio transmissions as possible causes. See also, Violanti et al., "Disease Risk and Mortality Among Police Officers: New Evidence and Contributing Factors," *Journal of Police Science and Administration, 14*, pp.17-23, 1986.

Tuffey said that the data the PBA/NYS is collecting will also be sent to the Food and Drug Administration, which is gathering anecdotal reports of cancer linked to police radar (see *MWN*, S/O91).

In response to a PBA/NYS request, the New York state police stopped using hand-held radar guns in November. The state police used about a dozen of these units to calibrate speedometers in its own vehicles, according to Maj. Douglas Ostrander of the NYS police. The department's standard radar units use dashboard-mounted antennas. Late last year, the Connecticut state police stopped using hand-held radars due to concern about the alleged cancer hazard (see *MWN*, N/D91).

Drs. Robert Davis and Samuel Milham of the Washington State Department of Health in Olympia are reviewing the health records of some 1,000 police officers in the state and expect to complete the study this year (see *MWN*, M/A91).

No Increased Reproductive Risks Among MRI Workers

Pregnant women did not experience higher rates of reproductive problems, such as miscarriages and premature deliveries, when they worked as magnetic resonance imaging (MRI) technicians than when they were employed in other jobs,

according to the preliminary results of a new study.

"These results, while tentative...suggest that there is not a substantial increase in these common adverse reproductive outcomes," concluded Drs. Emanuel Kanal of the Pittsburgh (PA) NMR Institute, Frank Shellock of the Cedars-Sinai Medical Center in Los Angeles, CA, David Savitz of the University of North Carolina, Chapel Hill and Joseph Gillen of the University of Pittsburgh.

In terms of static field exposures, "the data are reassuring," Kanal told *Microwave News*. But he emphasized that, "The study does not provide us with any data on the safety—or lack thereof—of time-varying field exposures, since only the extreme minority of operators would have been exposed to these components."

The team sent questionnaires addressing menstrual, reproductive and work histories and potential confounders—such as smoking, age and alcohol consumption—to female MRI technicians and nurses at more than 90% of the clinical MRI facilities in the U.S. More than 1,900 women responded with information on 1,448 pregnancies.

Pregnancies that occurred while the respondents were MRI operators were compared with those that occurred when the women were otherwise employed or not working. The researchers observed a nonsignificant relative risk of 1.3 for miscarriages during MRI work; there were no increases in fertility problems or in pre-term deliveries. They noted, however, that the results are "tentative given the unknown response rate, self-reporting information and the potential for heightened health concerns among MRI operators."

In a telephone interview, Savitz noted, "The study does suggest that all women who were working [either at MRI centers or elsewhere] at the time of pregnancy showed more reproductive risks than those who were not working at all."

Kanal presented the findings at the *77th Annual Meeting of the Radiological Society of North America* in Chicago on December 4, 1991. Kanal and Shellock are members of the Society for Magnetic Resonance Imaging's safety committee.

In a related area, the International Non-Ionizing Radiation Committee of the International Radiation Protection Association provides guidance for the protection of patients undergoing an MRI scan in the December 1991 issue of *Health Physics (61*, pp.923-928).

Gulf Coast Site for EMPRESS II Draws Community Opposition

The Navy has again encountered opposition to the EMPRESS II barge—this time while seeking a site for the electromagnetic pulse (EMP) simulator in the Gulf of Mexico, off the Mississippi and Alabama coasts.

Previously forced to abandon plans to deploy the facility on Chesapeake Bay, the Navy has operated EMPRESS II—the acronym stands for EMP Radiation Environment Simulator for Ships—off the coast of North Carolina since 1988. But, due to local weather conditions, the Navy can only use that location during the summer. It has been pursuing the Gulf Coast site for use the rest of the year (see *MWN*, J/A88 and J/A89).

Through most of its environmental review process, the Navy encountered little opposition to the winter site, which is about 25 nautical miles offshore. But controversy flared in December after a series of articles on risks associated with EMP, written by Glynn Wilson, appeared in the *Islander*, a semiweekly newspaper in Gulf Shores, AL.

A January 7 meeting in Gulf Shores, the largest town on this stretch of beaches and tourist resorts, drew 400 to 500 people. "From [the Navy's] presentation, more opposition grew," said Roger Riggs, a local attorney who has been leading the opposition to EMPRESS II. In the final environmental impact statement (EIS), released last October, the Navy wrote that, "There is scientific evidence to assure us that EMP has no effect on humans." But Riggs disagreed: "They do not discuss the broad range of material that's out there," he told *Microwave News*. The EIS is available from: Lt. Commander Joseph Osborne, Naval Sea Systems Command (PMS-423), Department of the Navy, Washington, DC 20362-5101, (703) 602-3348.

Florida Radar–Cancer Link *(continued from p.1)*

In a telephone interview, Hopkins conceded that many researchers have tried—and failed—to find a viral cause for Hodgkin's, but he added that recent studies of retroviruses, following the discovery of the AIDS virus, have rekindled interest in this possibility.

Dr. Samuel Milham Jr., an epidemiologist with the Washington State Department of Health in Olympia, questioned Hopkins's conclusion. "Viruses account for only a small portion of all cancers. I don't see how the radar can be dismissed out of hand," Milham told *Microwave News*.

The radar facility, which is maintained by the FAA, is an FPS/66A—a long-range radar that operates on 1265 MHz and 1365 MHz. A height-finding radar that operated on 2710 MHz was decommissioned in 1989.

Radar is well known in the area as a persistent source of radiofrequency interference (RFI). Complaints from people who live in the South Patrick Shores subdivision and from the Air Force Technical Applications Center (AFTAC), a high-security computer facility on the base, have prompted repeated investigations that implicated the radar facility. Military contractors have taken RF measurements on at least three occasions since 1987. The FPS/66A's emissions are readily identifiable because bursts of RFI occur every 12 seconds, corresponding to the time it takes to complete a 360° sweep of the horizon.

In an apartment about 1,000 yards away from the radar—more than twice as far from the facility as the homes of most of those in the cluster—engineers found a peak field strength of 195 V/m (~10 mW/cm^2) and an average strength of 0.42 V/m

(~0.05 μW/cm²) at 1345 MHz. Measurements made near Highway A1A, which runs next to the radar installation, showed average field strengths of 0.2 μW/cm² at 1265 MHz, 2.5 μW/cm² at 1345 MHz and 132 μW/cm² at 2710 MHz.

Hopkins reported that 2.2 Hodgkin's cases would be expected in the study area for 1967-1990. He found that the actual occurrence of the disease was 2.7-3.6 times the expected rate. The precision of that ratio depends on assumptions about latency period—the interval between exposure to the presumed cause of the illness and onset of symptoms—which determine who is included in the study population. Hopkins counted the eight cases based on where people lived four to nine years before diagnosis.

Hopkins said he is following up on the possible radar link and has requested information on the power output and direction of the radar. He downplayed the possibility that exposure to toxic chemicals played a role in this cancer cluster.

The elevated risk of Hodgkin's appears to have passed. "If anything, there has been a deficit of Hodgkin's in the area" in recent years, Hopkins said. He is looking for something that could account for the drop-off in Hodgkin's cases. Any change in the strength or direction of the emissions in the mid-seventies "would certainly pique my interest," he said.

Though all but one of the eight people in the DHRS study lived in one corner of the South Patrick Shores subdivision, within a few blocks of the radar, Hopkins said there is "no hard evidence" that Hodgkin's is caused by exposure to non-ionizing radiation. He said, however, "It certainly is true that if you stand in that neighborhood...and look north, what dominates your view is that radar dome."

On January 7, following publication of a special report in *Florida Today* on the possibility of a link between the cancer cluster and the radar, the FAA said it planned to replace the radar facility at Patrick AFB by the end of 1994. An FAA spokeswoman, Kathleen Bergen, told *Microwave News* that the radar will be replaced as part of a multibillion-dollar upgrade of air traffic control facilities nationwide, which was being planned as far back as 1981. "Our decision to put in a new facility has nothing to do with any alleged cancer cluster," she said.

In a January 8 editorial, *Florida Today* praised the FAA's decision to shut down the radar, but added that, "the clouds of suspicion and fear that hang over the Patrick radar and similar installations will remain until adequate research is conducted to resolve the health issue conclusively."

European Bioelectromagnetics *(continued from p.1)*

being organized under the auspices of the European Community's Directorate-General for Science, Research and Development. For instance, Dr. Bertil Persson of the Lund University Hospital in Lund, Sweden, is working with scientists from five labs in Belgium, France, Italy and Sweden to set up a project on the *Biomedical, Biological and Health Effects of Modulated Radiofrequency (RF) Radiation.* A second research project, on power frequency electromagnetic fields (EMFs), is in the planning stages.

At the same time, a proposal has been developed by COST—which stands for European Cooperation in the Field of Scientific and Technical Research—to coordinate bioeffects research with an aim toward setting a common European standard for exposures to non-ionizing radiation, from DC to visible light. At an October workshop in Rome, Italy, 28 participants from nine countries adopted a memorandum of understanding for this project (COST 20B) on the biomedical effects of EMFs. If approved by COST officials next April and if at least four of the 23 COST member countries* then agree to participate, a four-year effort will be launched to "stimulate" work on unresolved health problems.

Professor Zlatko Koren of the University of Zagreb in Croatia, who is leading the COST initiative (see *MWN*, J/A91), told *Microwave News* that he expects at least 15 countries to sign up for the project. He said that it would be sponsored by the participating countries.

Plans are also under way for establishing a European Bioelectromagnetics Center (EBC) to provide, according to Leal, "the best physical and biological conditions to perform collaborative scientific experiments, in vivo and in vitro" for all types of non-ionizing radiation. The board of directors of the EBEA is assembling a committee to canvass scientists from across Europe on the best way to set up the center. Koren anticipates coordination between the COST project and the EBC.

EBEA Research Papers

The EBEA conference offered a rich assortment of research results from across Europe. These included:

- New evidence that microwave radiation can increase the permeability of the blood–brain barrier—Drs. Leif Salford and Bertil Persson of the Lund University Hospital;
- Indications that a 20 Hz, 20 G magnetic field can alter the morphology and mitochondrial activity of human breast cancer cells—Dr. Sabine Johann of the Institute of Experimental Surgery at the Technical University of Munich, Germany;
- Indications of an increase in chromosomal breaks among

*These include the 12 members of the European Community, as well as Austria, Czechoslovakia, Finland, Hungary, Iceland, Norway, Poland, Sweden, Switzerland, Turkey and Yugoslavia.

MICROWAVE NEWS is published bimonthly • ISSN 0275-6595 • PO Box 1799, Grand Central Station, New York, NY 10163 • (212) 517-2800; FAX (212) 734-0316 • Editor and Publisher: Louis Slesin, PhD; Managing Editor: Robert Dieterich; Associate Editor: Barton Biggs; Assistant Editor: Andrew Goffe; Contributing Editors: Jennifer Goren, Mark A. Pinsky; Copy Editors: Jim Feldman, Peter Pullman; Circulation Director: Barbara Gerson • *Subscriptions: $285.00 per year ($315.00 Canada & Foreign, U.S. funds only); single copies: $50.00*

cable splicers employed at a high voltage test lab, especially those who smoke—Dr. Arnt Vistnes of the University of Oslo, Norway;

• The first observation of changes in the movement of calcium in *individual* cells exposed to a 50 Hz magnetic field—Ewa Lindström and a team from the University of Umeå, Sweden and the National Institute of Occupational Health in Umeå;

• Further analysis of the data generated by the Henhouse Project (see *MWN*, M/A88) demonstrating even more conclusively that pulsed magnetic fields can have profound effects on the developing chick embryo—Dr. Jocelyne Leal of the Ramón y Cajal Hospital in Madrid, Spain;

• Epidemiological and accident reports showing that airport workers who are exposed to radar radiation have higher rates of chromosomal aberrations and other health problems—Drs. Jasminka Goldoni and Vera Garaj-Vrhovac of the Institute of Medical Research and Occupational Health at the University of Zagreb;

• Experimental data indicating that intermittent exposure to 45 Hz, 1.26 mT magnetic fields can have effects on the EEGs of human volunteers—Russian-Finnish team led by Dr. Eugene Lyskov of the Institute of the Human Brain in St. Petersburg, Russia.

In addition, Finnish researchers presented new epidemiological evidence that magnetic fields from video display terminals (VDTs) can result in greater risk of miscarriages. (Detailed reports on this work and on the Croatian radar results will appear in our next issue.)

The next EBEA meeting will be held in 1994; Leal announced that she had already received offers to host the meeting from both western and eastern Europe. In the meantime, the EBEA is planning a workshop on *Interaction Mechanisms of EMFs with Biological Systems*, which will be held in Puschino, Russia in October. The EBEA is also one of the organizers of next June's *World Congress for Electricity and Magnetism in Biology and Medicine*, to be held in Orlando, FL.

The *Transactions* of the conference, including abstracts of the papers and posters presented at the meeting, are available from: Dr. Marcel Rooze, Laboratory of Embryology and Human Anatomy, Medical School, Free University of Brussels, 1000 Brussels, Belgium, (32+2) 536-6376. The price was unavailable at press time. A selection of these papers will be published in a special issue of *Bioelectrochemistry and Bioenergetics*.

EC Panel Proposes Guidelines for Worker NIER Exposures

A working group of the Commission of the European Communities has issued proposed guidelines for occupational exposures to non-ionizing electromagnetic radiation (NIER).

The recommendations closely follow those of the NIER committee of the International Radiation Protection Association. They include guidelines for static and extremely low frequency electromagnetic fields and radiofrequency, microwave, infrared, visible and ultraviolet radiation.

The proposal appears in *Physica Medica* (7, pp.77-89, April-June 1991)—the official journal of the Italian Association of Biomedical Physics. For more information, contact: Dr. Martino Grandolfo, Physics Laboratory, Superior Institute of Health, Viale Regina Elena 299, 00161 Rome, Italy.

FROM THE FIELD

Interview: Congressman George Brown

As chairman of the House Committee on Science, Space & Technology, Rep. George Brown (D-CA) has played a leading role in setting federal electromagnetic field (EMF) research funding. In 1990, at his initiative, Congress gave the Environmental Protection Agency (EPA) $750,000; in 1991 his legislation led to a $1.94 million EPA EMF research budget. Late in 1991, Brown and Rep. James Scheuer (D-NY) introduced H.R.3953, the National Electromagnetic Fields Research and Public Information Dissemination Act. The bill would provide $70 million over ten years—$60 million for research and $10 million for public information—to be paid for jointly with federal and private funds (see MWN, *N/D91).* Microwave News *spoke with Brown by telephone in mid-January.*

Microwave News: Some people were surprised that in your legislation you named the Department of Energy (DOE) rather than EPA as the lead agency.

Brown: We made that decision in an effort to cooperate with the [Bush] administration.

MWN: Did you have a specific request from the administration?

Brown: The DOE had met with us and we were presented with a *fait accompli*.

MWN: Do you still foresee a large role for EPA in this?

Brown: Yes, we feel that EPA will have a role. There are going to be many agencies that will all be part of this and they will be equals with the DOE in providing coordination.

MWN: In the statement of introduction for your legislation, you expressed dismay with the way the DOE was designated the lead agency.

Brown: Right. I would have preferred EPA myself....We're not sure yet it will be carried out properly [by the DOE] at this point.

MWN: Can you explain that a little more?

Brown: Well, we're going to try to keep it within the purview of the people most concerned with health and the environment.

MWN: Your legislation puts the lead authority in DOE's Office of Health and Environment rather than the Office of Conservation and Renewable Resources (OCRR). Is that out of concern—as some DOE officials have expressed—that there is at least the appearance of a conflict of interest in OCRR because it is charged with promoting the electric power industry?

Brown: That's one of the concerns....Frankly, our main concern is with having an effective operation over at [DOE]. We have struggled with bureaucratic controversies for many, many years, and there isn't any good way to resolve them. What we hope to do is to establish some system and to provide considerable oversight.

MWN: You also expressed concern that the DOE was designated lead agency in appropriations report language.

Brown: We feel very strongly about that.
MWN: Do you intend to try to pursue how that happened in this particular case? I know you have a broader concern with that as chairman of an authorization committee.
Brown: We are actively pursuing ways to get the Appropriations Committee to stop making policy....We will seek to eliminate [the appropriations language] and replace it with authorization language....[W]e haven't passed an energy authorizations bill in God knows how long....
MWN: You had talked about the need for more Congressional oversight. Do you see Congress becoming more involved in federal EMF research?
Brown: Yes, I think so. Obviously, I have difficulty speaking for other committees....In our case, we have engaged in the most vigorous oversight program this committee has ever had.... We intend to continue that, and we intend to reassert our authorizing legislation as promptly as possible. But we intend to do that by working with the other committees which have some claim to overlapping jurisdiction. We're not trying to carve out the issue to ourselves...or to fight with the other committees.
MWN: Your bill calls for $60 million over ten years for research, or about $6 million a year. What would you like to see accomplished?
Brown: Well, within ten years we ought to be able to get a fairly definitive understanding of whether there are adverse biological effects at any particular level of EMF. I suspect that as with most situations, conditions hold in which there could be adverse health effects and we need to find that out in various circumstances. I see no reason why we can't achieve that kind of information within ten years.
MWN: Your bill uses a public–private funding mechanism.
Brown: Various industry groups have suggested that they feel that this is what we need to get a vigorous program that would still have the confidence of the public.
MWN: Do you feel that's a reasonable way to go?
Brown: Absolutely. The way the legislation sets the program up, the public agencies are in control but there are strong advisory committee and private industry connections in the process.
MWN: Do you see a role, as others do, for groups such as the National EMF Research Program (NERP) or the Health Effects Institute (HEI)?
Brown: It could easily be, because there is ample room for any other nonpublic organization...to be involved here in one way or another.
MWN: Would you be comfortable with some of the $60 million being given to the NERP or HEI?
Brown: I would have no problems with it. The bill provides mechanisms in which we can ascertain whether there are conflicts of interest or other things of that sort.
MWN: Could some of the federal funds go to the Electric Power Research Institute (EPRI) for, say, mitigation research?
Brown: I wouldn't object. I would assume that that kind of research would be done. In terms of funding, EPRI and some of the other private groups are proposing to contribute to the federal effort. So I'm not sure which way the money would go.
MWN: You are chair of a committee that is going to play a major role—as you say, you are not the only committee—
Brown: No, we're not the only committee...and we intend to cooperate with the [House Energy and] Commerce Committee.
MWN: Where do you rank this issue among other issues before your committee?
Brown: I do not rate it all that high. It certainly does not rate as high as the public interest in toxic waste or in radioactive hazards, or some things like that. I rate it down around the third or fourth tier of public concern, but one that may be rapidly increasing. And this is what we have to try to anticipate. Some of the members of Congress are under very strong pressure from constituency groups to do something about it. We don't want this to get out of hand, and the Congress to be accused of mostly reacting.
MWN: What kind of information program do you intend to fund with your legislation?
Brown: We're not in a PR game here. What we want to do is to set up mechanisms by which there is adequate transmission of research results and analytic findings and policy implications to key people in the public and [to] public interest groups that have a concern about this issue.
MWN: What are your bill's prospects in this session?
Brown: Well, this type of bill is not one that should cause us too many headaches....It has industry support; it has strong support among the members of Congress who are involved with this issue, which is not necessarily all that large a number. But I know of no organized opposition to it, so that means we ought to be able to move ahead. And the arguments about it will be over the sort of details that you raised: Who's going to carry it out? Who spends the money? And so on....[T]he money is already flowing under slightly different conditions....My anticipation is that we'll have this bill enacted this year.
MWN: Is it your hope that you will be able to get enough response from your hearing in March to develop some sort of consensus for your legislation?
Brown: Yes. Out of that hearing—I think not one hearing, we can always have a couple of short ones—I think we'll be able to go ahead with the markup of the bill and get it moving.
MWN: Are you planning to seek a Senate sponsor?
Brown: We'll get a Senate sponsor.
MWN: Let me jump to another issue, White House involvement in this issue. What's your knowledge of, or your dealings with, the administration on this?
Brown: I've spoken to the White House Science Advisor, Dr. [Allan] Bromley. He is the one who took upon himself the responsibility to make sure that the EPA report was not too flamboyant or likely to excite unnecessary public reaction [see *MWN*, M/A90 and N/D90].
MWN: Was Bromley's role appropriate?
Brown: Well, I was worried about it at the time, because I don't like to have the White House interfering with the peer-review process within the agencies, and I thought that was going along all right. I talked to Bromley about it, and he assured me that it was not his intention to interfere with the legitimate review process, but that he did have a broader concern. I think he acted quite properly....
MWN: Do you hear about EMFs when you're back in your district?
Brown: Yes....There are strong interests in southern California. There has been one program at the University of California—sort of in the nature of a public education program on the hazards of EMF—and some of the best research on EMF is being done at the Veterans Hospital [in Loma Linda] in my district.
MWN: Do you foresee a situation in which utilities are routinely going to have trouble siting power lines?
Brown: They already are, but for other reasons. There's a host of reasons—aesthetic, environmental, what have you, that cause power lines to have trouble. And I expect that will continue....On the other hand, the utilities are being much more perceptive when it comes to siting. I think that, on balance, they'll be able to do all right.
MWN: What's it going to take to get the federal government moving forward on this issue?
Brown: The federal government, at a low level, through the DOE, has been working on this for years. This is just what I would describe as a reasonable next-step expansion of an ongoing program, and [there's] nothing dramatic or startling about it in my opinion....We need to be more perceptive and anticipatory in a number of areas, and this is setting a good example for it.

UPDATES

CELLULAR COMMUNICATIONS

California Investigation... The potential health effects of cellular handsets will not be considered during the cellular phase of the California PUC's investigation into EMF hazards (see *MWN*, N/D91). "The [FCC] has preempted state authority to regulate these handsets," Administrative Law Judge Meg Gottstein wrote in a January 29 ruling. Gottstein, who is presiding over the investigation, also decided that cellular compatibility with hearing aids is beyond the scope of the investigation. The PUC will instead focus on transmissions from cellular broadcast facilities. In the same ruling, Gottstein created a panel responsible for organizing an informational workshop intended to narrow the scope of the probe and reduce the need for formal hearings. The panel will be chaired by a representative from the commission's Advisory and Compliance Division and will include Diana Brooks of the Division of Ratepayer Advocates (DRA), Dr. Raymond Neutra of the state Department of Health Services (DHS), John Scully of the Cellular Carriers Association of California and Sun Yung Kim of Citizens Concerned with Telecommunications EMF (CCTE). Gottstein's ruling followed a December 13 PUC workshop during which interested parties discussed the structure of the investigation. According to a report from the meeting, the cellular industry said it wants the proceeding "to be conducted as expeditiously as possible. Industry is concerned about the message sent when the [PUC] has an open investigation into the safety of its facilities." However, the DRA and the DHS maintained "that this phase of the proceeding should not be rushed." The DRA said it is also "concerned that the cellular industry has more extensive resources than other parties in this proceeding," and members of CCTE argued that they should be reimbursed for work in the investigation, according to the report. Dr. Neutra voiced similar concerns in a November 25 letter to Gottstein: "Neither the [DHS] nor the community groups have the resources to assemble the experts who have concerns about [RF] exposures, so the hearings would tend to be one-sided." Neutra also advised Gottstein to include cellular handsets in the investigation: "I would urge you to consider them since the exposure of those who use them is dominated by this source," rather than transmission towers.

LEGISLATION

Maine Restricts Light at Night... The state of Maine has enacted a law to curtail light pollution. The ordinance, which went into effect January 1, restricts new outdoor fixtures of more than 1800 lumens that are paid for by the state—including streetlights. New fixtures are to be "full cutoff luminaires," which allow no direct light above the fixture. For roadway lighting, the strength of the lighting is limited to the minimum required by the federal Department of Transportation, and safety alternatives such as reflectors or lowered speed limits must be used wherever possible. Rep. Jason Wentworth of Arundel, sponsor of the legislation, said engineers often recommend much stronger outdoor lighting than is needed for safety.

MEETINGS

EMF Conference... The power industry magazine *Transmission and Distribution (T&D)* is sponsoring its second "EMF conference and debate," March 9-10, 1992, at the Crystal Gateway Marriott Hotel, Arlington, VA. Speakers at the meeting, *EMF: How Dangerous?* will include: Dr. Robert Adair of Yale University; Dr. David Carpenter of the State University of New York, Albany; John Coughlin, chair of the steering committee of the National EMF Research Program and a member of the Wisconsin PSC; Rep. Peter Kostmayer (D-PA); and Dr. Stanley Sussman of EPRI. The registration fee is $450.00. Contact: *T&D*, EMF Conference, 5072 West Chester Pike, Box 556, Edgemont, PA 19028, (215) 359-1241.

PEOPLE

Dr. **Bill Kaune** has left Enertech Consultants and has returned to Richland, WA, where he used to work at Battelle Northwest Labs, to set up EM Factors, a consulting and research firm. Among the EMF services he is offering are: exposure assessments, dosimetry, instrumentation and mitigation....**Dinah McElfresh** has taken over from **Dick Ekfelt** as the executive director of the Electromagnetic Energy Policy Alliance....Dr. **Sam Milham** of the Washington State Department of Health has been awarded a Lifetime Achievement Award by Governor Booth Gardner for his epidemiological studies....**Ed Mantiply** of EPA's Office of Radiation Programs has moved his operation from Las Vegas, NV to the National Air and Radiation Environmental Lab in Montgomery, AL. Mantiply will continue to work on both high and low frequency issues....**Paul Gailey** has joined the Oak Ridge National Lab in Oak Ridge, TN to head the EMF program which supports the DOE. He replaces **Ben McConnell**....FDA's **Howard Bassen** and the University of Utah's Dr. **Carl Durney** have been elected fellows of the IEEE....Dr. **Sol Michaelson** of the University of Rochester, NY died of cancer on January 7.

RESOURCES

Michigan Hearing Transcript... The transcript of the August 6, 1991 congressional hearing on power line EMFs is now available. Rep. Howard Wolpe (D-MI) held the hearing in his home district to help resolve a conflict between Consumers Power Co. (CPC) of Jackson, MI and Michigan Residents Against Giant Electric (RAGE), a citizens group (see *MWN*, S/O 91). After the hearing Wolpe wrote to CPC urging the company to suspend construction of a 115-mile, 345 kV line. CPC rejected the suggestion, but later agreed to have the state's PSC settle the dispute in binding arbitration. Wolpe is chairman of the subcommittee on investigations and oversight of the House Committee on Science, Space and Technology. A limited number of copies of the 480-page transcript, *EMF and High-Voltage Power Lines: A Case Study in Michigan*, are available for $14.00 each from: U.S. Government Printing Office, Superintendent of Documents, Congressional Sales Office, Washington, DC 20402, (202) 783-3238. Refer to Stock No.552-070-11402-5.

Harkin Half Cooked..."I'm not a microwave Democrat." That's the catchy slogan Senator Tom Harkin (D-IA) was reported to be using as he made the rounds in New Hampshire. His point, according to the January 17 *New York Times*, was that others in the Democratic presidential primary were like leftovers heated up in a microwave oven: hot on the outside but cold on the inside, like the hard-hearted Republicans who have held the White House for more than a decade. Harkin appears to have his facts backwards: microwaves actually cook from the inside out.

Tesla Hits the Top Ten... Is the American public more interested in gauss than in Glasnost? Encyclopedia Britannica's Instant Research Service has found, after receiving 162,000 requests for information last year, that more people asked about Nikola Tesla, the inventor of AC current, than about either Mikhail Gorbachev or Boris Yeltsin. Tesla ranked as the tenth most popular individual for the year, just one notch below Al Capone and a mere three below Jesus.

1992 Conferences: New Listings

March 23-24: **2nd Nordic Meeting on the Bioeffects of EMFs**, Aalborg, Denmark. Contact: Povl Raskmark, Institute for Electronic Systems, Aalborg University Center, Fredrik Bajers vej 7A, DK-9220 Aalborg Øst, Denmark, (45) 98 15 85 22.

April 7-8: **Nonthermal Health Hazards of ELF EMFs: Principles of Biological Action and Exposure Evaluation**, Holiday Inn Motel, Silver Spring, MD. Contact: Dr. Marjorie Lundquist, Industrial Hygiene Institute, PO Box 11831, Milwaukee, WI 53211, (414) 372-7753.

April 22-24: **EMC/ESD International 1992**, Sheraton Tech Center, Denver, CO. Contact: Dawn Keith, EMC/ESD International, 6300 South Syracuse Way, Suite 650, Englewood, CO 80111, (800) 525-9154.

April 30-May 1: **Measurement of Power System Magnetic Fields**, Lenox, MA. Contact: Hazel Mazza, Electric Power Research Institute, High-Voltage Transmission Research Center, East New Lenox Rd., PO Box 796, Lenox, MA 01240, (413) 494-4358.

May 18-19: **4th Annual EEI/EMF Conference**, Ritz-Carlton Pentagon City, Arlington, VA. Contact: Gayle Harreld, EEI, 701 Pennsylvania Ave., NW, Washington, DC 20004, (202) 508-5654.

June 8-12: **High-Voltage Transmission Line Design**, Lenox, MA. Contact: Hazel Mazza, see April 30 above.

August 24-27: **22nd European Microwave Conference**, Helsinki University of Technology, Espoo, Finland. Contact: Microwave Exhibitions and Publishers, 90 Calverley Rd., Tunbridge Wells, Kent TN1 2UN, U.K., (44+892) 54 40 27.

September 21-24: **17th Annual Conference of the Australian Radiation Protection Society** (ARPS), Sheraton Hotel, Darwin, Australia. Contact: Dr. Jiri Kvasnicka, ARPS-NT, PO Box 4405, Darwin NT 0801, Australia, (61+89) 89 66 07.

November 17-18: **Electrosafe 1992**, Jean Monnet Building, Luxembourg. Contact: Conference Services, Institution of Electrical Engineers (IEE), Savoy Pl., London WC2R OBL, U.K., (44+71) 240-1871, ext.222.

December 1-4: **37th Annual Conference on Magnetism & Magnetic Materials**, Westin Galleria Hotel, Houston, TX. Contact: John Nyenhius, Purdue University, School of Electrical Engineering, West Lafayette, IN 47907, (317) 494-3524.

For more listings of 1992 conferences, see *MWN*, N/D91.

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