

POOR ORIGINAL

NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

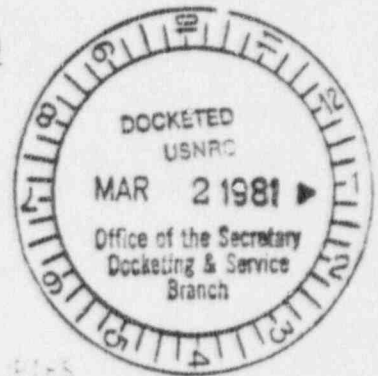
In the Matter of

GENERAL ELECTRIC COMPANY

(VALLECITOS Nuclear Center -
General Electric Test Reactor
Operating License No. TR-1)

Docket No. 50-70
(Show Cause)

81025



INTERVENORS' JOINT UPDATE TO NRC STAFF INTERROGATORIES

1. Intervenor are filing this joint response in view of the tight schedule for updating discovery answers, as well as because of the recent appearance of Glenn W. Cady, Esq. as Counsel for Intervenor Friends of the Earth and Ms. Barbara Shockley. This filing procedure was cleared orally, by telephone, with Counsel for the NRC staff on February 25, 1981.

This joint filing should not be viewed as a concession that all Intervenor are unified in this proceeding and each Intervenor submits the joint filing with the understanding that it does not prejudice the independence of their individual positions.

2. What follows are the NRC Staff's questions and Intervenor's answers, as per the Board's request:

NRC QUESTION #1: RE: COMMISSION ISSUE NUMBER 1.

What the proper seismic and geologic design bases for the GETR facility should be.

1-1.a. Upon what person or persons do you rely to substantiate your case on Issue 1?

ANSWER: Darrell Herd, Earl Brabb, William Ellisworth, Robert Morris, Mark Bonilla, James Devine, other USGS scientists who have written analyses of the earthquakes in California since the shutdown of the GETR and analyses of the 1971 San Fernando quake; Dr. James Brune, Dr. M. Trifunac, Dr. J. A. Simons, Dr. W. Joyner, Dr. Bruce Bolt, Dr. T. McEvilly and Richard Jahns.



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1-1.b. Identify which of the above persons you intend to call as witnesses in this proceeding.

ANSWER: The ASLB Memorandum and Order of February 3, 1981 states that "The Board requested (in the prehearing conference in January 1981) that the Staff attempt to have those named experts (Messrs. Herd, Brabb and Morris) and others who have worked on this project for the Geological Survey available for questioning at the hearing, notwithstanding that they may not be the witnesses offered by Staff on this issue." Intervenor's intend to call Messrs Herd, Brabb, Ellsworth and Bonilla as witnesses in this proceeding. We view them as being consultants to the staff and, therefore, as hostile to Intervenor's. In addition, Intervenor's intend to offer Dr. M. Trifunac as a hostile witness, due to his significant consultations to the NRC-ACRS proceeding. It is our hope that the NRC Staff will also make available Dr. Trifunac for questioning during the hearing. (See, further, answer to 1-1.d.)

1-1.c. Provide the addresses and educational and professional qualifications of any persons named above.

ANSWER: Messrs Herd, Brabb, Ellsworth, Bonilla, Joyner and the other USGS scientists who analyze California earthquakes are all located at the USGS offices at 345 Middlefield Road, Menlo Park, California 94025. Messrs. Morris and Devine are located at the USGS office at National Headquarters, USGS, Reston, Virginia 22092. All of their educational and professional qualifications are available to the NRC readily from the USGS.

Messrs. Brune and Simons are seismologists at the University of California, San Diego's Scripps Institute of Oceanography's Institute of Geophysics and Planetary Physics (UCSD-SIO-IGPP) in La Jolla, California 92037. Dr. Trifunac is a professor at the University of South California's Department of Civil Engineering in Los Angeles, California 90007. Messrs. Bolt and McEvilly are seismologists at the University of California, Berkeley's Seismology Laboratory Berkeley, California 94720. Dr. Jahns is at the Stanford University, Earth

Sciences Department, Stanford, California 94305.

All of these individuals are familiar to the NRC Staff's Geosciences Branch because of their involvement in this and other NRC proceedings.

1-1.d. Identify which of those persons identified in b. above you anticipate will appear voluntarily and which under subpoena.

ANSWER: Intervenors anticipate that the USGS scientists will appear voluntarily at the request of the NRC Staff, as requested by the ASLB. If the Staff does not make these USGS scientists available or if the USGS seeks to assign them to duties which will be in conflict with their ability to appear at the Hearing, Intervenors will subpoena them to appear as hostile witnesses. If the NRC does not call Dr. Trifunac during the hearings, then Intervenors will subpoena him. Intervenors anticipate that the Licensee will submit testimony from its consultants Bolt, McEvilly and Jahns, which Intervenors would be able to cross-examine on. If these persons are not presented as witnesses, Intervenors will subpoena them as hostile witnesses.

1-2. Provide summaries of the views, positions or proposed testimony on Issue 1 of all persons named in response to Interrogatory Number 1-1, that you intend to present during this proceeding.

ANSWER: Intervenors hereby incorporate by reference, as a means of providing the summaries of the views, positions, and proposed testimony, all documents prepared by the USGS scientists that are relevant to this proceeding, including but not limited to the following: The original map by Darrell Herd of September 1977; the written and oral comments and reports and reviews by USGS scientists regarding the Vallecitos site since the publication of the new 1977 USGS map; and the NRC Staff reports regarding seismic and geologic design bases since the beginning of the site review in 1977, including the Staff SER inputs from the Geosciences Branch (which include USGS reports as appendices and references) dated 1977, 1978, 1979, 1980 and 1981; and the testimony and transcripts

from the ACRS subcommittee and full committee meetings regarding the Vallecitos site. We expect the USGS scientists and Dr. Trifunac to testify as to the completeness and accuracy of the statements made in those documents.

1-3. What do you recommend as the proper design basis for surface displacement at the site?

ANSWER: Intervenors recommend the proper design basis for surface displacement as 2.5 meters or more, on a strand of the Verona Thrust Fault Zone directly beneath the GETR.

1-4. What do you recommend as the proper design basis for vibratory ground motion at the site?

ANSWER: Intervenors recommend that the proper design basis for vibratory ground motion at the site be greater than 1.15 g horizontal and greater than 1.74 g vertical.

1-5. What do you recommend as the proper design bases for the combined effects of surface displacement and vibratory ground motion? Include in this response the time sequence of these events that you postulate.

ANSWER: Intervenors recommend that the 2.5 meters of surface displacement beneath the GER will occur simultaneously with the horizontal and vertical accelerations in excess of 1.15 g horizontal and 1.74 g vertical.

1-6. State all bases, calculations, and references used (for example, trench logs, maps, well data, published works, etc.) or that you intend to use during this proceedings, for supporting the positions stated in response to Interrogatories 1-3, 1-4, and 1-5, as appropriate. Specify the interrogatory response number which the individuals sources were used for. For calculations furnished, include, for example, the amount and direction of surface offset, the maximum vibratory ground motion, and the probability associated with the ground motion that you assume.

ANSWER: Because the GETR is located in the Verona Thrust Fault Zone, with thrust faults discovered since 1977 on both sides of and beneath the reactor Intervenors

contend that the seismic and geologic design bases for the GETR include a surface rupture displacement of 2.5 meters minimum with larger displacements possible and simultaneous peak ground accelerations (free field instrumental) of greater than 1.74 g vertical and greater than 1.15 g horizontal. The reasons, bases, calculations, and references used for these opinions are discussed in detail in the NRC Staff SER inputs and the USGS reports produced in 1977, 1978, 1979, 1980 in this proceeding. Furthermore, the 2.5 meters surface rupture and the 1.15 g horizontal accelerations are based on the data set and reports by the USGS and other scientists regarding the San Fernando Earthquake of February 1971. The 1.74 g vertical value is based on the data set and analyses and reports regarding the Imperial Valley Earthquake of October 1979. The NRC Staff Geosciences Branch is very familiar with the data sets and reports and analyses regarding both of those earthquakes because of the extensive amounts of referencing of them done in the NRC proceedings before ASLBs and Appeals Boards in the Diablo Canyon and San Onofre Nuclear Reactor Site Licensing Proceedings in California. Since the time of the GETR shutdown, there have been many meetings and hearings involving the NRC Geosciences Branch and various parameters and earthquakes that are relevant at the GETR site.

The 2.5 meter surface rupture at the GETR site is based on a comparison with the San Fernando earthquake of 1971, which was on a thrust fault of similar rupture length to the mapped Verona Fault. The surface rupture during the future Vallecitos earthquake would be simultaneous with the peak ground accelerations, both vertical and horizontal. The San Fernando quake (Magnitude 6.5) caused 2.4 meters of surface rupture for 12 kilometers, with a peak acceleration of 1.15 g horizontal at the Pacoima Dam.

Another Magnitude 6.5 quake struck California on October 15, 1979 in the Imperial Valley. (Hereinafter referred to as IV 79.) Prior to that quake, there was very little data on near field ground acceleration measurements. The IV 79 quake was the best instrumented quake in history and it may become one of the most

analyzed and written about. There are dozens of scientific reports, either published or in preparation, which describe its characteristics and relevance. This document hereby incorporates by Reference all scientific papers which have been published or which are in preparation by the USGS, the California Division of Mines and Geology and scientists at the University of California, California State Universities and the California Institute of Technology regarding the IV 79 quake. The peak ground acceleration there was 1.74 g vertical.

Another interesting characteristic of the IV 79 quake was ^{that} the vertical accelerations exceed^{ed} horizontal ones, contrary to basic assumptions made by the NRC Staff in the establishment of seismic design criteria for nuclear reactors in the United States. Corroboration of this phenomenon was available after the June 1980 Victoria quake in Baja California which recorded several ground accelerations exceeding 1.0 g, with verticals exceeding horizontals.

In January 1980, the Vallecitos Nuclear Center was shaken by earthquakes in the Livermore Valley, adjacent to Vallecitos Valley. That quake was strong confirmation of the natural seismic phenomena of seismic focusing or directivity which can cause amplification of groundmotions in the direction of seismic rupture propagation. This phenomena can contribute to higher ground accelerations at the GETR site during a future quake.

In August 1978, an earthquake offshore from Santa Barbara, California also confirmed the phenomena of seismic focusing or directivity. In August 1979, the Calaveras Fault was the source of a Magnitude 5.9 quake now known as the Coyote Lake quake. That quake shook all of Northern California, and is one of several which have occurred along the Calaveras Fault since the shutdown of the GETR by the Commission's Show Cause Order. This recent seismicity demonstrates that the current activity and capable nature of the Calaveras Fault Zone. The Calaveras Fault Zone is capable of a Magnitude 7.5 quake at any time and the probability of that quake occurring is higher now than it has been since the 19th Century when the Calaveras experienced several major quakes. A major quake is overdue on the Calaveras. It is currently in a state of seismic gap. The next

major quake on the Calaveras could occur between the Board's decision on this OSC hearing and the Board's decision at the relicensing hearings.

NRC QUESTION #2: RE: COMMISSION ISSUE NUMBER 2.

Whether the design of GETR structures, systems and components important to safety requires modification considering the seismic design bases determined in issue (1) above, and, if so, whether any modification(s) can be made so that GETR structures, systems and components important to safety can remain functional in light of the design bases determined in issue (1) above.

2-1. a. Upon what person or persons do you rely to substantiate your case on Issue 2?

ANSWER: The Intervenor's case on Issue 2 is substantiated by the professional opinions of several engineers. These include three California licensed structural engineers whose names are Gary Gray, Jim Caid and John Rutherford. In addition, we will ^{utilize} analyses provided by Dr. David Brillinger, Chair of the Statistics Department at the University of California, Berkeley, Berkeley, CA 94720.

2-1.b. Identify which of the persons identified in a. you intend to call as witness in this proceeding.

ANSWER: Intervenor's intend to introduce as witnesses in this proceeding Messrs. Rutherford and Gray and Dr. Brillinger.

Unfortunately schedule conflicts prevent the personal appearance of Mr. Rutherford at the hearings. Because we intend to introduce written testimony from Mr. Rutherford and he will be unable to personally appear at the hearings due to a previous commitment to present a technical paper at a conference in Stockholm, Sweden on June 5, 1981 (and he is scheduled to leave the country prior to this date), Intervenor's are prepared to make available Mr. Rutherford for cross-examination by deposition. Intervenor's will be amenable to attempting to provide Mr. Rutherford's testimony ahead of the deadline for filing written testimony in order to facilitate such examination.

Intervenors reserve the right to introduce testimony by Mr. Jim Caid, although at present it is not our intention to do so. We will advise all parties to the proceeding of our intention as soon as a final determination is made.

2-1.c. Provide the addresses and educational and professional qualifications of any persons named above.

ANSWER: Dr. David R. Brillinger, Chairman, Statistics Department, University of California at Berkeley, Berkeley, CA 94720. A copy of Dr. Brillinger's biography (two pages), listing of professional committee work and list of publications (five pages) are attached hereto and incorporated as a part of this answer.

Mr. Gary Gray is a licensed architect and a licensed structural engineer with a B.S. in Civil Engineering from the University of California, Berkeley (1953) and a M.S. in Civil Engineering from the Massachusetts Institute of Technology (1957). He is a member of the American Institute of Architects, the American Society of Civil Engineers, the Consulting Engineers Association of California, and the Structural Engineers Association of Northern California. His address is 1001 Merced Street, Berkeley, CA 94707.

Mr. Jim Caid is a licensed civil and structural engineer who lives and works in California. More information will be provided regarding Mr. Caid if he is to be made available as a witness.

Mr. John Rutherford has been a licensed civil and structural engineer in the State of California since 1958. He received his M.S. in Structural Engineering from the California Institute of Technology and his B.S. in Civil Engineering from Lehigh University. Mr. Rutherford's address is 1141 Chestnut Street, San Francisco, CA 94109.

Mr. Rutherford has been professionally involved in hundreds of geologic investigations as a structural engineer. He is experienced in seismic risk evaluations in the design and modification of structures subject to earthquake stresses. He is knowledgeable in the state of the art in both geological fault investigations and earthquake resistant design. He is experienced in analyses of soils investi-

gations, foundation designs, soil-structure interaction analyses and the preparation of geologic hazards reports.

2-1.d. Indicate which of the persons identified in b. above that you anticipate will appear voluntarily and which under subpoena.

ANSWER: We anticipate that all of the persons listed in 2-1.b. above will appear voluntarily as witnesses for either consolidated Intervenor Congressmen Dellums, Burton and Burton or consolidated Intervenor Friends of the Earth and Ms. Barbara Shockley or both groups.

2-2 Provide summaries of the views, positions, or proposed testimony on Issue 2 of all persons named in response to Interrogatory Number 2-1, that you intend to present during this proceeding.

ANSWER: Intervenor anticipate that their structural engineering experts will testify that because of the possibility of surface rupture directly beneath the reactor the NRC and the Licensee of the GETR cannot guarantee that the public health and safety will be protected following a future earthquake on the Calaveras or Verona Fault Zones because the NRC and the Licensee cannot prove or guarantee that there will be no structural damages to the GE Test Reactor during and following that future Vallecitos Earthquake on the Calaveras or Verona Fault Zones. That because the GETR and the Vallecitos Nuclear Center are located directly on top of an active capable thrust fault zone and because the GETR faces the possibility of surface rupture directly beneath the structure, accompanied by severe seismic shaking, Intervenor will attempt to establish that there are no possible design modifications to the GETR which would be adequate to protect the public health and safety and, therefore, that the GETR should remain shutdown as is currently the case and has been since October 1977.

Dr. Brillinger will testify that the use of probability analysis should not be incorporated in the Safety Evaluation of the GETR without suitable margins of error being included. And that the assumptions used in developing input factors for the probability equation are debatable and must be considered in greater depth.

That, in turn, the conclusions reached by the probability analysis cannot be considered to have been established. And that as a result the Atomic Safety and Licensing Board should not utilize this analysis in reaching its determination as to whether it is safe to restart and continue to operate the GETR.

2-3 Which specific GETR structures, systems and components important to safety require design modification considering the seismic and design bases that you postulate in response to Interrogatories 1-3, 1-4, and 1-5. In each case indicate the nature, extent and the types of modifications that you recommend.

ANSWER: Considering the seismic and design bases that Intervenor described in detail in response to Staff Interrogatories 1-3, 1-4, and 1-5, the Intervenor contend that no modifications to the GETR would be adequate to protect the public health and safety and therefore that the GETR should remain shutdown as it was ordered by the NRC in October 1977.

2-4. State the bases, calculations and references used for supporting the positions specified in response to Interrogatory 2-3 as to the following:

- a. Why each structure, system and component specified is important to plant safety;
- b. Why each structure, system and component specified needs modification.

ANSWER: This Interrogatory asks the Intervenor to comment on the proposed modifications for the GETR structures, systems and components specified by the NRC and the Licensee. However, considering the seismic and design bases that Intervenor described in detail in response to Staff Interrogatories 1-3, 1-4, and the 1-5, and the explanations presented in 2-1, 2-2, and 2-3, the Intervenor contend that no modifications are appropriate or adequate to protect the public.

- 2-5.a. Is it your position, or do you anticipate that it will be your position at the hearing, that the modifications specified in response to Interrogatory 2-3 can be made so that GETR structures, systems and components important to safety can remain functional in light of the design bases determined in Issue 1;
- b. If the answer to a. is no, state the specific bases, calculations, and references which support this conclusion.

ANSWER: Intervenor's did not specify any modifications in response to Interrogatory 2-3 because it is the Intervenor's position that the GETR structures, systems and components necessary to protect the public health and safety cannot be guaranteed to remain functional during and following surface rupture, seismic shaking, and vertical and horizontal ground accelerations at the GETR site.

NRC QUESTION #3: RE: COMMISSION ISSUE NUMBER 3.

Whether activities under Operating License No. TR-1 should continue to be suspended pending resolution of the foregoing.

- 3-1.a. Upon what person or persons do you rely to substantiate your case on Commission Issue Number 3?
- b. Identify which of the persons identified in a. you intend to call as witnesses in this proceeding.
- c. Provide the addresses and educational and professional qualifications of any persons named above.
- d. Indicate which of the persons identified in b. above that you anticipate will appear voluntarily and which under subpoena.

ANSWER: It is the position of the Intervenor's that activities under OL # TR-1 should continue to be suspended because of reasons described in detail above. Intervenor's responses to 3-1.a, b, c and d incorporate Intervenor's responses to 1.1a, b, c and d and 2.1.a, b, c, and d above.

3-1.a. J. Glenn Barlow

3-1.b. Intervenor's intend to call Glenn Barlow as a witness in this proceeding.

3-1.c. Mr. Barlow's address is Glenn Barlow, Friends of the Earth, 124 Spear St., San Francisco, CA 94105.

Mr. Barlow attended Yale University and received a degree in Communications from the University of California at San Diego.

Mr. Barlow worked for several years as environmental investigative reporter and nuclear documentary producer with the Pacific FM Radio Network.

Mr. Barlow is currently a Research Consultant for the Intervenors.

Mr. Barlow is particularly qualified in relation to the issues in this Proceeding because he has been a Communications expert for the Intervenors in regard to the GETR since 1976. Glenn Barlow has reviewed and analyzed all of the communications between the NRC staff and the Licensee re the GETR and the Vallecitos Nuclear Center. Mr. Barlow has attended the meetings held in California between the NRC staff and the Licensee since 1977.

Mr. Barlow participated, as a Representative of the Intervenors, during the field trips in 1977, 1978 and 1979 in visits to the trenches and other Geoscience Investigations that were conducted for these Proceedings.

Mr. Barlow is the Communications expert for the Intervenors who witnessed the oral and verbal communications (during these field trips and meetings) between the various scientists and staffpersons from the NRC staff, the USGS, and the Licensee and their consultants.

3-1.d. Mr. Barlow will appear voluntarily.

3-2. Provide summaries of the views, positions, or proposed testimony on Commission Issue Number 3 of all persons names in response to Interrogatory No. 3-1, that you intend to present during this proceeding.

ANSWER: Intervenors' responses to 3-2 incorporate Intervenors' responses to 1.2, 1.3, 1.4, 1.5, and 1.6 and 2.2, 2.3, 2.4 and 2.5.

3-2. A summary of Mr. Barlow's proposed testimony on Commission Issue Number 3 is that activities under Operating License No. TR-1 should continue to be suspended.

- 3-3. State the specific bases, calculations and references upon which the persons named in response to Interrogatory No. 3-1 rely to substantiate their views regarding Commission Issue 3.

For all references requested in these interrogatories, identify them by author, title, date of publication and publisher if the reference is published, and if it is not published, identify the document by the author, title, the date it was written, the qualifications of the author relevant to this Proceeding, and where a copy of the document may be obtained. Include copies of all references, or make available for Staff inspection and copying, all references.

ANSWER: Intervenors' responses to 3.3 incorporates the Intervenors' responses to all of the Interrogatories in this current set.

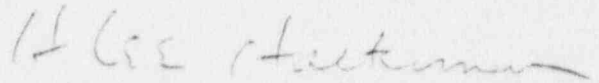
- 3-3. Activities under Operating License No. TR-1 should continue to be suspended.

- (1) Because of the possibility of surface rupture beneath the GETR;
- (2) Because of the large horizontal and vertical accelerations expected during future quakes on the Verona and Calaveras Fault Zones;
- (3) Because the GETR was not designed for surface rupture and large ground accelerations;
- (4) Because a major quake (M7.5) could strike the Calaveras Fault at any time and be accompanied by sympathetic ground motions and surface rupture on the Verona Fault Zone;
- (5) Because no modifications would be adequate to protect the public health and safety.

Respectfully submitted,



Glenn W. Cady, Counsel for Intervenors
Friends of the Earth and Barbara Shockley



H. Lee Halterman, Counsel for Intervenors
Dellums, Burton and Burton

February 25, 1981

BIOGRAPHY OF DAVID R. BRILLINGER %

- 1937 Born on 27 October at Toronto, Canada
- 1958 One of five highest ranked competitors in the Putnam Mathematical Competition
- 1959 B.A. in Pure Mathematics, University of Toronto
- 1960 M.A. in Mathematics, Princeton University
Associate of the Society of Actuaries
- 1961 Ph.D. in Mathematics, Princeton University
- 1961-1962 Social Science Research Council Post Doctoral Fellow at the London School of Economics
- 1962-1964 Lecturer in Mathematics at Princeton University
Member of Technical Staff at Bell Telephone Laboratories, Murray Hill, N. J.
- 1964-1966 Lecturer in Statistics at the London School of Economics
- 1966-1969 Reader in Statistics at the London School of Economics
- 1967-1968 Visiting Associate Professor of Statistics at the University of California, Berkeley
- 1968-1969 Member, Research Section Committee, Royal Statistical Society
Member, Series B Editorial Board, Royal Statistical Society
- 1969 Fellow of the Institute of Mathematical Statistics
Instructional Lecturer, Twelfth Biennial Seminar of the Canadian Mathematical Congress
- 1969- Professor of Statistics, University of California, Berkeley
- 1970-1972 Associate Editor, The Annals of Mathematical Statistics
- 1972-1978 Associate Editor, The Annals of Statistics
- 1972-1978 Associate Editor, The Annals of Probability
- 1972 Fellow of the American Statistical Association
- Summer consultant to the Institute of Biometry and Community Medicine, University of Exeter, Exeter, England
- 1972- Analysis Advisory Committee of the Education Commission of the States

- 1973-1974 Miller Research Professor, University of California, Berkeley
- 1974-1977 Council of the Institute of Mathematical Statistics
- 1974 Member of the International Statistical Institute
- 1975- Research Associate of the Seismographic Station of the University of California, Berkeley
- 1975-1979 Council of the Bernoulli Society for Statistics and Probability
- 1975-1978 Editorial Board of the Journal of Multivariate Analysis
- 1975-1976 Guggenheim Fellow
- Advisor on Graduate Studies in Mathematics to the Council of Ontario Universities
- 1976 Visiting Professor of Mathematics, University of Auckland
- 1976- Editorial Board Springer-Verlag Series in Applied Statistics
- 1977-1980 Grant Selection Committee for Pure and Applied Mathematics, National Research Council of Canada
- 1977-1979 National Statistics Committee, National Research Council
- 1977- Associate Editor, Canadian Journal of Statistics
- 1977 Short term visitor (one month) Commonwealth Scientific and Industrial Organisation (Australia)
- 1977-1978 Member, Statistical Task Force, Weather Modification Advisory Board
- 1979- Chairman, Statistics Department, University of California, Berkeley
- 1979- Member, Panel on Fertility Determinants, National Research Council
- 1979- Editorial Board of the Journal of Time Series Analysis
- 1980- Board of Editors, Journal of Theoretical Neurobiology
- 1981- Member, Committee on Applied and Theoretical Statistics, National Research Council

PROFESSIONAL COMMITTEE WORK OF DAVID R. BRILLINGER

- 1975-1976 Editor Selection Committee, Institute of Mathematical Statistics
(Chairman in 1976)
- 1976 Chairman, Nominating Committee, Institute of Mathematical Statistics
- 1976-1979 Committee on the Integration of Statistics, International
Statistical Institute
- 1976-1978 Publications Committee, Institute of Mathematical Statistics
- 1977-1979 Committee on Corporate Members, Mathematical Association of
America
- 1977-1978 Chairman, Invited Papers Committee, The Annals of Statistics
- 1977-1980 Co-Chairman, Organizing Committee, Special Meeting on Time Series
Analysis, Institute of Mathematical Statistics
- 1977-1978 Chairman, Advisory Committee, Survey Research Center, University of
California, Berkeley
- 1978-1979 Member Regional Energy Activity and Demographic Model Review
Committee, U.S. Dept. of Energy
- 1980- Member International Statistical Institute Committee to prepare
Roster of Statisticians

PUBLICATIONS OF DAVID R. BRILLINGER.

- 1961a "A note on the definition of asymptotic normality for multidimensional random variables," Estadistica, Vol. 20, 371 .
- 1961b "A justification of some common laws of mortality," Transactions of the Society of Actuaries, Vol. 13, 116-119 .
- 1961c "Asymptotic means and variances in the k-dimensional case," Ph.D. Thesis, Princeton University, 70 pp.
- 1962a "Examples bearing on the definition of fiducial probability with a bibliography," Annals of Mathematical Statistics, Vol. 33, 1349-1355.
- 1962b "A note on the rate of convergence of a mean," Biometrika, Vol. 49, 574-576.
- 1963a "A note on the re-use of samples," Annals of Mathematical Statistics, Vol. 34, 341-343.
- 1963b "Necessary and sufficient conditions for a statistical problem to be invariant under the action of a Lie group," Annals of Mathematical Statistics, Vol. 34, 492-500.
- 1964a "A technique for measuring the spectral density matrix of two signals," Proceedings of the Institute of Electrical and Electronic Engineers, Vol. 52, 103-104.
- 1964b "The asymptotic behavior of Tukey's general method of setting approximate confidence limits (the jackknife) when applied to maximum likelihood estimates," Review of the International Statistical Institute, Vol. 32, 202-206.
- 1965a "A property of low-pass filters," SIAM Review, Vol. 7, 65-67.
- 1965b "A moving average representation for random variables covariance stationary on a finite time interval," Biometrika, Vol. 52, 295-297.
- 1965c "An introduction to polyspectra," Annals of Mathematical Statistics, Vol. 36, 1351-1374.
- 1966a "The analyticity of the roots of a polynomial as functions of the coefficients," Mathematics Magazine, Vol. 39, 145-147.
- 1966b "The application of the jackknife to the analysis of sample surveys," Commentary, Vol. 8, 74-80.
- 1966c "An extremal property of the conditional expectation," Biometrika, Vol. 53, 594-595.

- 1967a (with M. Rosenblatt) "Asymptotic theory of estimates of k-th order spectra," Proceedings on the National Academy of Sciences of the U.S.A., Vol. 57, 206-210 .
- 1967b (with M. Rosenblatt) "Asymptotic theory of estimates of k-th order spectra," pp. 153-188 in Advanced Seminar on Spectral Analysis (ed. B. Harris), New York, Wiley.
- 1967c (with M. Rosenblatt) "Computation and interpretation of k-th order spectra," pp. 189-232, Ibid.
- 1967d "Bounded polymasure and associated translation commutative polynomial operators," Proceedings of the American Mathematical Society, Vol. 18, 487-491.
- 1968 "Estimation of the cross-spectrum of a stationary bivariate Gaussian process from its zeros," Journal of the Royal Statistical Society, B, Vol. 30, 145-159.
- 1969a (with M. Hatanaka) "An harmonic analysis of non-stationary multivariate economic processes," Econometrica, Vol. 37, 131-141 .
- 1969b "The calculation of cumulants via conditioning," Annals of the Institute of Statistical Mathematics, Vol. 21, 215-218.
- 1969c "The canonical analysis of stationary time series," pp. 331-350 in Multivariate Analysis - II (ed. P. R. Krishnaiah) New York, Academic.
- 1969d "An asymptotic representation of the sample distribution function," Bulletin of the American Mathematical Society, Vol. 75, 545-547.
- 1969e "Asymptotic properties of spectral estimates of second order," Biometrika, Vol. 56, 375-390.
- 1969f "A search for a relationship between monthly sunspot numbers and certain climatic series," Bul. Inter. Statist. Inst., Vol. 43, Book 1, 293-307.
- 1970a "The identification of polynomial systems by means of higher order spectra," Journal of Sound and Vibration, Vol. 12, 301-313.
- 1970b (with M. Hatanaka) "A permanent income hypothesis relating to the aggregate demand for money," Economic Studies Quarterly, Vol. 21, 44-71.
- 1970c "The frequency analysis of relations between stationary spatial series," pp. 39-81 in Proceedings of the Twelfth Biennial Seminar of the Canadian Mathematical Congress (ed. R. Pyke) Montreal, Canadian Math. Congress.
- 1972a "On the number of solutions of systems of random equations," Annals of Mathematical Statistics, Vol. 43, 534-540.

- 1972b "The spectral analysis of stationary interval functions," pp. 483-513 in Proceedings of the Sixth Berkeley Symposium on Mathematical Statistics and Probability, (eds. L. M. LeCam, J. Neyman, E. L. Scott) Berkeley, University of California Press.
- 1973a "Estimating the mean of a stationary time series by sampling," Journal of Applied Probability, Vol. 10, 419-431 .
- 1973b "A power spectral estimate insensitive to transients," Technometrics, Vol. 15, 559-562.
- 1973c "The analysis of time series collected in an experimental design," pp. 241-256 in Multivariate Analysis - III (ed. P. R. Krishnaiah) New York, Academic.
- 1973d "An empirical investigation of the Chandler wobble and two proposed excitation processes," Bulletin of the International Statistical Institute, Vol. 45, Book 3, 413-434.
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BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

GENERAL ELECTRIC COMPANY

Valleytos Nuclear Center -
General Electric Test Reactor
Operating License No. (R-1)

Docket No. 50-70
(Slow Cause)

CERTIFICATE OF SERVICE

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Respectfully submitted, *

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