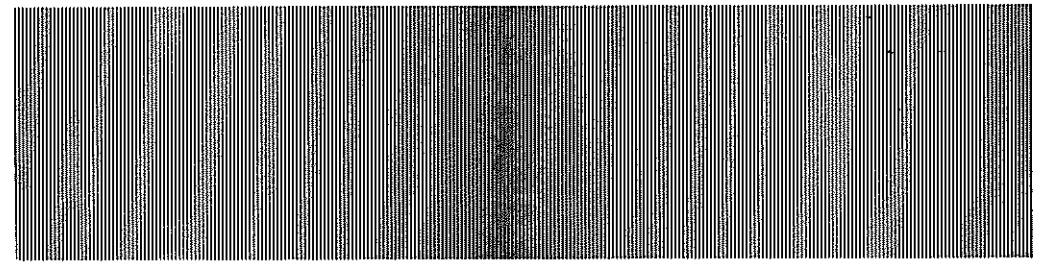


MICRO WAVE NEWS



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Microwave News invites contributions to *From the Field*, our occasional column featuring news and opinions from the non-ionizing radiation community. Letters from readers are also welcome.

EMPRESS II: EMI Threat to Nuclear Power Plants

The Navy's plan to build a powerful electromagnetic pulse (EMP) simulator on the Chesapeake Bay has provoked new concern about the susceptibility of nuclear power plants to interference from EMP radiation. The proposed facility is designed to test the vulnerability of ships to electric fields of up to 50 kV/m.

No nuclear plant has ever been subjected to EMP radiation, and some observers fear that pulses from the proposed EMPRESS II facility might cause "false-trips" in electronic or electrical systems at the Calvert Cliffs nuclear generating plant, located approximately 30 miles from the preferred EMP antenna site. Repeated false-trips could trigger a reactor shutdown, or as one expert believes, in a worst case scenario result in a core meltdown.

Maryland state officials believe that electromagnetic interference (EMI) at Calvert Cliffs could be a serious problem, and this is one reason why they oppose siting EMPRESS II — the second Electromagnetic Pulse Radiation Environment Simulator for Ships — anywhere in the Chesapeake Bay. According to Robert Lunsford of the state Department of Natural Resources, "those who are the most informed are also the most concerned about interference."

The Navy and other defense agencies use simulators like EMPRESS II to determine how military hardware would be affected by EMI from a "real" EMP, the burst of non-ionizing radiation created by a high-altitude nuclear blast.

(continued on p.10)

EPA To Reopen Public Record on RF/MW Guidance

High-ranking officials at the Environmental Protection Agency (EPA) have decided not to propose a federal guidance on radiofrequency and microwave (RF/MW) radiation safety. Instead, the agency will seek public comment on a host of technical issues related to RF/MW radiation — everything from bioeffects to economics.

According to Sheldon Meyers, acting director of the EPA Office of Radiation Programs, the agency will return to the *Federal Register* to round up information that has become available since EPA first issued its advanced notice of proposed rule making in December 1982 (see *MWN*, January/February 1983).

Joe Cannon, assistant administrator for air and radiation programs, recommended this approach as a compromise between stopping all work on the RF/MW guidance and issuing a proposed guidance for public comment. Deputy EPA Administrator Al Alm concurred with Cannon's recommendation.

Although Meyers said that he hoped a notice of inquiry would appear by the end of the year, other agency commitments may delay it until early 1985.

Electrical Work Again Linked to Cancer

Two new epidemiological studies have linked occupational exposures to electromagnetic (EM) fields to cancer. Maryland researchers have identified an increase in the relative risk of brain tumors among exposed workers and a UK study has found a rise in the incidence of eye cancer among male electrical and electronics workers in England and Wales.

There are now eleven reports from the US and Europe connecting low frequency EM radiation with cancer (mostly leukemia) or reproductive problems (see *MWN*, March, June and December 1983).

Brain Tumors in Maryland

In a paper presented at the 1984 Annual Meeting of the Society for Risk Analysis in Knoxville, TN, on October 2, Dr. Ruey Lin announced that he had found an association between exposures to EM radiation and the development of brain tumors. In addition, those workers in electrical occupations with the highest exposure to EM fields died at a significantly younger age than those who were not exposed.

Lin and co-workers at the Maryland Department of Health and Mental Hygiene in Baltimore reviewed the death certificates of 951 white adults who died of brain tumors between 1969 and 1982. They found that compared to controls, who were matched on the basis of age and date of death and who died of causes other than malignancy, a significantly higher proportion of workers who died with a primary brain tumor had been employed in electrical occupations, such as electrician, electric or electronic engineers and utility company servicemen.

In a telephone interview following the risk analysis meeting, Lin told *Microwave News* that the new research "supports the theory that non-ionizing radiation may be a brain tumor promoting agent." He went on to add a note of caution, however, saying that there is still uncertainty due to the absence of exposure data. For instance, Lin said that he does not know whether the increased risk of brain tumors is related to magnetic or electric fields. In addition, he said that he could not rule out the possibility that other agents, such as polychlorinated biphenyls, solvents, or metal fumes are involved.

Lin recommended that additional epidemiological and animal studies are needed to explore the possible relationship between electrical occupations and cancer. A paper describing the results presented in Knoxville has been submitted for publication.

Cancer Among Electrical Workers

Dr. A.J. Swerdlow of the Department of Community Medicine at the University of Glasgow in Scotland, UK, has uncovered a significant increase in eye cancer among adult men (47 percent) and women (50 percent) in England and Wales, between 1962 and 1977. The increased incidence was "notably high" for male electrical and electronics workers, 15-74 years of age, between 1968-1975.

Swerdlow noted that the general increase was "unexpected," and he offered no explanation for the finding. He used cancer registration data as a measure of cancer incidence and believes that the higher registration rates "reflect a real rise in incidence of eye cancer, and therefore probably of eye melanoma, which accounts for the great majority of eye cancer."

Proportional registration ratios were also higher among three occupational groups in addition to electrical and electronics workers: administrators and managers, professional technical workers and artists. Generally, Swerdlow found that eye cancer incidence was "generally higher in the non-manual social classes than in the manual classes." He cautions that the occupational and social class results should be interpreted with caution because of the small sample size and the possibility of errors in occupational classification and in coding.

Nonetheless, Swerdlow concludes that "the high ratios found for electrical and electronics workers...would not have been expected from their social class and are of particular interest."

No gradient of incidence with geographical latitude was identified, in contrast to other reports of an association between skin melanoma and latitude. Swerdlow's paper appears in the *American Journal of Epidemiology*, 118, 294, 1983.

NY State Plans Replication of Winters's ELF Study

The New York State Power Lines Project will fund at least one replication study of Dr. Wendell Winters's experiments on the effects of 60 Hz fields on human tumor cells. Winters's finding that electromagnetic fields can enhance the growth of cells by up to 5.6 times the normal rate is the most startling result reported to date among the project's 16 studies and has generated considerable interest inside and outside the non-ionizing radiation community (see *MWN*, April and September 1984).

Because of the implications of Winters's findings, earlier this summer the project's scientific advisory panel asked Drs. Gordon Livingston of the University of Utah and Maimon Cohen of the University of Maryland to submit proposals for replication studies. Both researchers are already project participants.

Livingston's proposal has now won tentative approval from the panel. His study is expected to take about six months and cost approximately \$30,000. Cohen, however, is not expected to respond to the panel's invitation until his own study is closer to completion.

The panel has also received two evaluations of Winters's work following site visits to his lab at the University of Texas Health Science Center in San Antonio this summer. A joint report by Drs. Jeffrey Trent of the University of Arizona and Ronald Buick of the University of Toronto, and another by panel chairman Dr. Michael Shelanski of New York University were sent to Winters for comment last month. (Trent, a cancer biologist, will be a consultant to

Livingston during his replication study.) Copies of the two evaluations and Winters's response should be available by late October.

Project manager Michael Rampolla told *Microwave News* that a final decision on whether to move ahead with the second replication study will be made after the DOE-EPRI-NYS contractors meeting in St. Louis in November. Winters's final report is due at the end of the year.

Developments in the other project studies include:

- Preliminary results from Livingston's study on the reproductive integrity of mammalian cells show that the growth of CHO cells was retarded by exposure to 60 Hz fields. Earlier, Livingston received a no-cost extension to do more work, and his final report is due October 31. No genetic effects were observed.

- Dr. Charles Graham at the Midwest Research Institute (MRI) exposed human subjects to 9 kV/m and 0.2 gauss electromagnetic fields in his study of "The Influence of 60 Hz Fields on Human Behavior, Physiology and Biochemistry." The observed effects were consistently variable and "appear to have no single or simple explanation," according to the latest semiannual project status report. Graham's final report should be completed in November.

- Work at MRI on the biochemical analyses of samples from Graham's subjects is being funded by the Department of Energy and is not under the management of the power lines project. A preliminary report on these results is expected soon.

- Dr. Richard Stevens has replaced Dr. Lowell Sever as the head of Battelle's epidemiological study of cancer among people exposed to electromagnetic fields, one of two project studies based on Dr. Nancy Wertheimer's findings. Stevens left the Institute for Cancer Research in Philadelphia to join Battelle's Pacific Northwest Laboratories. No delay is anticipated as a result of the switch.

RFI Amendments in Congress

Senator Barry Goldwater (R-AZ) and Representative Jim Bates (D-CA) have introduced bills to "eliminate willful or malicious interference with communications." Goldwater introduced S.2975 on September 10 and Bates proposed H.R. 6195 on September 6. The bills have the support of the FCC.

The proposals, which seek to amend the Communications Act of 1934, are similar. Both would make causing deliberate radiofrequency interference (RFI) a violation of the act rather than a violation of Federal Communication Commission (FCC) administrative rules. This change would facilitate FCC enforcement and would increase penalties to up to \$10,000 and one year in prison for a first offense and up to two years in prison for repeated violations.

Goldwater's bill would also arm the FCC with the power to seize interfering transmitting equipment. Offenders could then be prevented from causing further harm during the commission's lengthy and complex administrative and judicial proceedings.

There is very little chance that either bill will be enacted

into law during the current session of Congress. Congress has adjourned for the elections and there is no indication that it will reconvene before next year.

A spokesman for Bates said that the amendments are a response to a number of incidents of harmful RFI which have taken place in his southern California district. The FCC has been investigating RFI cases in the San Diego area for some time.

One blatant case involved an amateur radio operator who was recently placed on three years probation by a federal court for causing disruptive jamming for more than 20 years. The amateur's license was revoked in 1979, but the RFI continued. In February 1984, U.S. marshals seized his radio equipment.

In remarks accompanying his bill, Goldwater stated that "the increase in willful interference to authorized communications simply must be stopped," adding that "I expect the FCC to use these provisions aggressively."

The Republican senator, who is a long-time radio hobbyist, warned that if this new bill is insufficient, "I am prepared to...further increase the penalties for violation and include...mandatory disqualification of those convicted from being licensees in the future."

His proposed legislation takes aim at four types of interference: (1) Transmissions, such as unmodulated carriers, recorded material, music and threats, made directly over the ongoing transmissions of other operators. (2) Long continuous transmissions on a frequency known by defendant to be used as a repeater input frequency without monitoring the repeater output frequency. (3) Initiation of transmissions when others were already using the frequency. (4) Whistling on frequency for long periods of time for jamming purposes.

The Senate bill would add a new Section 333 to Title III of the Communications Act: "No person shall willfully or maliciously interfere with or cause interference to any radio communication." And it would add the following paragraph to Section 510(a) of the Act:

Any electronic, electromagnetic, radiofrequency, or other device or component thereof within the control of any person accused by the Commission of an alleged criminal violation of Section 333 of this Act or rules prescribed thereunder, and capable of emitting the radiation alleged to violate such section or rules, may, after issuance of written notice delivered by certified or registered mail or in person of such alleged violation, be seized by the United States when there exists reasonable belief that seizure is necessary to prevent continued willful or malicious interference to any radio communication. Such equipment is subject to forfeiture to the United States upon conviction of such person rendered in United [States] District Court for violation of Section 333. For purposes of this paragraph "reasonable belief" shall be deemed to exist in, but not limited to, instances where continued interference is caused by use of the same or similar equipment by any person after that person has been issued such written notice from the Commission alleging violation of Section 333 and requesting that the person cease the actions alleged to constitute violation of such section until a final determination is made.

HIGHLIGHTS

A copy of the S.2975 appears in the September 10 *Congressional Record*, p.S10866, as amended on September 18, p.S11423.

Bates's bill, H.R.6195, is much briefer than Goldwater's, specifying only that causing malicious RFI is a violation of the Communications Act.

The Bates bill has been assigned to the subcommittee on telecommunications, consumer protection and finance of the House Committee on Energy and Commerce. The Goldwater proposal has yet to be assigned to a subcommittee within the Senate Committee on Commerce, Science and Transportation.

ANSI C95 Work Stalled—ELF Standard Under Consideration

Revision of the American National Standards Institute (ANSI) radiofrequency and microwave (RF/MW) radiation safety standard has bogged down under a new literature review system. "We are proceeding at a snail's pace," said one ANSI official at the last meeting of the institute's C95 committee on radiation hazards and C95.IV subcommittee on human safety standards. Meanwhile, the structure and operation of the subcommittee and its parent committee C95 have come under attack from Professor Nicholas Steneck, a historian at the University of Michigan.

In other developments, at the July 15 C95 meeting in Atlanta, GA, a group was formed to weigh the need for a new subcommittee on extremely low frequency (ELF) radiation bioeffects. (The ANSI standard, C95.1-1982, only covers frequencies above 300 kHz.) The ELF group was established after some members argued that ANSI should expand the scope of its safety guidelines to include 60 Hz and very low frequency (VLF) radiation and pulsed fields. Dr. Richard Phillips, who will soon leave Battelle's Pacific Northwest Labs to join the Environmental Protection Agency (EPA) in North Carolina on December 3, was named chairman of the group.

In addition, the largely inactive subcommittee C95.VII on medical surveillance was combined with C95.IV at the request of C95.VII chairman, Dr. Paul Tyler.

The ANSI RF/MW safety guidelines were revised in 1982 and, according to ANSI rules, must be reaffirmed or updated within five years. When Dr. F. Kristian Storm took over the chairmanship of C95.IV subcommittee for the current review, he set up a complex system of five committees and 14 working groups to evaluate new data on health risks (see *MWN*, July/August 1983).

Dr. John Osepchuk was one among those concerned about the paralysis of the subcommittee, commenting that "Storm's system of review does not seem to be working." Osepchuk, who is with Raytheon and is the secretary of C95.IV, said that more than 200 papers on RF/MW bioeffects had been selected for review as possibly germane to the revision of the safety standard, but that none had yet been evaluated.

Dr. Don Justesen of the VA Medical Center in Kansas City, MO, who chaired the July subcommittee meeting, also

expressed concern over this bottleneck in Storm's organizational structure.

In letters to Storm and Professor Saul Rosenthal, chairman of ANSI C95, Steneck has challenged the fairness of the subcommittee's composition and actions. He suggested that if the committee and subcommittee could not be reformed, ANSI should stop issuing standards on RF/MW radiation safety (see "From the Field," pp.6-7).

Storm did not respond to written and telephone requests from *Microwave News* for comment on the Steneck letters. In a telephone interview, Rosenthal said that he was concerned about the allegations and was discussing them with members of C95 and its subcommittees but would not reply to them directly.

In a brief discussion at the meeting, Justesen said that it is only the statements of people like Steneck that are undermining the credibility of the ANSI standard. But Dr. P. Czerski of the Food and Drug Administration advised that the committee should set firm definitions and criteria to satisfy the problems raised by Steneck.

Storm did not attend the C95 meetings in Atlanta. He was believed to be at a conference in Geneva, Switzerland.

At the July meeting, Steneck said that the committee "should broaden its expertise to develop a standard that is more sensitive to the world-at-large."

Indeed, during the C95 committee meeting, Rosenthal, who is with the Polytechnic Institute of New York, called for new members to increase the public's participation. One setback followed almost immediately. Dr. Edward Groth III of Consumers Union declined to join the committee for evaluation of exposure risk set up by Storm and chaired by EPA's David Janes. In a letter to Janes, Groth cited time pressures as well as a lack of expertise on RF/MW bioeffects.

Navy Stops RF/MW Bioeffects Research at Bethesda Institute

The Navy has decided to end research on the bioeffects of microwave radiation at the Naval Medical Research Institute (NMRI) in Bethesda, MD. According to knowledgeable sources, the decision was made by the Navy's senior management.

Only the in-house research program at NMRI has been eliminated. Most of the Navy's research on microwave bioeffects is funded by the Office of Naval Research (ONR) and will be unaffected by the NMRI cutback.

Most of the \$385,000 budget for the microwave project at NMRI in fiscal year 1984 (FY84), which ended September 30, was used to support Dr. John Thomas's laboratory. Thomas is best known for his work on the synergistic action between microwaves and drugs, such as Librium (see *MWN*, February 1981). There are no funds for this intramural effort in the FY85 budget.

In a telephone interview, Thomas said the cutback on microwave research reflects a decision by the Naval Medical Research & Development Command (NMRDC) to place

a higher priority on the health effects associated with physically extreme environments (hot and cold) and with chemical warfare.

During the last two years, Thomas has also been working on a \$101,000 contract with the New York State Power Lines Project on the potential behavioral effects of 60 Hz fields. The study is due to be completed in mid-November.

The end of FY84 also marked the end of bioeffects research on extremely low frequency (ELF) radiation at the

SHORT COURSES

We would like to hear from those readers who use our short course calendar. First, is it useful? Should we expand the calendar or run it less frequently? And second, how far in advance do you make plans to attend a short course? At present, we list courses that begin about the middle of the month following our issue date: in this October issue, the first listing is for the 13th of November. Does this allow you enough time to decide which courses to take? (One drawback to working too far in the future is that many courses are announced only a few weeks before they are scheduled to be given.)

November 12-16: **Radiation Safety**, Evanston, IL. Fee: \$895. Contact: Continuing Engineering Studies, 2804 Technological Institute, Northwestern University, Evanston, IL 60201, (312) 492-3365. Repeated May 6-10.

November 13-14: **Magnetic Analysis Program**, Milwaukee, WI. Fee: \$495. Contact: A.O. Smith Engineering Systems, 8901 N. Kiideer Court, Milwaukee, WI 53209, (800) 558-6980, ext. 2860. Repeated December 11-12.

November 13-14: **Grounding, Bonding & Shielding**, Washington, DC. Fee: \$495. Contact: Greg Gore, R&B Enterprises, 20 Clipper Rd., West Conshohocken, PA 19428, (215) 825-1965.

November 13-15: **EMC Design Applications**, Sunnyvale, CA. Fee: \$745. Contact: Jim Hill, EMXX Corp., 6706 Deland Dr., Springfield, VA 22152, (703) 451-4619.

November 13-16: **Grounding & Shielding**, Sunnyvale, CA. Fee: \$815. Optional fourth day for \$235. Contact: Don White Consultants, Inc. (DWCI), State Route 625, PO Box D, Gainesville, VA 22065, (703) 347-0030. Repeated December 4-7: New York, NY.

November 14-16: **Hyperthermia in Cancer Therapy**, Seattle, WA. Fee: \$350. Contact: Continuing Medical Education, University of Washington, SC-50, Seattle, WA 98195, (206) 543-1050.

November 14-17: **Fundamentals of NMR Imaging**, San Antonio, TX. Fee: \$385. Contact: Continuing Medical Education, University of Texas Health Science Center, 7703 Floyd Curl Drive, San Antonio, TX 78284, (512) 691-6295.

November 15-16: **EMI Prediction & Analysis**, Washington, DC. Fee: \$495. Contact: see R&B, November 13 above.

November 16: **Electrostatic Discharge Control**, Sunnyvale, CA. Fee: \$295. Contact: EMXX, see November 13 above.

November 19-21: **EMP and Its Effects on Systems**, Washington, DC. Fee: \$695. Contact: Continuing Engineering Education, George Washington University (GWU), Washington, DC 20052, (800) 424-9773, or (202) 676-6106 in DC.

November 21-23: **Safety in the Use of Microwave Equipment**, Loughborough, UK. Fee: 295 Pounds. Contact: Mrs. K. Gilbert, Center for Extension Studies, University of Technology, Loughborough, Leicestershire LE11 3TU, UK, (0509) 263171, ext. 249.

November 26-30: **HF Spectrum: New Concepts and Technologies**, Washington, DC. Fee: \$875. Contact: GWU, see November 19 above.

Naval Aerospace Medical Research Lab (NAMRL) in Pensacola, FL. The lab's research on microwave bioeffects will continue (see *MWN*, September 1984). Both NMRI and NAMRL report to NMRDC.

Dr. Elliot Postow, program manager for electromagnetic radiation at NMRDC and editor of *Bioelectromagnetics*, told *Microwave News* that he is devoting more time to other issues now that the Navy had made microwave research a lower priority.

CONFERENCES

November 5-7: **DOE-EPRI-NYS Contractors Review: Research on Bioeffects of Transmission Lines**, Sheraton St. Louis, MO. Contact: Dr. William Wisecup, Aerospace Corp., Suite 4000, 955 L'Enfant Plaza, SW, Washington, DC 20024, (202) 488-6328.

November 5-8: **4th International Meeting of the Bioelectrical Repair and Growth Society**, Holiday Inn, Kyoto, Japan. Contact: BRAGS, 425 Medical Education Building, 36 and Hamilton Walk, Philadelphia, PA 19104, (215) 898-8653.

November 13-15: **JINA'84: International Symposium on Antennas**, Nice, France. Contact: Secretariat JINA'84, CNET-PAB Centre de la Turbie, 06320 Cap d'Ail, France.

November 27-30: **30th Annual Conference on Magnetism and Magnetic Materials**, Town and Country Hotel, San Diego, CA. Contact: Richard Josephs, Code 5023, Naval Air Development Center, Warminster, PA 18974.

December 4-8: **American Clinical Hyperthermia Meeting**, Americana Canyon Hotel, Palm Springs, CA. Contact: Dr. Haim Bicher, Daniel Freeman Memorial Hospital, 333 N. Prairie Ave., Inglewood, CA 90301, (213) 674-7050.

December 9-12: **Workshop on Low Level Field Effects on Cells**, Brookhaven National Lab, Upton, NY. Contact: Eugene Findl, Brookhaven National Lab, Upton, Long Island, NY 11973, (516) 282-4907.

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January 23-25: **RF Technology Expo**, Disneyland Hotel, Anaheim, CA. Contact: Kathy Kriner, RF Tech Expo, 6530 S. Yosemite St., Englewood, CO 80111.

February 3-8: **1985 Winter Meeting of the IEEE Power Engineering Society**, Penta Hotel, New York, NY. Contact: T.A. Balaska, Bishop Electric Corp., 363 Old Hook Rd., Westwood, NJ 07675, (201) 666-5553.

March 5-7: **6th Symposium & Technical Exhibition on Electromagnetic Compatibility**, Zurich, Switzerland. Contact: EMC Symposium & Exhibition, ETH Zentrum-IKT, 8092 Zurich, Switzerland, (01) 256-27-90.

March 21-22: **IMTC/85: Instrumentation/Measurement Technology Conference**, Hyatt Regency, Tampa, FL. Contact: Dr. Robert Ashley, Sperry Corp., PO Box 4648, Clearwater, FL 33518, (813) 577-1900, ext. 2228.

April 3-4: **21st Annual Meeting of the National Council on Radiation Protection and Measurements**, Washington, DC. Contact: NCRP, Suite 1016, 7910 Woodmont Ave., Bethesda, MD 20814, (301) 657-2652.

April 16-17: **8th International Colloquium on the Prevention of Occupational Risks due to Electricity**, London, UK. Contact: International Fire Security & Safety, Exhibitions & Conferences, Cavendish House, 128/134 Cleveland St., London W1P 5DN, UK, (01) 387-5050.

April 29-May 2: **23rd International Magnetics Conference**, St. Paul, MN. Contact: R.O. McCary, GE, Corporate R&D, Schenectady, NY 12345, (518) 385-5436.

May 3-9: **33rd Annual Meeting of the Radiation Research Society**, Biltmore Hotel, Los Angeles, CA. Contact: RRS, 925 Chestnut St., Philadelphia, PA 19107, (215) 574-3153.

FROM THE FIELD

Steneck Letters to ANSI C95.IV and ANSI C95

Reprinted below are two edited letters by Professor Nicholas Steneck concerning the ANSI standard C95.1-1982, Safety Levels with Respect to Human Exposure to Radiofrequency Electromagnetic Fields, 300 kHz to 100 GHz (see MWN, September 1982). Steneck addressed his concerns to Dr. F. Kristian Storm, chairman of the American National Standards Institute's (ANSI) C95.IV subcommittee on "Safety Levels and/or Tolerances with Respect to Personnel," and to Dr. Saul Rosenthal, chairman of the full ANSI C95 Committee on "Radiofrequency Hazards." (See story about ANSI C95 and C95.IV on p.4.)

Steneck is a professor of history and the director of the Collegiate Institute for Values and Science at the University of Michigan. He is the author (with three associates) of "The Origins of US Safety Standards for Microwave Radiation," Science, 208, 1230, 1980 and "Science and Standards: The Case of C95.1-1982," Journal of Microwave Power, 19, 153, 1984. Last month, MIT Press (Cambridge, MA) published Steneck's book, The Microwave Debate (\$25.00).

June 5, 1984

Dear Dr. Storm:

The arrival of the latest set of ANSI C95 minutes and the agenda for this year's meeting was like an encounter with a ghost from the past. For over 20 years, C95 and C95.IV have periodically been rejuvenated with new committee structures, chairpersons and goals, always with the hope that new revisions will lead to the establishment of a generally acceptable radiofrequency protection guide (RFPG).

To date, the hoped-for goal of general acceptability has yet to be achieved. It is frequently argued that the primary cause of present discontent is a lack of understanding on the part of the public. The public, it is argued, fails to distinguish high-level from low-level exposure and has as a consequence all too often objected to actions that involve no threat to public health. Hence, the present thrust of policy in this area is one that stresses more public education and the collection of more scientific data, presumably to aid public education. The activities of your own subcommittee fall squarely into this pattern.

I would like to suggest for your consideration another explanation of the lack of public confidence in ANSI's RFPG, one that will hopefully cause you to question the validity of current C95.IV actions.

It can be argued, I believe, that public objection has been aimed not so much at ANSI's RFPG as at the way it has been set. The public sees in C95.IV deliberations actions that are not responsive to their needs. This being the case, they can find no compelling reason to accept the RFPG. Let me be more specific, mentioning just two of the several problems.

1. The absence of broadbased decision making. Over the past twenty-plus years, C95 and C95.IV have spent the vast majority of their time discussing one issue— bioeffects. The assumption that is made is that extrapolation from knowledge about bioeffects to an RFPG is a simple process that can be carried out by those who understand bioeffects. This assumption is wrong! The most controversial aspect of any standard is the process of extrapolation, of going from facts to judgments and policy. C95 and C95.IV have to my knowledge never engaged in extended discussion of the extrapolation process or called on experts to help them with this difficult aspect of standard setting.

C95.1-1982 informs the public that exposure below its RFPG is

not harmful, but it does not specify what is meant by *harmful*. What is harm? Who is being protected? From what are they being protected? What degree of certainty is built into the RFPG?...

2. C95 and C95.IV membership. If deriving a standard were equivalent to adding two plus two, the membership of your committee would not matter. However, setting standards is not a straightforward objective process; values enter into decision making at every step. Thus, who sits on C95 and C95.IV matters very much to the public, because it is through the membership that different points of view are expressed.

Who on your subcommittee speaks for the public? When key decisions have to be made, what is the balance between those with user interests or ties and those whose only responsibility is to the public? What is the balance between the public and RF users on the larger parent committee you must ultimately satisfy? I submit that if you take a close look at this issue you will again discover an extremely compelling reason for a lack of public confidence in your deliberations....

Public confidence cannot be restored by yet again attacking the bioeffects issue....

The public does not lack understanding. They understand that deliberations on microwave policy have reflected and continue to reflect limited points of view. They also understand that such an approach to policy is not justifiable. It is time that C95 and C95.IV achieved similar understanding and modified its procedures accordingly. This is the area that calls for more education!

As the newly appointed head of C95.IV, you are in a position to foster this education. I strongly urge you to do so, realizing that the consequences of a failure to act responsibly could in the long run present the greatest threat to the safe and constructive use of microwave technology in society.

Sincerely,

Nicholas H. Steneck

September 20, 1984

Dear Dr. Rosenthal:

Following the invitation issued by Don Justesen at the July 15 C95.IV meeting, I have set out below some specific suggestions for revising the methods used to set ANSI C95.1. I am addressing these suggestions to you as chairman of C95 with the hope that they will be considered on their merits and used constructively as appropriate.

Needless to say, I was disappointed in the response at this year's C95.IV meeting to my earlier letter to Dr. Storm. Considering John Osepchuk's notification to C95.IV members that "discussion of this letter will be in order at the meeting in Atlanta" and the promises of more discussion made during the opening C95 meeting, the motion to adjourn C95.IV without any discussion of the issues I raised is difficult to understand. These events, along with the failure of Dr. Storm to acknowledge receipt of my letter, leads to the conclusion that the leadership of C95.IV has no interest in changing the methods that are being used to set and revise ANSI's RF standard. If this is the case, you are the next logical person to address.

There are at the very least four crucial areas that need to be considered in more detail before going forward with present plans to revise C95.1-1982.

1. The scope and significance of C95.IV actions. C95 members have never adequately addressed the issue of the scope and significance of their activities. It has always been understood that ANSI is not a regulatory body and that ANSI standards are not binding standards. This fact has been repeatedly used over the years to diffuse concern about the scope and significance of C95.IV actions. Why become overly concerned if the final product

is only a guideline that can be used or not used as deemed appropriate?

An appropriate starting point for discussion would be this common assessment of the significance of ANSI standards. Does the fact that ANSI is a private organization that facilitates the generation of voluntary standards limit the responsibility that C95 must assume, particularly its legal responsibility? I believe that a very convincing case could be made that would argue otherwise and that your committee and its subcommittees may not be as far removed from responsibility as is commonly assumed.

C95 members cannot be ignorant of the fact that C95.1 has been widely used for making judgments about the safety of exposure to RF radiation. Moreover, such use has frequently been at the urging of prominent C95 members who have, when giving advice, listed among their credentials their membership on C95 or C95.IV. In other words, your membership knows that its judgments about standards are used for setting public policy and have recommended that this is appropriate. Can there be any doubt, therefore, that C95.IV and C95 must bear some responsibility when questions are raised about the adequacy of present standards, even when such questions are raised in legal settings?

Is C95 ready to accept this responsibility? Are you ready to defend in court all of the activities that have taken place under your chairmanship? Are you prepared to explain and defend the relationships between ANSI, its members, and their activities, as for example between ANSI, EPA, EPPA, and recent pressure brought to bear on EPA to adopt ANSI's standard and not a more conservative one generated within EPA? Are you satisfied that ample consideration was given to the issue of target population when C95.1-1982, breaking with past tradition, was applied to general populations and not limited to occupational exposure?...

2. Broadening ANSI's approach to setting standards. Our legislative bodies and our legal systems in this country have made very clear their expectations regarding exposure standards for the general public and working populations. The requirements for responsive standards have been discussed at length by policy experts, philosophers, social scientists and public interest groups. As a consequence of these activities, setting standards has become a relatively sophisticated process, demanding of those who set standards broad abilities and sensitivities, not only in the sciences but in the social sciences and humanities as well.

In comparison to the methods used in government and elsewhere to set standards, the methods used by C95.IV are primitive at best. Government and the courts have mandated that cost-benefit analysis be used to set standards that affect the public. C95.IV has steadfastly ignored cost-benefit analysis. None of its members has expertise in this area, making it impossible for such an analysis to be planned or undertaken....

3. Eliminate obvious conflicts of interest. As I am sure I do not have to bring to your attention, there is no such thing as an absolute scientific exposure standard. The advice you give when you issue and revise C95.1 reflects judgments that are made under the pressure of competing interests. Two interests in particular are of importance when considering RF radiation—health interests and development interests. Either interest could be maximized by ignoring the other. Health interests could be maximized by forbidding any exposure to RF radiation. Development interests could be maximized by outlawing RF exposure standards. Hopefully, the task C95.IV sets for itself is reaching a fair and equitable compromise between these competing interests.

Now ask yourself, what are the chances that C95.IV will reach a fair and equitable compromise? How much confidence should the public have in the ability of this subcommittee to act fairly? The

scientist who heads the [sub]committee is one whose primary interest is technological development. Within his own field, his approach to the control of a particular disease, cancer, is interventionist, not preventionist. C95.IV's secretary works for industry. The person who will select the scientific literature that will be used to set standards is under contract from the Air Force, a development conscious organization. The two scientists who oversee the evaluation of the literature selected for review have worked for the military and have testified for industry. And so it goes.

Keep in mind, I am not seeking to undermine the integrity of the persons above by mentioning their affiliations. Each is engaged in activities that are recognized as important to the vitality and well-being of US society. However, I am questioning the wisdom of staffing a committee that will make judgments that affect the public with persons who so consistently are allied with only one of the groups that has an interest in RF exposure standards....

4. More openness in disseminating information. If, when all is said and done, you feel that C95 and its subcommittee, C95.IV, are doing the best they can, it would seem reasonable to explain your satisfaction and rationales more fully. The rationale document added to C95.1-1982 was a positive step in the direction of disclosure, but only a small step. It provides partial explanation of the scientific methods used, but completely ignores all of the other decisions that were made in setting C95.1-1982.

C95.IV members know that many of the judgments they made involve complex sets of assumptions. The decision to use average SARs, thereby ignoring hotspots, has important ramifications, most of which were raised in C95.IV meetings. The use of SAR itself as the basic unit of the standard also has ramifications. If you do not mention these ramifications, pointing out for example that the use of average SAR could perhaps fail to take into account a localized effect, they will become the topic of intense discussion and a source for skepticism when raised by persons who are wondering whether to accept your judgments or reject them.

If C95.IV members are confident that their judgments are the best that can be made, then explain fully, especially to the public, why this is the case. If it is decided that cost-benefit analysis is not important, give reasons for eliminating such considerations. If the factor-of-ten safety factor is adopted, explain why....

•••

These suggestions may be difficult to implement. I am aware of this fact. They call for increased complexity, more work and additional members. You are working with a volunteer organization and no real budget. It may be unrealistic to expect C95 and C95.IV to do more.

But if more cannot be expected, what course of action should follow? My own feeling is that it is irresponsible and possibly immoral to continue with the status quo. If C95 cannot do the job required to set responsible standards, then perhaps it should not set standards, or even issue guidelines, since it can reasonably be assumed that ANSI's recommended guidelines will be used to set public policy.

ANSI's departure from this field would most likely result in a temporary state of confusion. Without ANSI's judgments, industry would have no reference point for demonstrating to the public the safety of proposed facilities. But maybe complete chaos is what is needed to once and for all force responsible decision making. It is in allowing irresponsible decision making to continue that I see the immorality of C95 and C95.IV actions....

Sincerely,

Nicholas H. Steneck
Department of History
University of Michigan
Ann Arbor, MI 48109

COMPATIBILITY & INTERFERENCE

FCC Rules for ISM...Be on the lookout for FCC action on ISM equipment RFI. Docket 20718 has been dormant since the commission proposed rules in 1978 and 1979, but a notice covering all ISM devices, including RF lighting, should appear in the *Federal Register* in December. It is likely that the FCC action will address the concerns of the National Electrical Manufacturers Association (NEMA) regarding requirements for test marketing RF lighting devices. In two petitions filed last February, NEMA asked the commission to relax labeling and reporting requirements for lights sold under a waiver of Part 18 Subpart H rules (see *MWN*, September 1983).

Computer RFI Rule Exemption...The FCC has proposed exempting "one-of-a-kind" large computers and similar equipment from existing RFI rules. The proposed rule comes in response to a petition from Electronics Associates Inc., which argues that testing some of its products for verification of compliance with Part 15 Subpart J rules is costly and very difficult. In a notice published in the August 30 *Federal Register* (49 *FR* 34370), the commission noted that it may be more cost effective to handle any RFI from these units on a case by case basis and proposed exempting large systems built in quantities of 10 or less. For information, contact the FCC's Julius Knapp at (202) 653-8247.

ANS C63...American National Standards Committee C63 on EMC and its subcommittee 1 will meet on November 15-16 at the FCC offices in Washington, DC. According to the current schedule, subcommittee 1 will meet on the afternoon of the 15th and the full committee will assemble on the morning of the 16th. For more information, contact IEEE's Fred Huber at (212) 705-7960.

GOVERNMENT

FDA and Guy Experiment...Some consumers have expressed concern over the safety of their microwave ovens after hearing about the University of Washington study that found an increase in malignant tumors among rats exposed to microwave radiation (see *MWN*, July/August 1984). To calm these fears, the FDA released a *Talk Paper* on August 28, stating that such concerns are "unwarranted" in light of the agency's performance standard for microwave ovens and the actual operation of the units in tests. The FDA notes that "even persons making extensive use of a microwave oven" would be exposed to levels far below those used in the University of Washington study. A number of newspapers carried editorials expressing the same opinion about ovens, after running news stories about the study. For instance, the August 21 *Kansas City Star* proclaimed, "Don't Throw It Away Quite Yet."

MEDICAL APPLICATIONS

Reporting Serious Injuries...Beginning December 13, the FDA will require manufacturers of medical devices to report deaths or serious injuries caused by their products. Malfunctions that *could* cause death or serious injury should they recur must also be reported. FDA Commissioner Dr. Frank

Young explained that the new rule will formalize what has been a largely voluntary reporting system. For details, see the September 14 *Federal Register* (49 *FR* 36326), see also correction on September 19 (49 *FR* 36644), or call Robert Forst at (301) 443-4874.

MEETINGS

Proceedings...The record of the 7th *International Wroclaw Symposium on EMC*, which was held last June, is now available. Printed in two volumes, the proceedings contain about 100 papers. Many of the papers are in Russian, with abstracts in English. Copies are available for \$40.00 (pre-paid) from: EMC Organizing Committee, Box 2141, 51-645 Wroclaw 12, Poland. A limited number of copies of the records of the 1976, 1980 and 1982 symposia are still available. Ask for details....The proceedings of the August workshop on *Electromagnetic Waves and Neurobehavioral Function*, held in Corsendonk, Belgium, will be published by Alan Liss, Inc. Though the price of the volume has not yet been set, you can get a 30 percent discount off the regular price if you order before December 10, 1984. Contact: Alan Liss, Inc., 150 Fifth Ave., New York, NY 10011.

MILITARY SYSTEMS

OTH-B Radar Developments...The USAF has released a final EIS for its west coast over-the-horizon backscatter (OTH-B) radar (see *MWN*, May 1983). Components of the mammoth system, including transmitter, receiver and control center, will be located at four sites in California, Idaho and Oregon. For information, contact Ro Raffa, Electronic Systems Division, Hanscom AFB, MA 01731, (617) 271-7976....As construction begins in the West, the AF will use some of its \$60 million-plus budget for OTH-B development in FY85 to expand its eastern radar in Maine, which is scheduled to reach full 180-degree coverage in FY86. The Navy is also studying the possibility of building one or more OTH-B radars in the South. Development of a transportable system will begin soon, under a \$18.5 million contract recently awarded to Raytheon....Australia has decided to upgrade its Jindalee experimental OTH-B radar to an operational system.

New DEW Line EIS...The USAF's Electronic Systems Division has announced that it will prepare an EIS for the planned upgrading of the Distant Early Warning (DEW) Line radars into the North Warning System, designed to detect airborne missiles heading towards the US. The system will consist of short and long-range radars at 52 sites in Alaska and Canada; it will be able to protect against high flying bombers as well as low flying cruise missiles. The AF estimates that a draft EIS, covering five or six sites in Alaska, will be issued in late 1985. In August, the Sperry Corp. of Great Neck, NY, won a \$79.7 million contract to design and develop 39 short-range radars. Although no contract has yet been awarded for the long-range radars, negotiations are underway with GE of Syracuse, NY. GE is already working on 13 similar units, AN/FPS-117s, in Alaska, which are part of the AF's Seek Igloo program. Deployment of the new North Warning radars will begin in the summer of 1986 and the whole system should be operational in 1992.

OVENS

Resources... Gerling Laboratories has issued two reports: (1) *A Listing of Microwave Patents Associated with Industrial Processing and Domestic/Commercial Microwave Ovens*, updated edition dated August 22, 1984; and (2) *Index to the Gerling Laboratories Technical Library*, May 30, 1984. The library has catalogued more than 1500 patents. Reference materials listed in the latter report are broken down into five categories: bioeffects, food processing, industrial applications, microwave ovens and standards and specifications. Each report is available for \$25.00 from Gerling Labs, 1628 Kansas Ave., Modesto, CA 95351, (209) 521-6549.

STANDARDS

IEC on MW Therapy Equipment & RF Measurements for Satcom Stations... The International Electrotechnical Commission (IEC) has released *Publication 601-2-6: Medical Electrical Equipment. Part 2: Particular Requirements for the Safety of Microwave Therapy Equipment*. The standard covers devices which use radiation in the 300 MHz-30 GHz band to treat patients, but does not apply to hyperthermia equipment. Under the new standard, leakage shall not exceed 10 mW/cm² at 5 cm from the equipment, 1 m from the front of the applicator or 25 cm from the rear of the applicator. In addition, the equipment must comply with the requirements of CISPR Publication 11 which specifies RFI limits from ISM equipment. The IEC has also published a new world standard, *Publication 510-1-2: Methods of Measurement for Radio Equipment Used in Satellite Earth Stations. Part 1: Measurements Common to Sub-Systems and Combinations of Sub-Systems. Section 2: Measurements in the RF Range*. It covers both transmitting and receiving equipment and establishes test methods for frequency, impedance and a host of other parameters. The medical equipment standard costs \$30.00 and the satcom standard is \$40.00, both from ANSI, International Sales Dept., 1430 Broadway, New York, NY 10018.

Now Available... • New Jersey's RF/MW standard is published in the August 6 *New Jersey Register* (16 NJR 2120). The state adopted the 1982 ANSI guidelines this spring (see *MWN*, April 1984). • The Underwriters Laboratories has issued a review draft of the 13th edition of *Safety Standard for Television Receivers and Video Products*, No. UL1410, which covers power-operated sets intended for household or commercial use. Comments are due by October 30. Order from Carolyn Dobrei, UL, 333 Pfingsten Road, Northbrook, IL 60062. • The Association for the Advancement of Medical Instrumentation (AAMI) has released a proposed revision of *Safe Current Limits for Electromedical Apparatus*. A copy is available for \$10.00 for AAMI members and \$16.00 for others from Dawn Boots, AAMI, 1901 N. Fort Myer Dr., Arlington, VA 22209. • IEEE Standard 81-1983, *IEEE Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potential of a Ground System*, is under review before becoming an American National Standard. A copy is available for \$8.50 from Ms. M. Lynch, IEEE, 345 East 47 St., New York, NY 10017. • ANSI has printed a collection of four speeches

presented at a conference earlier this year. Single copies of *Standards and the Law* are available free from Marie Brown, ANSI, 1430 Broadway, New York, NY 10018.

VDTs

UK Cluster... An apparent cluster of problem pregnancies among VDT operators has been reported in England. Preliminary results of a study of workers at the Department of Employment at Runcorn, Cheshire, indicate that 36 percent of the 55 pregnancies among VDT users ended abnormally, compared to 16 percent among controls. The cluster was uncovered during a study of pregnancies at the site by the Civil Service Medical Advisory Service of the Council of Civil Service Unions. In response, the council has urged the Central Computer and Telecommunications Agency to permit workers to be reassigned to non-VDT work during pregnancy. The agency has rejected the council's request. A final report on the cluster has not yet been released, but union officials already are calling for a "large-scale study to disentangle the effects of VDTs from other factors."

Radiation... In last month's story on very low frequency (VLF) pulsed fields, we mentioned a new set of measurements completed by Dr. Hari Sharma of the University of Waterloo in Ontario, Canada. That study has now been released. Sharma tested terminals at the Surrey Memorial Hospital in Vancouver, British Columbia, where one of the reported cluster of problem pregnancies occurred (see *MWN*, July/August 1982), and at seven other hospitals in British Columbia. The report concludes that, "The data on adverse pregnancy outcomes... indicated that there might be linkage between exposure to the [electromagnetic] fields and adverse pregnancy outcomes." Noting that both electric and magnetic components of VLF fields can be biologically active, Sharma found peak electric field values at 30 cm from the screen ranging from 19-170 V/m at approximately 16 kHz. Maximum magnetic fields along the surface of the terminal casings approached 20 A/m. He recommends maximum limits of 25 V/m and 2 A/m for 16 kHz pulsed electric and magnetic fields and for 60 Hz magnetic fields at the terminal surface. In the report, Sharma states that the data, which had been questioned when released in preliminary form (see *MWN*, April 1983), are consistent with other researchers' findings. • The congressional Office of Technology Assessment (OTA) has released *Potential Office Hazards and Controls*, September 1984, which concludes that further radiation testing of VDTs is unnecessary. While acknowledging that there is insufficient evidence with which to assess radiation risks and there now exists "nearly epidemic proportions of fear among pregnant VDT operators," the report recommends better education and training of employers and employees as the primary response to worker concerns. "Due to the complexity of studying radiation effects, laboratory research does not appear to offer a feasible approach to dealing with the issue of fear of radiation," according to the report. Field testing, it adds, "is difficult and expensive. The value of such testing is questionable." A copy of the report can be obtained from the OTA, Washington, DC 20510, (202) 226-2070.

Any significant EMI at Calvert Cliffs could have far-reaching implications for U.S. defense policy involving a "survivable" nuclear war. The Nuclear Regulatory Commission (NRC) ended its investigation of EMP hazards this year and concluded that reactors would safely shut down after exposure to much higher levels of EMP than EMPRESS II will produce at the plant (see story on p.12). But the exposure of Calvert Cliffs, which would begin with the startup of EMPRESS II in late 1986, may test the commission's conclusion and reopen the debate on the feasibility of hardening reactors against EMP. The cost of protecting all U.S. nuclear plants would probably exceed one trillion dollars.

The potential for EMPRESS II-induced EMI was initially raised by Maryland state officials and by engineers at the Baltimore Gas and Electric Company (BG&E), one of the operators of Calvert Cliffs. The Chesapeake and Potomac (C&P) Telephone Company is also concerned about EMI to its equipment, which is scattered throughout the coastal area.

Experts Advise Caution

Two prominent experts on EMP believe the situation warrants extreme caution even though the EMI risks to Calvert Cliffs from EMPRESS II are small. Both Dr. Conrad Longmire of Mission Research Corp. in Santa Barbara, CA, and Demetrios Basdekas of the NRC in Washington, DC, told *Microwave News* that it is impossible to calculate what effect even relatively low-intensity EMP will have on a system as complex as a nuclear power plant.

In a draft environmental impact statement (EIS) released this September for EMPRESS II, the Navy devotes only two paragraphs to Calvert Cliffs. It estimates that a pulse from the preferred site for the EMP antenna at Bloodsworth Island would produce an electric field of approximately 100

V/m at the nuclear plant, which is 26 nautical miles away. "This value is only 0.2 percent of the full threat value of 50 kV/m," the Navy reasons, and "EMP has never been observed to affect any electrical or electronic system at field strengths this low."

Even though the EMPRESS II pulse at the plant would be relatively weak and lack other potentially significant characteristics of a real EMP, Longmire and Basdekas both said EMPRESS II would provide an "interesting" full-scale test.

Basdekas noted that one must take all types of coupling into account in evaluating potential effects. As an example, he hypothesized that additional energy could enter the plant via transmission lines. Although the pulse's extremely short duration limits its energy, through conductive coupling with an energized system, such as an operating power line, the pulse could be reinforced.

In a telephone interview, Longmire noted that "our understanding of EMP coupling is still in the research stage," and that EMPRESS II offers a chance to gather basic information. Nevertheless, he stressed that interference problems are very unlikely, estimating that "the odds are 100 to 1 that nothing will happen."

In fact, one of the Navy's chief arguments for building the \$10 to \$20 million EMPRESS II is that analysis and computer modeling are not capable of determining a complex system's vulnerability to EMP. The draft EIS notes that scale model and component testing are insufficient by themselves "without validation with empirical data from full-scale EMP testing of the ship. Such a data base does not exist."

In support for the Navy's plans, the National Academy of Sciences' study on EMP, released on August 8, concluded that because there is "no way to base an analytical estimate of EMP vulnerability on first principles, there can be no

CLASSIFIEDS

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Books from San Francisco Press

Three books on RF exposure policy: Clemmensen, **Nonionizing Radiation: A Case for Federal Standards?** (\$7.50); Steneck, **Risk/Benefit Analysis: The Microwave Case** (\$15); Marha *et al.*, **EM Fields and the Life Environment** (\$10). Prepaid orders to San Francisco Press, Inc., Box 6800, San Francisco, CA 94101-6800. (Californians add tax.)

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Research Query — Researcher seeking verification of reported "hangovers" from radar/MW exposure. Citations, references or other information requested. Send to: William J. Callahan, 63 Main Street, PO Box 0000, Southampton, NY 11968.

VDT Health and Safety Publications

VDT News offers bimonthly news reports on the latest developments for \$35.00 a year. Our *VDTs: 1983 Health and Safety Update* (\$7.50) summarizes the important news from last year in thorough detail. And our booklet, *VDTs: Health and Safety*, (\$6.95) covers 1981-1982 and is an important resource for anyone concerned about VDTs. Orders must be prepaid and sent to: *VDT News*, PO Box 1799, Grand Central Station, New York, NY 10163.

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substitute for the best physical simulations possible" (see *MWN*, September 1984).

Longmire suggested that the Navy proceed very carefully with the startup of EMPRESS II, working closely with the utility to monitor the effect of increasingly powerful pulses.

EMPRESS II

EMPRESS II is a barge-mounted antenna designed to submit Navy ships to repeated EMPs. The firing rates would vary from one pulse every three minutes at an antenna voltage output of 4 megavolts (MV) to one pulse every 30 minutes for a maximum voltage output of 7 MV, the pulse which produces a 50 kV/m electric field 100 yards away.

The antenna would operate in the bay for 30 to 40 days of its first year in operation and about 20 days each subsequent year. Its barge would be pulled out to an ocean site in the summer months for testing of aircraft carriers.

The EMPRESS II pulse is very similar to an EMP generated by a nuclear blast in several respects, including its rise time of 10 nanoseconds (nsec), or billionths of a second. It cannot, however, duplicate the lower frequency components of an actual EMP. Because of the finite height of the antenna, 128 feet, the pulse has a fast decay of approximately 100 nsec as compared to 1000 nsec for real EMP. This results in decreased field strengths for frequencies below 1 MHz. There is a corresponding shift in energy to higher frequencies.

Baltimore Gas and Electric

"Informal coordination" between the Navy and BG&E began in late April, according to the addendum to the draft EIS. Engineers from BG&E and the DELMARVA Power and Light Company are now working on the EMI issue through a joint task force.

Neither BG&E nor the Navy would discuss specifics, but an internal BG&E memorandum obtained by *Microwave News* outlines the scope of the utility's initial concerns. It states: "We are interested in the effects of EMP primarily from the standpoint of possible false-trips. The result of a false-trip will depend on the equipment involved; however, a single false-trip could well result in the tripping of one of the two 850 MW units. Multiple false-trips could result in tripping both units and in the temporary loss of all off-site power to the plant."

NRC's Basdekas believes that it is possible that a nuclear reactor will not shutdown safely after false-trips. In the worst case, a core meltdown could occur even for an EMP "well below 50 kV/m."

A BG&E spokesman confirmed that two sets of questions had been submitted to the Navy, but added that "there is no particular concern because there really isn't any problem." The Navy would only comment that the utilities "are addressing the question of whether EMPRESS II poses a problem to their equipment," and that "pending a determination to that end, we have jointly agreed not to speculate on the matter."

Sandia Report for the NRC

The major study on EMP and nuclear power plants was completed for the NRC by Sandia National Laboratories in 1982. Based on an analysis of the susceptibility of the Watts

Bar nuclear plant in Tennessee, the report, *Interaction of Electromagnetic Pulse with Commercial Nuclear Power Plant Systems*, February 1983, concluded: "In view of the similarities in the design and construction of nuclear power plants, and based upon the conservatism in the analyses," a 50 kV/m EMP would not affect the safe shutdown of nuclear reactors.

Both Longmire and Basdekas believe the Sandia analysis is too limited to be of great value, however. For example, Basdekas told the NRC in May 1982 that Sandia's preliminary draft conclusion "is not supported by the available information, is based partly on unwarranted assumptions and is contradicted by existing information."

One example he cited was the "significant localized upset conditions in several plants," including Three Mile Island's reactor 2, caused by EMI from walkie-talkies. At Three Mile Island, interference caused hydrogen detection instruments to malfunction, prompting the utility to declare an emergency (see *MWN*, March 1982). Basdekas noted that "the near field strength of such devices is about 1 V/m."

In its response to Basdekas's comments on the final Sandia report, the NRC noted that most of his recommendations "are predicated upon the assumption that EMP is a problem," but that the "evidence available supports the study team position that damage is unlikely to result from EMP." Further, it stated that Basdekas's recommendations "are not supported by the technical evidence and weight of technical judgment generated to date on this topic."

Telephone EMI

EMPRESS II has prompted C&P Telephone as well as the utility companies to look into potential EMI effects. C&P is currently attempting to calculate EMI thresholds for its equipment, some of which is likely to be within 10 to 15 miles of any EMPRESS II site.

Company engineer Mark Oliver anticipates that problems would be limited to "upsets" resulting in brief interruption of phone signals and perhaps switching equipment problems which could result in dialing errors. The only major consequence of the upsets would be for digital data transmission, where one glitch can be disastrous. Oliver told *Microwave News* that there may also be an accumulated effect from exposure to repeated EMPRESS II pulses, but added, "no one really knows very much about what EMP can do."

C&P Telephone has already had one experience with interference from EMP radiation. In 1978, a simulator at the Patuxent River Naval Air Station caused EMI on telephone cables entering one of the station buildings. The company would not discuss what kind of fields caused the problem nor how it was solved.

A Navy booklet issued in January 1979 for workers at the Patuxent River station reported that the Strike Aircraft Test Directorate's sophisticated computer facilities were affected by the station's EMP Simulator for Aircraft (EMPSAC). Computer memory was erased and automatic typewriters ejected pages midway through typing. The peak field strength in the area of the affected building was about 2000 V/m.

The draft EIS provides an interesting list of other EMI incidents, all of which occurred at field strengths well in excess of 100 V/m. The Navy concludes that damage to electrical/electronic systems should not occur below 5 kV/m, though that threshold should be halved for sensitive electronic/digital systems. The interference threshold for upsets to sensitive digital systems should be 1.5 kV/m.

Information on EMP effects on aircraft was initially requested by the air traffic manager at the Norfolk International Airport, but airspace near the simulator will be restricted. Therefore, the Navy addresses the possible routing and scheduling impact of EMPRESS II on aircraft rather than interference issues in the draft EIS.

(A review of the draft EIS discussion of EMP interference with cardiac pacemakers and EMP biological effects will appear in our next issue.)

State Opposition

Maryland state officials are most concerned over the potential biological effects of EMP, with Calvert Cliffs an important but secondary issue. Among the things they have questioned is whether the EMPRESS II pulse will affect aquatic and bird life near the barge-mounted antenna.

The state is very sensitive to the environmental and commercial importance of the bay and early on told the Navy that its draft environmental assessment presented an "unrealistic" evaluation of the overall impact of EMPRESS II. For example, it stated that "impacts on biota could range from an electrocution to long-term behavioral changes." An environmental assessment precedes the decision on whether an EIS is required.

State officials have also expressed concern over the biological effects of EMP on the public, even though the people receiving repeated, high intensity exposure will be Navy personnel. During each test, a ship with four full-time technicians and a crew of 50 to 100 would receive numerous pulses over a three to ten-day period. In addition, eight crew members would man the barge.

In a September 20 letter to Secretary of the Navy John Lehman, Jr., Governor Harry Hughes stated, "I am distressed and dismayed by the Navy's handling of the environmental impact statement process concerning its electromagnetic pulse projects in Maryland." Citing the September 13 Department of Defense agreement with the Environmental Protection Agency "which purported to represent a strong commitment by the Defense Department to environmental protection of the Chesapeake Bay region," Hughes said "the Navy's actions regarding the environmental assessment of its electromagnetic pulse projects raise

basic questions about the sincerity of this agreement."

Hughes referred to a new land-based TACAMO EMP Simulator (TES) as well as to EMPRESS II. TES is scheduled to replace the EMPSAC simulator at Patuxent River in 1985. The Navy has prepared a brief environmental assessment for TES but will not prepare an EIS for it.

The Governor's relationship with the Navy over EMPRESS II has been stormy from the start, and it appears that state pressure contributed to the Navy's decision to complete an EIS (see *MWN*, July/August 1984).

In Virginia, Charles Ellis of the state Council on the Environment told *Microwave News* that after responding to a "scoping letter" for the project in 1983, the state didn't hear from the Navy again. Virginia has not come out against EMPRESS II, but its July 27 response to the Navy's environmental assessment stressed the need for a detailed study.

The Navy expects to hold hearings on the draft EIS in November and to complete a final version by April 1985. Both Maryland and Virginia plan to submit comments after the hearings. If the project goes ahead as planned, EMPRESS II would begin operation in late 1986. ●

NRC Ruling on EMP

This June, the Nuclear Regulatory Commission (NRC) decided that measures to protect nuclear power plants against EMP interference "are unnecessary for the protection of public health and safety." With this decision to deny three 1982 petitions for rule making, the commission terminated its evaluation of EMP hazards. The ruling was published on July 12, 1984 (49 *FR* 28409).

The notice of denial concluded that, "there is no reason to believe that an EMP would prevent any commercial nuclear power plant from achieving a safe shutdown condition." The NRC's technical assessment was based in large part on the Sandia National Laboratories report, *Interaction of Electromagnetic Pulse with Commercial Nuclear Power Plant Systems*, NUREG/CR-3069, February 1983 (see *MWN*, April 1983).

The petitioners, including the Ohio Citizens for Responsible Energy, maintained that in the event of nuclear war, EMP from high-altitude nuclear blasts could wreak havoc on nuclear power plant electronic and electrical systems and result in core meltdowns. They argued that the commission's rules (10 CFR 50) should be amended to require protective measures against EMP interference in all nuclear plants in the interest of public safety. (The NRC rules were written before much was known about EMP.) The petitions were filed in connection with the licensing of the Perry, Limerick and Midland nuclear plants.

The NRC's current position on EMP hazards was laid out in a September 6, 1983 policy paper prepared by commission staff. The SECY-83-367 report concluded that "no further resource allocation is now justified by public health and safety considerations," and therefore "at the present time, the commission need not take any further action to evaluate the potential effect of an EMP on the safe operation of nuclear power plants."

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