

NOV. 9 1995

Decision 95-11-017 November 8, 1995

## BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA,

Order Instituting Investigation on the Public Utilities Commission's Own Motion to develop Policies and Procedures for addressing the potential health effects of electric and magnetic fields of utility facilities.

**ORIGINAL**

Background: In 1991, the California Public Utilities Commission (CPUC) received a complaint from a resident of San Francisco regarding a possible link between power lines and health problems. The CPUC conducted an investigation and issued a report in 1992, which concluded that there was no scientific evidence linking power lines to health problems. The report recommended that the CPUC take steps to address concerns about power lines, including developing guidelines for utility companies to follow in their operations.

Based on this investigation, the CPUC opened an investigation to consider the potential role of electric utilities in mitigating health effects, if any, of power frequency electric and magnetic fields (EMFs) created by electric utility power lines and by cellular radiotelephone system facilities. Initial comments on the specific EMF issues identified in the investigation demonstrated a consensus that EMF issues involving electric utilities and cellular utilities should be treated separately. Accordingly, an October 11, 1991 (D-91-11-013) Administrative Law Judge (ALJ) ruling bifurcated this investigation, with the first phase to address EMF generated from electric utilities and the second phase to address radio-frequency (RF) and EMF radiation generated by cellular utilities. In the electric utilities phase, we found by Decision (D-93-11-013) that there was no scientific link between power frequency EMFs and adverse health effects to humans. However, in response to the public concern and the scientific uncertainty regarding the potential health effects of EMF exposure, steps were established to address EMFs related to new and upgraded electric utility facilities and power lines. These steps included no-cost and low-cost measures to reduce EMF levels, workshops to develop EMF design guidelines, uniform residential and workplace EMF measurement programs, involvement by stakeholders and the public, a \$1,489,000,

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four-year education program, a \$5,600,000, four-year non-experimental and administrative research program, and participation in federal experimental research to be conducted under the National Energy Policy Act of 1992.

This order addresses the cellular phase of our EMF-related investigation, which considers the Commission's role in mitigating health effects, if any, of RF radiation generated by cellular utilities within the Commission's jurisdiction. Article XII, Section 6 of the California Constitution empowers the Commission to establish rules for the utilities it regulates. Public Utilities Code Sections 451 and 1002 require the Commission to consider the impact of utilities' services on the environment and human health and safety. Accordingly, our cellular investigation was limited to assessing the potential health effects and appropriate mitigation measures associated with cellular transmission facilities, ~~and no analysis is being made of cellular handsets as they are not considered within the Commission's jurisdiction.~~

~~Cellular hand sets were not considered in this investigation because of the Federal Communications Commission (FCC) has exercised preemptive authority over the states regarding the regulation of cellular handsets. Specifically, in the FCC's Matter of Deregulation of Mobile Customer Premises Equipment (CG-91 Docket No. 83-372), deregulated mobile telephone equipment to conform the FCC's treatment of that equipment with its treatment of all other customer premise equipment. The FCC further stated that it would preempt state authority to the extent necessary to achieve this deregulation. (96 F.C.C.2d, 112.) It also noted earlier that the Cellular Steering Committee will consist of five persons. The Cellular Steering Committee was established pursuant to a January 29, 1992 ALJ ruling. The committee consisted of one representative each from the Commission's Advisory and Compliance Division (ACD), Division of Ratepayer Advocates (DRA), California Department of Health Services (DHS), and~~

**Cellular Carriers Association of California, and "Citizens Concerned About Telecommunications" (EMF)** CACD chaired the ad hoc Committee<sup>s</sup> to level off priorities to answer as best as possible the following: The Committee's goal was to narrow issues for evidentiary hearing by planning and holding an informational workshop on the health effects of cellular utilities' EMF and RF radiation. Interested parties assisted in the planning of the workshop agenda by submitting EMF and RF radiation questions and issues to the Committee for consideration and incorporation into the workshop agenda. The Committee also developed a report to the Commission on December 31, 1993, (Appendix A) to this order.

The Committee held its workshop for all interested interested parties on July 21, 1993. The workshop was videotaped so that other individuals and organizations not able to attend the workshop could be informed of the potential health effects of exposure to EMFs and RF radiation from cellular utility facilities. Subsequently, the CACD submitted a workshop report to the Commission on December 31, 1993, (Appendix A) to this order. The workshop report identified the levels of cellular utilities' EMF and RF radiation impacts, issues for further consideration and interim safety measures. However, no comments were filed on the workshop report.

**Q. Cellular frequencies fall approximately in the middle of the frequency spectrum. Measured in hertz, or cycles per second, cellular frequencies typically are measured at 800 megahertz. Unlike television and radio transmission, which rely on one tower to provide all service, cellular transmission depends upon a multitude of cell sites or stations spread over a large service area. As the cellular system grows, cell splitting occurs. Further, as more cell sites are created to serve a particular area, the necessary operating power for each cell site is reduced. RR bns**

The two basic types of antennae used in cellular systems are the omnidirectional and the panel, or sector, antenna. Power density is used as a means of determining the level of exposure to RF and EMF. Such density measurements for both omnidirectional and panel antennae, with one exception, are well below 550 microwatts per square centimeter for exposure of 30 minutes or more. The omnidirectional antenna measures one microwatt per square centimeter. As to the panel antenna, measurements for one channel at less than 5 feet and for 19 operating channels at 20 feet were approximately 200 microwatts per square centimeter. The exception to such low-density readings is the measurement taken on a panel antenna with 19 operating channels from less than 5 feet, which registered 4,000 microwatts per square centimeter. However, there is little likelihood of human exposure at such close range because panel antennae are generally not accessible at less than 5 feet and because of their location on roof tops and towers. It is noted that RR is not a radio. Although epidemiological studies conducted of embassy DOD employees exposed to microwave radiation, naval radio operators and amateur radio operators have found that there was a slight tendency for increased cancer risk, several methodological difficulties were found to exist with these studies. Scientific studies have not yet indicated any obvious relationship between prolonged lower-level RF radiation exposure and increased mortality or morbidity, including cancer. In addition, the power densities measured closer to cellular towers were not found anywhere near the power densities used in the scientific experiments. Hence, we will not adopt any specific numeric standard in association with cellular utilities in EMF or RF radiation measurements at this time.

Issues for Further Consideration aside from the situation

The workshop report identified three issues for a separate consideration for future cellular industry action concerning EMF and RF radiation. These issues were: (1) the adoption of an emf

exposure standard; (2) workshops or hearings to be held at a later date; and (3) public perception surveys to be carried out as part of this investigation. The workshop presentations and discussions substantiated that very little is known about possible health hazards associated with EMF and RF exposure levels. However, cellular power densities have been found to be consistently below present exposure standards. Therefore, consistent with our conclusion in the holding electrical utility phase of this investigation, it is premature to adopt a set of EMF and RF radiation exposure standards for the cellular utilities in the absence of scientific evidence that there is a definitive link between cellular exposure levels and health risks.

However, as more scientific research is completed, more definitive answers regarding cellular EMF and RF radiation and its health will develop which may require Commission action. Therefore, it is reasonable to establish an informational process to periodically update interested parties on recent and significant developments related to EMF and RF radiation in the cellular industry. In this regard, CACD has volunteered to be a "storehouse" of the latest cellular EMF and RF radiation developments and to convene periodic workshops upon the receipt of significant cellular EMF and RF radiation information. CACD is already in the progress of updating its report attached to this order. Further, the results of our pending order in our investigation of mobile telephone service and wireless communications, including cellular (I.93-12-007), should be incorporated into CACD's workshops. CACD may accomplish this task without the holding of open of this investigation. Accordingly, CACD should hold informal cellular EMF and RF radiation workshops as additional information becomes available and report the results directly to the Commission through the resolution process if such results to be summarized in the report that the public perception about potential health problems associated with EMF and RF exposure now

radiation from the cellular utilities would continue to exist as long as there remained unanswered and unexplored questions in the scientific community on this issue. We concur. However, pursuant to Public Utilities Code § 451, cellular utilities have a duty responsibility to furnish and maintain facilities as necessary to promote the health and safety of their patrons, employees, and the public. Until clearer answers emerge from the scientific community, cellular utilities should identify and address public concerns about potential health problems from EMF and RF radiation associated with the location and construction of new cell sites through the environmental review process called for in General Order 159's advice letter or application filings. CACD's report notes that siting cells close to schools or hospitals often raise local opposition based on a perception of health risks.

Possible Interim Measures: CACD concluded in its report that it would be difficult to adopt a formal regulatory policy on cellular EMF and RF risk of radiation without conclusive scientific data confirming that health problems are associated with cellular facilities and without a robust cellular EMF and RF radiation policy statement from the DHS. However, CACD did recommend we adopt interim measures similar to, but less complex than, those adopted in the electric phases of this investigation. These steps are proposed to encourage and inform cellular utilities before encouraged to consider alternative locations of cell sites and to restrict access to cell sites, though most of which are already too inaccessible, by use of warning signs or physical barriers such as fences. We have already taken action by requiring cellular facilities to address public concerns about potential health risks from EMF and RF radiation associated with the siting and construction of new cell sites in their General Order 159 advice letter or application filings. However, it should be noted that workshops have been held on revising General Order 159 in conjunction with

Specifically, CACD proposed that cellular utilities be encouraged to consider alternative locations of cell sites and to restrict access to cell sites, though most of which are already too inaccessible, by use of warning signs or physical barriers such as fences. We have already taken action by requiring cellular facilities to address public concerns about potential health risks from EMF and RF radiation associated with the siting and construction of new cell sites in their General Order 159 advice letter or application filings. However, it should be noted that workshops have been held on revising General Order 159 in conjunction with

R.90-01-012 /vc Upon the issuance of a Commission decision in the General Order rulemaking proceeding, cellular utilities should defer implement any revised requirements. Therefore, we will not adopt the CACD's recommendation at this time. ~~for information and CACD - 18~~

Findings of Fact 18 A five-person 'cellular steering committee' (Committee) now composed of members of the staff and representatives of parties for this proceeding was established on January 29, 1992 pursuant to a ruling of the Assigned Administrative Law Judges ~~in accordance with the~~

~~note 2 /b/ The Committee's goal was to narrow the EMF and RF issues to radiation issues for evidentiary hearing by planning and holding an informational workshop on the health effects of cellular utilities' EMF and RF radiation with a scope of a year or less as specified in section~~

3. Interested parties assisted in the planning of the July 30 workshop by submitting EMF and RF radiation questions and issues to the Committee for consideration and incorporation into the workshop agenda.

4. The Committee held its workshop on July 30, 1993.

5. CACD filed its workshop report on December 31, 1993. No comments to the workshop report were received.

~~note 6 /c/ The workshop report did not find a need for evidentiary hearings at this time.~~

~~note 7 /d/ The workshop report includes EMF issues which CACD believes should be considered in determining future Commission action regarding EMF and the cellular industry.~~

8. Density measurements for both the omnidirectional land mobile panel antenna, with one exception, are well below 550 microwatts per square centimeter for exposure of 30 minutes or more.

9. An exception to the low density measurement is the blue band 19 channel panel antenna beam at less than 5 feet reported by CACD.

10. The 19-channel panel antenna is not generally accessible at less than 5 feet due to the location of the antenna or roof tops and towers, therefore, there is minimal human exposure impact.

11. Scientific studies have not indicated any obvious relationship between prolonged lower-level RF irradiation exposure and with increased mortality or morbidity including cancer.

12. CACD has volunteered to be a storehouse of the latest cellular EMF and RF radiation developments and to convey periodically workshops upon the receipt of significant cellular, EMF and RF radiation information concerning this issue and to endeavor to keep the public perception about potential health problems will continue to exist as long as there remain unanswered and unexplored questions in the scientific community on the EMF and RF radiation issue.

13. The public perception about potential health problems will continue to exist as long as there remain unanswered and unexplored questions in the scientific community on the EMF and RF radiation issue.

14. Cellular utilities have a responsibility to furnish and maintain facilities as necessary to promote the health and safety of their patrons, employees, and the public.

15. CACD proposed the adoption of interim measures that were similar to, but less complex than, those adopted in the energy phase of this investigation.

16. The public interest requires this order to become effective upon the date signed by the Director of CACD.

Conclusions of Law

The Director of CACD's workshop report should be adopted to the extent discussed in the body of this order.

2. It is not appropriate to adopt any specific numerical standard in association with cellular utilities' EMF or RF emitted radiation measurements until we have a firm scientific basis for adopting any particular standard.

3. CACD's proposal to hold informal cellular, EMF and RF emission radiation workshops as additional information becomes available should be adopted. The results of such workshops should be reported by CACD directly to the Commission through the resolution process.

4. The Director of CACD may be authorized to file a motion for leave to file a brief in opposition to this decision if he feels that it is in the public interest to do so.

5. The Director of CACD may file a brief in support of this decision if he feels that it is in the public interest to do so.

O R D E R

IT IS ORDERED that:

1. The Commission Advisory and Compliance Division's (CACD) workshop report attached to this order as Appendix A, except for CACD's proposed interim measures on the use of warning signs or physical barriers, is adopted.
2. CACD shall hold informal cellular EMF and RF radiation workshops as additional health information becomes available and upon its preparation of any updated EMF reports, and shall report the results of such workshops to the Commission through the resolution process.
3. Investigation 91-01-012 is closed.

This order is effective today.

Dated November 8, 1995, at San Francisco, California.

DANIEL Wm. FESSLER  
President  
P. GREGORY CONLON  
JESSIE J. KNIGHT, JR.  
HENRY M. DUQUE  
JOSIAH L. NEEPER  
Commissioners

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## BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

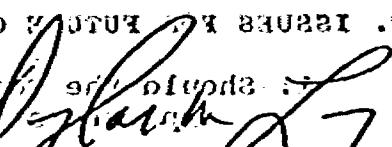
Order Instituting Investigation on  
 the Commission's own motion to <sup>investigate</sup>  
 develop policies and procedures  
 for addressing the potential health effects  
 of electric and magnetic fields of utility facilities

DEC 21 1993  
 SAN FRANCISCO, CA  
 NO. I.91-01-012

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Prepared by: ..... Respectfully submitted,  
 Bruce S. Kaneshiro  
 December 1993.....

C. ISSUANCE OF A HUMAN CONSIDERATION  
 BY   
 Douglas M. Flong, Chief  
 Environmental and Energy  
 Advisory Branch  
 Commission Advisory and  
 Compliance Division

D. POSSIBLE INTERIM MEASURE  
 COPY OF ORDER 30, 1993  
 Cancellation letter.....ACCIDENT

**Report on the Informational Workshop  
on Electric Magnetic Fields (EMF)  
and Cellular Transceiver Facilities**

Commission Advisory and Compliance Division

December 1993

On January 29, 1992, an Administrative Law Judge (ALJ) ruling in I.91-01-012 instructed the steering committee of active parties in the investigation to conduct an informational workshop on electromagnetic fields (EMF) from cellular telephone facilities and to submit a report summarizing the results of the workshop. The steering committee was composed of representatives from the Commission's Division of Ratepayer Advocates (DRA), the California Department of Health Services (DHS), the Cellular Carriers Association of California (CCAC), and the public.

#### A. WORKSHOP SUMMARY

The informational workshop was held on July 21, 1993. The overall goals of the one-day workshop were to gather information on EMF from cellular transceiver facilities and to narrow the issues under discussion. The workshop had four specific objectives:

- (1) Provide an overview of the cellular industry, including frequencies, intensities, siting considerations and near- and long-term future possibilities.
- (2) Discuss ranges and types of exposures from cellular telephone transceiver facilities.
- (3) Discuss results of cellular telephone and other radio frequency (RF) research on epidemiological, whole animal and cellular/molecular effects.
- (4) Provide an overview of current laws, regulation, and policies on cellular telephone and other RF radiation, including discussion on specific standards and guidelines for occupational and public exposures.

The workshop had four presentations to cover the objectives listed above. Mr. James Proffitt, Director of Interconnection and Standards at PacTel Corporation, provided the overview of the cellular industry and system. Mr. Ronald Petersen of AT&T Bell Labs' Radiation Protection Department spoke on exposure issues. Dr. Asher Sheppard, an EMF researcher and consultant, presented

# **CORRECTION !!**

*THE PREVIOUS DOCUMENT(S) MAY HAVE  
BEEN FILMED INCORRECTLY ....*

# **RESHOOT FOLLOWS**

FILED

## BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

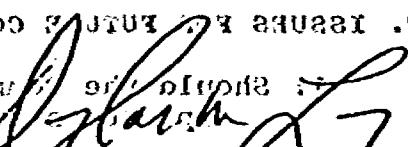
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 the Commission's own motion to develop policies and procedures for addressing the potential health effects of electric and magnetic fields of utility facilities

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Prepared by: ..... Respectfully submitted,  
 Bruce S. Kaneshiro  
 December 1993.....

C. Isaacson & Associates  
 2.....  
 By   
 Douglas M. Long, Chief  
 Environmental and Energy  
 Advisory Branch  
 Commission Advisory and  
 Compliance Division

D. Reasonable Interim Measure.....  
 Copy of Volume 30, 1993  
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Report on the Informational Workshop on  
Electric Magnetic Fields (EMF)

DRAFT FOR INFORMATIONAL WORKSHOP ON  
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AND CELLULAR TRANSCIEVER FACILITIES  
COMMISSION ADVISORY AND COMPLIANCE DIVISION  
DECEMBER 1993

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on Electric Magnetic Fields (EMF)  
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Commission Advisory and Compliance Division

December 1993

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#### A. WORKSHOP SUMMARY

The informational workshop was held on July 21, 1993. The overall goals of the one-day workshop were to gather information on EMF from cellular transceiver facilities and to narrow the issues under discussion. The workshop had four specific objectives:

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- (2) Discuss ranges and types of exposures from cellular telephone transceiver facilities.
- (3) Discuss results of cellular telephone and other radio frequency (RF) research on epidemiological, whole animal and cellular/molecular effects.
- (4) Provide an overview of current laws, regulation, and policies on cellular telephone and other RF radiation, including discussion on specific standards and guidelines for occupational and public exposures.

The workshop had four presentations to cover the objectives listed above. Mr. James Proffitti, Director of Interconnection and Standards at PacTel Corporation, provided the overview of the cellular industry and system. Mr. Ronald Petersen of AT&T Bell Labs' Radiation Protection Department spoke on exposure issues. Dr. Asher Sheppard, an EMF researcher and consultant, presented

#### B. WORKSHOP RESULTS

Over the past 10 years, the industry has made significant progress in reducing the levels of RF energy emitted by cellular phones. The industry has also developed more efficient transceiver technologies, such as TDMA and CDMA, which reduce the power required to transmit signals.

The results of the workshop indicate that the industry is making significant strides in addressing the concerns of the public regarding the safety of cellular phones. The industry is committed to continuing its efforts to reduce the levels of RF energy emitted by cellular phones and to develop new technologies to further reduce these levels.

The industry is also working to address the concerns of the public regarding the potential health risks associated with cellular phones. The industry is committed to conducting further research to better understand the potential health risks associated with cellular phones and to develop guidelines for safe use.

animal and molecular/cell-level RF EMF experimentation results. Dr. Robert Cleveland, who coordinates the Federal Communications Commission (FCC) activities related to the environmental effects of RF/microwave radiation, discussed existing laws, regulations, policies and guidelines. The workshop had also scheduled Dr. Doreen Hill of Energetics, an epidemiologist formerly of the Environmental Protection Agency (EPA), to speak on epidemiological research results. Unfortunately, she was unable to attend. Dr. Raymond Neutra, also an epidemiologist and Acting Chief of the Environmental Health Investigations Branch of DHS, presented Dr. Hill's research on her behalf.

The workshop presentations, including the question and answer sessions, were videotaped in their entirety and are available for purchase by the public. A hard copy packet of the slides used in the presentations is included with the videotapes. A letter from the Commission Advisory and Compliance Division (CACD) dated August 30, 1993 announced the availability of the videotapes and was mailed to all workshop attendees as well as the EMF cellular transceiver facilities service list. There have been approximately 24 videotapes sold.

## B. WORKSHOP RESULTS

The following points were discussed by the various participants during the presentations or in the question and answer periods that followed each presentation. These points were taken by CACD as the key ideas during the workshop; CACD notes that the videotapes are the most comprehensive account of the workshop.

### I. The U.S. Cellular Industry and System

- Over the past 10 years, the industry has acquired more than 11 million customers.
- The industry has a capital investment of over \$11 billion.
- There are over 10,000 base stations deployed nationwide, of which approximately 1,000 are in California.
- Cellular frequencies fall approximately in the middle of the frequency spectrum. Measured in hertz or cycles per second, cellular frequencies typically are measured at 800 megahertz. VHF television and FM radio are lower, at approximately 100 to 200 megahertz.

- Cellular transmission differs from television or radio transmission in that cellular depends upon a multitude of cell sites or stations spread over the service area to provide effective service, while television and radio typically will rely on one tower to provide all service.

- a. As a cellular customer moves about, signals are handed off from one cell site to another among cell sites, whichever site can best carry the signals. The cell stations also have the capability to lower or raise the power of the customer's receiver depending upon the receiver's distance from the cell site.
- b. To level off the system it is necessary to make some adjustments to the power of each user's equipment. This is done by the cell station which coordinates switching signals among cell sites. A switcher station is the brains of the system.
- c. As the system grows, cell splitting will occur. Cell splitting is the creation of more cell sites for a particular area which increases customer capacity, but it reduces the necessary operating power for each site. Smaller sized cell sites, or microcells, will eventually replace many of the present cell sites. These microcells operate at lower power levels than the present sites, but can carry more channels.
- II. Cellular Exposure Levels**
- a. The cellular system uses two basic types of antennae: omnidirectional and panel or sector. Panel antennae will be used more in the future since they can increase service for more customers with lower power densities than the present antennae.
- b. Power density is used as a means of determining compliance with existing exposure standards. The present standard is 550 microwatts per square centimeter for exposure of 30 minutes or more.

- c. Power density measurements for both omnidirectional and panel antennae have been found to be very low; for example, omnidirectional antennae were measured at 1 (one) microwatt per square centimeter either below or away from the antennae tower. A microwatt is one millionth of a watt. This upper measurement is with all channels operating simultaneously at full operating power. (The antennae seldom operate at full power.)
- d. Measurements made directly in the panel antenna beam (at 10 feet, less than 5 feet) were about 200 microwatts per square centimeter for one channel, and about 4,000 microwatts per square centimeters for 19 channels. At 20 feet, the 19 channel reading dropped to 200 microwatts per square centimeter. While the 19 channel reading is less than 5 feet exceeds exposure standards, this position is likely to be inaccessible due to the location of the antenna on top of towers. The 10 foot reading is well below the maximum power level of the equipment.

- e. Power density measurements of both microwaves and microcells were found to be very low. It was noted that there is no power greater than level of 550 microwatts per square centimeter.
- f. The current exposure standard of 550 microwatts per square centimeter is for exposure of 30 minutes or more. If the exposure time is less, such as 15 minutes, then the level of power density can be twice as much (1,100 microwatts per square centimeter). It was also noted during further discussions that the exposure standard is for a single source of power; there are areas which have more than one source of power. Thus, the combination of all power densities from surrounding sources may cause a particular area to be very high and possibly exceed exposure standards.
- g. While cellular facility power densities were clearly below the present exposure standards for the public, questions were raised regarding cumulative effects of chronic or continuous low exposure. At this point, there are no data or studies regarding cumulative effects. There was also discussion on the fact that many cellular facilities are using digital technology, which sends pulsed messages. Questions were raised about potential effects of pulsed messages.
- h. Discussion also centered upon the issue of the burden of proof; that is, is the cellular industry responsible for proving that cellular facilities are safe? Mr. Petersen noted in the discussion that proving that a risk is nonexistent is a very difficult task. Evaluations of raw possible risk are made on the available evidence which (in Mr. Petersen's opinion) do not indicate sufficient grounds for significant risk.
- c. Power density levels for cellular facilities based on the available evidence prove that cellular facilities are not a significant health hazard.
- III. Epidemiological Study Results**
- a. There are no completed epidemiological studies on the frequencies or exposure of cellular facilities or hand-held receivers and the risk of cancer. Two studies on cellular telephones are currently underway at the National Cancer Institute.
- b. Epidemiological studies have been done on exposures to Moscow embassy employees (subjected to microwave radiation), naval radar operators and amateur radio operators. In general, these studies found that there was a slight tendency, if any, for increased cancer risk. However, several methodological difficulties exist with these studies.
- c. The 1984 EPA RF Document concluded that human data are currently limited and incomplete but do not indicate any obvious relationship between prolonged lower level RF

radiation exposure and increased mortality or morbidity, including cancer. Studies since 1984 have not presented definitive evidence to cause a change in the 1984 conclusion.

- d. The results of the studies call for caution and further research, but cannot determine risk or be used to set standards. The studies do not definitively implicate RF radiation or electric and magnetic fields as a causative agent of cancer, but they do point to potentially "risky" jobs that deserve more careful examination through further research.
- e. Discussion centered on the fact that the aforementioned studies focused on adults, and that potential effects on children have not been addressed. It was noted during the discussion that the studies were focused on possibly identifying high-risk jobs, so children were not considered.
- f. Discussion also focused on the assertion in other literature that evidence indicates that electric and magnetic radiation is a definitive cause of cancer; it was noted that public health officials, upon review of the evidence, do not agree with the conclusion that such evidence is definitive.

#### IV. Results of Animal and Molecular Experiments

- a. Specific Absorption Rate (SAR) is the rate of energy absorbed per unit of mass, measured in watts per kilogram. SAR depends on size, shape and orientation of the object irradiated. SAR will also increase and peak depending upon the magnitude of frequency. A man's SAR peaks at approximately 70 megahertz, while a rat's SAR will peak at 1,000 megahertz.
- b. Prolonged whole body exposures (animals) with SAR exceeding 1 watt per kilogram raises body temperature, and can cause thermoregulatory failure, depending on species, environment and frequency. Prolonged whole body exposures also may enhance tumor expression, drug and virus effects. However, there are also many null effects.
- c. There are fewer studies under athermal conditions that leave unanswered questions about mechanisms and potential health effects involving nervous system and immune system.
- d. There are too few chronic studies to judge cancer risks. There is no modern study of microwave toxicology.
- e. Athermal biological effects indicate the existence of mechanisms for which heat input and temperature rise are not

- at issue in molecular and cell studies. Some questions not addressed by the experiments include whether health hazards associated with the biological effects are unknown.
- g. Discussion centered on comparing the power densities used in Dr. Sheppard's experiments and the power densities measured near cellular towers. The power densities measured close to the towers are not anywhere near the power densities used in the experiments. None of the experiments addresses the low exposure levels in the environment close to cellular antennae.
- h. Discussion also speculated on possibly moving from animal and lab studies to the development of an exposure standard. At this time, there is no intellectual framework of applying the studies to humans.
- i. Discussion also revolved around the presentation of the findings; concerns were raised that negative findings or null effects were not being presented as clearly to give a balanced view of the experiments.

#### V. Laws, Regulations, Policies and Guidelines

- a. A number of different federal agencies have become involved in varying degrees with radio frequency regulation. The Environmental Protection Agency (EPA) was developing exposure guidelines, but its research program was phased out in 1985. The Food and Drug Administration (FDA) regulates RF emissions from consumer/industrial devices; it is looking into RF emissions from hand-held cellular phones.
- b. The FCC is responsible for regulating RF transmitters and assessing the environmental impacts of RF transmitters through formal Environmental Impact Statements (EIS).
- c. The FCC's present policy is that it does not require routine submission of environmental information about microwave, cellular and amateur transmitters since there is no evidence to indicate that these devices exceed the current RF human exposure levels as set by the 1982 American National Standards Institute (ANSI) guidelines.
- d. The ANSI guidelines, promulgated in 1982, set 4 watts per kilogram for whole body exposure as a threshold for unfavorable effects. Safety factors are then applied by dividing the threshold by a factor of 10 to set an occupational exposure standard of 0.4 watts per kilogram. That standard is then divided by a factor of 5 to set a public exposure standard of 0.08 watts per kilogram. It

- should also be noted that some biological effects have also been detected at an exposure level of 1 watt per kilogram.
- e. The new (1992-93) exposure guidelines developed by the Institute of Electrical and Electronics Engineers (IEEE) and adopted by ANSI use the same exposure standards as the 1982 standards (preceding paragraph). The IEEE concluded that there is a lack of reliable data on chronic exposure.
- f. Exposure standards are different for occupations (controlled environment) and the general public (uncontrolled environment) since the public may be exposed for longer hours, may not be as well informed, may not have personal control over possible hazards, and may include more vulnerable people (pregnant women, infants, invalids, etc.).
- g. The FCC is currently proposing to adopt the new IEEE/ANSI guidelines, and is looking at other issues contained in the guidelines such as definitions of controlled and uncontrolled environments and evaluation of low-power hand held devices.
- h. In terms of future plans, the FCC will be reviewing public comments regarding possible adoption of the new IEEE/ANSI guidelines, and it will also address possible implementation of those guidelines. The IEEE and ANSI have already begun review for future revision of their most current guidelines. Dr. Cleveland was not aware of any other activity from other federal agencies besides those already discussed.
- i. Discussion centered on triggering a formal environmental impact statement for a particular site. Dr. Cleveland noted that if evidence can be provided that will show that a site exceeds current exposure standards, the environmental impact procedures would be triggered. There are even procedures for remedial action on sites already licensed by the FCC (assuming the evidence is convincing). At this time, however, there is no evidence to indicate that the cellular facilities exceed the current exposure standards.
- C. ISSUES FOR FUTURE CONSIDERATION**
- CACD believes that there are a number of issues that the Commission should consider in determining any future Commission actions regarding EMFs and the cellular industry. A review of these issues may be helpful in developing a sensible policy direction. The following points are based on the information gained from the workshop, and from the power frequency phase of this proceeding.
- CACD also notes the option of convening a consensus group for the purpose of developing policy options. This idea was very effective in developing the policies that support the

**Issue #1: Should the Commission adopt an exposure standard?**

The presentations and discussions in the workshop, especially by those representing the scientific community, indicate that very little is known about possible health hazards associated with RF exposure levels. However, cellular power densities have been found to be consistently below present exposure standards.

In the absence of scientific evidence that can neither definitively link nor disassociate health risks and cellular exposure levels, CACD believes that further research is needed before a Commission policy on cellular EMF exposure standards is developed. Until further research is conducted, the Commission could consider adoption of the 1992 IEEE/ANSI standard as a temporary measure. This standard is generally recognized as the dominant standard for RF exposure and the FCC is considering adoption of this standard for its own regulatory procedures. However, CACD recommends that it would be prudent for the Commission not to adopt any standard until the FCC has determined its course of action. The FCC is presently reviewing public comment on their proposal and has yet to determine a final position.

Rather than rely on these outside agencies, the Commission could request DHS to file a policy statement on cellular EMFs. The Commission relied heavily on the expertise of DHS in the power frequency phase of this proceeding, and found DHS to be most invaluable in the process of establishing a sensible EMF policy. As of this date, CACD is not aware of a DHS cellular EMF policy.

**Issue #2: Should the Commission institute hearings or workshops to address the issue further?**

CACD believes that more research will be committed to the issue of cellular EMFs and health. As the research is completed, more definitive answers will probably develop. In light of this continuing process of developing new information, CACD believes that the Commission should schedule periodic workshops for the exchange of recent and significant information. These workshops would allow interested parties an opportunity to be updated and informed on the latest developments. CACD could function as a storehouse of new information; when it appears that enough significant information has emerged, a workshop can be convened to share the information. CACD could make the decision to convene a workshop in conjunction with advice from DHS. Hearings would be an appropriate forum if the information constitutes a major policy development or change for the Commission.

CACD also notes the option of convening a Consensus Group for the purpose of developing policy options. This idea was very effective in developing the policies that support the

recommendations in the recent power frequency EMF decision (D.932152 11-013). CACD does not believe that a Consensus Group is an appropriate vehicle at this time. The reason for this is the significant lack of data on the issue. Unlike cellular EMF, power frequency EMF had the benefit of better developed research and more peer reviewed/validated scientific findings. This created a favorable atmosphere in which a Consensus Group could function. Unfortunately, the present state of definitive data on cellular EMF has led to extremely divergent views on the topic. As a matter of fact, the cellular industry remains unconvinced of any potential health effects from their facilities or products. It is doubtful at this time that a Consensus Group would have full participation or be an effective forum for policy development.

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### Issue #3: Public Perception of the Problem

Based upon telephone calls received from both the public and local government, as well as observations of recent media coverage on the issue, CACD notes that the public is becoming increasingly aware of the cellular EMF issue. Like any public health issue, cellular EMF has, and will continue, to gain local and national attention. The explosive growth of cellular base stations or cell sites throughout California has placed the issue squarely on the shoulders of local governments which are responsible for granting use and construction approval for these sites. (The Commission must also issue final authorization for the sites through General Order 159.) Due to public pressure from various communities to deny cellular companies from constructing more sites, local governments are looking to the Commission for more leadership on this issue.

CACD recognizes that the cellular EMF issue is just beginning; as long as there remains undefined information on the subject, speculation will continue to exist. There are many unanswered and unexplored questions as evidenced by the discussions during the workshop. CACD also notes that the Commission recognizes the cellular industry as a growing and vibrant industry that carries with it the possibilities of significant economic growth for the state. The Commission's November 1993 Report (Enhancing California's Competitive Strength: A Strategy for Telecommunications Infrastructure), recommends streamlining regulation of the telecommunications industry. The Commission has submitted the report to the governor as a proposed vision of California's telecommunication infrastructure. Considering these developments, the Commission may need convincing evidence that a more conservative regulatory policy on cellular EMFs is necessary.

The economic considerations of this issue are significant. CACD raises the equally, if not more, important issue of health and

safety of the public. Public Utilities Code, Section 451 requires, of regulated utilities to furnish and maintain facilities as necessary to promote the health and safety of its patrons, employees and the public. Furthermore, Section 1002 requires the Commission, in granting any certificate, to consider the potential effects of the project on community values and on the environment. The Commission is clearly responsible for ensuring that the utilities it regulates are providing service and facilities that do not constitute a threat to the public or the environment. As mentioned earlier, the current research on the matter has left many questions unanswered and therefore difficult to conclude that a health and safety problem does or does not exist. Until clearer answers emerge, the Commission should fully consider the possibilities that a health hazard could exist and that careful monitoring as well as some interim measures would be appropriate.

measures set to policy before public : 3# oneal

#### D. POSSIBLE INTERIM MEASURES

In the absence of conclusive scientific data on the subject, CACD finds it difficult to recommend a formal regulatory policy except to consider adopting the recent exposure standards that federal regulatory agencies are proposing as acceptable. CACD also believes that state health policy experts should provide a policy statement on the issue.

CACD notes that this issue is similar to the power frequency EMF situation. In light of that, CACD believes that as interim measures, some of the ideas that arose from the power frequency phase of this proceeding are appropriate starting points to consider for the cellular EMF issue. No- or low-cost steps to reduce EMF levels from electric utility facilities was a key policy statement that emerged from the power frequency phase of the OII. This policy entailed development of a 4% low-cost benchmark. CACD believes a similar, but less complex policy should be applied to the cellular EMF issue. Cellular companies can be encouraged to consider alternative siting, especially if projected cell sites are in close proximity to schools or hospitals. School and hospital sites can be designated only as last-choice possibilities. (Cellular sites next to or in schools are the most vigorously contested local issue.)

Cellular companies can also be encouraged to restrict access to cell sites by use of warning signs or physical barriers such as fences. Most cell sites are already inaccessible (e.g. on top of towers), but for those sites on rooftops of buildings, harder access will likely decrease incidental public exposure.

CACD believes these steps are reasonable for cellular phone companies to consider. The steps do not require significantly higher costs for a site nor are they admissions on the part of

the cellular industry that cellular facilities are hazardous but simply precautions the public can take to avoid the possibility of a hazard. (A similar analogy would be airline rules which require passengers to wear seat belts; the airlines do not of course characterize seat belts as an admission of reckless or incompetent pilots or a poorly maintained aircraft, but as a precaution against the possibility of a hazard.) These steps may demonstrate to the public that the industry is willing to accommodate public concern which may result in greater cooperation in the construction of future cell sites. In the meantime, efforts to discover any relationship between health effects and cellular EMF exposure levels should continue and future experiments be encouraged.

A complete set of video tapes from the July 31, 1993 conference will be made available to the public on the Public Utilities Commission's website at [www.puc.state.fl.us](http://www.puc.state.fl.us) for a fee of \$30.00. This price includes fax and shipping. (Out of state orders are \$36.00.) To place an order write or call Bette at the ADDO TRANSMISSIONS, 1841 Harry Rd., San Marcos, CA 92070 or phone (619) 228-8813. Orders will be sent one week from the date requested unless otherwise specified by check or credit card. [1]

The complete collection of standards at both corporate and grassroots levels, including the industry's voluntary protection program, director of health laws, radiaton protection legislation, and other relevant information will be available to the public on the Commission's website at [www.puc.state.fl.us](http://www.puc.state.fl.us). Mr. Ronny Pefferditch on behalf of the California industry spoke on exposure issues. Dr. Werner Sheldrick, an EMC researcher and consultant, presented a number of mitigation techniques to the industry. Dr. Robert Givens, who coordinates the industry's communication efforts, spoke on EME research issues. Dr. Jameson section secretary for safety to the industry, spoke on EME communication issues. Dr. Richard Dennerly, who coordinates the industry's radiaton protection, spoke on radiaton exposure guidelines. Dr. David Hill of Redefinitions, spoke on and updated the industry's position on epidemiologic findings of the Environmental Protection Agency. The complete set of the individual video of the conference and individual speaker presentations as well as discussion and answer sessions. It is the subcommittee's honor to welcome all members of the public to the video conference.

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STATE OF CALIFORNIA

## PUBLIC UTILITIES COMMISSION

25 VAN NESS AVENUE

SAN FRANCISCO, CA 94102-3778

**August 30, 1993****Interested Parties:** Commission Investigation of Potential Health Effects of Exposure to Electric & Magnetic Fields**Subject :** videotapes from the July 21, 1993 informational Workshop on Cellular Transceiver Facilities are now available for order.

A complete set of videotapes from the July 21, 1993 California Public Utilities Commission informational workshop on the potential health effects of exposure to electric and magnetic fields (EMFs) from cellular telephone facilities is now available. The complete set of four videotapes with a hard copy of the speakers' slides is available for \$39.50. This price includes tax and shipping. (Out of state orders are \$36.50.) To place an order write or call Barry at the VIDEO TRANSFER CENTER, 1841 Market St., San Francisco, CA 94103 or phone (415) 558-8815. Orders will be sent out within two working days and must be prepaid by check or credit card.[1]

The workshop covered background information on cellular radiotelephone facilities, transceiver siting considerations, ranges and types of exposures from facilities, epidemiological and animal research results, current laws and regulations, and guidelines for occupational and public exposure standards. Workshop speakers included Mr. James Proffitt, Director of Interconnection and Standards at PacTel Corporation who discussed the cellular industry and system. Mr. Ronald Petersen of AT&T Bell Labs' Radiation Protection Department who is an authority on exposures from cellular facilities, spoke on exposure issues. Dr. Asher Sheppard, an EMF researcher and consultant, presented animal and molecular/cell level EMF research results. Dr. Robert Cleveland, who coordinates the Federal Communications Commission activities related to the environmental effects of radiofrequency/microwave radiation, explained existing laws, regulations, policies and guidelines. Dr. Doreen Hill of Energetics, an epidemiologist formerly of the Environmental

1 The complete set is the unedited video of the conference and includes all speaker presentations as well as question and answer sessions. It is approximately 7 hours of viewing time. The quality of the speaker slides on the video varies but hard copies of the speaker slides are provided with the set of four tapes.

I.91-01-012 /ALJ/MFG/sid

CERTIFICATE OF SERVICE

The Bridge Response, certifies that the foregoing, copy of the  
Protection Agency (EPA) was scheduled to speak on the  
epidemiological research results but was unable to attend.  
Dr. Raymond Neutra, also an epidemiologist and Acting Chief of  
the Environmental Health Investigations Branch of the California's I  
Department of Health Services presented Dr. Hill's talk on her  
behalf.

The Commission periodically updates service lists to limit them  
to those parties who are actively participating in a proceeding.  
If you are interested in interested party status please refer to the  
Commission's Rules of Practice and Procedure regarding intervention,  
or contact our Public Advisor's Office at (415) 703-2074 for assistance. If you would like to continue to  
track the progress of the investigation, you should notify our  
Process Office that you wish to be placed in the "INFORMATION  
ONLY" category. Those in the Information Only category receive  
notices of hearings and ALJ Rulings free of charge but are  
charged at the current rate per page for Commission decisions.

Sincerely,

Douglas M. Long, Manager, ALJ and Commissioner  
Environmental & Energy Advisory Branch

cc: Administrative Law Judge Michael Galvin  
D. Brooks - Division of Ratepayer Advocates

Bridge Response

(END OF APPENDIX A)

CERTIFICATE OF SERVICE

I, Bruce Kaneshiro, certify that the following is true and correct:

I am a resident of the United States, State of California, a man over eighteen years of age, and am not a party to the within cause.

My business address is: 505 Van Ness Avenue, Room 3-B, San Francisco, California 94102.

By December 22, 1993, I served the foregoing document upon all service list parties, D. Brooks - Division of Rates and Rates and Services and the California Public Utilities Commission, ONP, Castegory, if you would like to contact me at (415) 503-2504 for assistance. If you would like to continue to do business with me, you may do so by calling me at (415) 503-2504 or by fax at (415) 503-2504.

Executed this 22nd day of December, 1993, at San Francisco,

California.

Commission Advisory and Compliance Division  
California Public Utilities Commission

505 Van Ness Avenue  
San Francisco, CA 94102

By Bruce Kaneshiro  
Bruce Kaneshiro

(END OF APPENDIX A)