Court Reporter
Submitted to ALJ

COHEN STMT 1
5/10/00
Phila, PA
RLS

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of PECO Energy Company, Pursuant to Chapters 11, 19, 21, 22 and 28 of the Public Utility Code for Approval of (1) a Plan for Corporate Restructuring, Including the Creation of a Holding Company and (2) the Merger of the Newly Formed Holding Company and Unicom Corporation	:	Docket No. A-110550F0147

DIRECT TESTIMONY OF COUNCILMAN DAVID COHEN

Q: Please identify yourself for the record.

A: I am David Cohen, a member of the City Council of Philadelphia for over twenty-two years, 20 of them served consecutively.

Q: On what basis do you offer testimony in this matter?

A: On the basis of my continuous interest and expertise in environmental matters of all kinds that have come before the Council during my membership in that body. In my first term in Council, from 1968 to 1971, I authored Philadelphia's Air Management Code, which remains in effect to this date. In 1987, I authored the City's Recycling Ordinance, which also remains in effect. Furthermore, in the mid-1980's I led the successful fight to defeat the construction of a trash to steam plant in South Philadelphia, a proposal widely acknowledged at the present time to have threatened the fiscal and environmental integrity of the City. As a leading environmental advocate in City Council, I have long been aware of the threat to the public posed by the erection and operation of nuclear plants, and have done everything in my power to limit, if not eliminate, this threat.

Q: Aside from your environmental background, do you have other information or expertise that is relevant to this proceeding?

A: As a member of City Council, I am acutely aware of the economic threats that face the City as a result of a variety of non-competitive costs faced by residents. Much attention has been paid to high taxes in Philadelphia as a cause of its troubling decline in population and business activity, but it is self-evident that high utility costs have the same negative impact on residential and business location.

Furthermore, this proposal threatens a direct loss of City jobs and tax revenue, something which Council and the Mayor have long established as a priority to prevent and deter.

Q: Given your background and experience, what do you see as the most troubling aspects of the proposed merger as it is presently posed before the Commission?

A: There are three main problems posed by this merger, first, the danger of increased health problems caused by nuclear radiation, second, the danger to the economy of the City and State, and, finally, the likelihood that the benefits of deregulation will be undermined.

Q: What environmental concerns do you have about atomic energy?

A: First, it is important to note the large body of evidence that even "normal operation" of nuclear plants poses a substantial threat to the health and safety of residents nearby. For instance a study released only last month found that infant death rates near five U.S. nuclear plants dropped drastically after the reactors closed. In the first two years after the reactors closed, infant deaths in counties within 40 miles of the plants fell 15 to 20 percent, compared to an average nationwide decline of just six percent between 1985 and 1996. These plants were well within the emission ranges deemed safe by the federal government. (A summary of the study is attached to my testimony as Exhibit "A".)

Another study showed that near the Three Mile Island plant, breast cancer "increased markedly following 'normal operation' after start-up [of the plant] following the accident."

Many other studies have elicited similar statistics about the danger of even "low levels" of nuclear radiation. I am attaching a statement by Joseph J. Mangano, MPH, MBA, research associate with the Radiation and Public Health Project in New York City, describing and listing those studies. (Furthermore, Mr. Mangano is testifying in this proceeding in support of my concerns relating to nuclear safety.) Notwithstanding this body of research, neither this Commission, any other State body, nor any federal agency, has ever conducted any large-scale systematic study of the long-term effects of radioactive exposure to the men, women and children living near nuclear plants. Thus, any increased likelihood of continued operation of nuclear plants in this area poses, at best, highly uncertain and risky impacts upon the health of Philadelphia residents.

Q: Why do you believe the merger increases whatever danger that PECO's nuclear plants now pose to the public health and safety?

A: Until recently it appeared likely that the nuclear threat would be declining in this country. No new plants have been ordered since 1978, and twelve have terminated operations since 1987. However, recent actions by the Nuclear Regulatory Commission ("NRC") have opened the door to greatly extending the lives of many existing plants. In particular, the NRC has inexplicably decided to disregard the potential health effects posed by applications to extend the lives of existing nuclear plants. And last month, without considering such effects, the Commission approved the first such request that came before it to extend the life of a nuclear facility.

Both PECO and Unicom derive much of their nuclear energy from plants whose useful lives may well be extended under these new rules. In addition, PECO is aggressively seeking to purchase additional plants, thus making clear its long-term commitment to nuclear energy. The merger will further increase the incentive to continue plants in operation since the amount of nuclear assets held under common ownership will immediately multiply upon completion of the regulatory process. Because new plants are being purchased at bargain-basement prices, operating profits from continued operation of these plants will be enormous and will grow for each year they are allowed to remain on-line. On top of that, reserves for decommissioning will continue to be amassed and earn interest. Together, these income sources create powerful incentives to continue the operation of these dangerous plants long into the future.

Finally, as I understand it, the Commission has no information before it regarding the increased likelihood of breakdowns and costly repairs caused by increased reliance on old nuclear plants. Thus, the economic, as well as health, risks of this merger are enormous.

Q: Why do you believe the merger may threaten to diminish the benefits derived from deregulation?

A: First, it should be clear that so far the benefits of deregulation to PECO customers have been minimal. First, only 16% of PECO's customers have chosen another supplier, likely due to the insignificance of the rate differentials that are available. Nor has PECO sharply cut its own rates. In that regard, it is apt to compare PECO's rate cuts to those which were granted to Unicom customers as a result of deregulation in Illinois. There, as I understand it, customers received a guaranteed rate reduction of twenty percent over three years. Here, PECO customers received a rate cut that is not only less than 10%, but declines over a period of years, and then disappears. And the settlement, notwithstanding the valiant efforts by several intervenors, has improved PECO's rate structure only marginally. The additional rate cut contained in the Joint Settlement is about 2.6%

in the first two years and then 1.7% for two more years. Then the rates return to the very high 1998 rates, which were the highest in the state.

The creation of a massive utility megacorporation, such as the entity to be formed under this proposal, clearly moves in the direction of remonopolizing the production of electricity. Notwithstanding provisions to enable competitors access to PECO's power supply, its sheer market power after this merger is highly likely to suppress any meaningful competition in short order. Thus, some high level of guaranteed savings should be a mandatory precondition of this Commission's approval of the proposal before it.

Given the relief that this Commission has afforded to PECO regarding its stranded costs, there is no justification for the limited rate reductions that have become available to customers in its service area. Thus, PECO should be required to provide all of its residential, commercial, and industrial ratepayers at least as high a percentage of guaranteed ongoing rate cuts as Unicom ratepayers received through Illinois' electric deregulation.

Q: How does this merger threaten the City's economy?

A: I want to start by congratulating other intervenors in obtaining a commitment from PECO to stay in Philadelphia for some period of time. But the fact that PECO will not commit to stay for more than a few years is a confession by PECO that this merger is very likely to damage the City's job base. Based upon my experience as a member of City Council, it is clear that the loss of PECO's headquarter jobs, no matter how long delayed, would be a major blow to the economy of the City and State. City Council has gone to great lengths to ensure that businesses remain in the City, or are attracted to relocate here. In addition, the Commonwealth has also put in place a number of programs seeking to ensure the preservation and expansion of business. These programs are conducted at great expense to taxpayers. Thus, it is proper for this Commission to take "judicial notice" that it cannot be, and is not, in the public interest to approve any merger which would to any degree increase the likelihood of jobs leaving the City and/or State. If the pending merger does not pose the threat of job loss, then PECO should have no difficulty agreeing to maintain its current number of jobs, and its corporate headquarters, in Philadelphia as long as it owns its distribution system. Otherwise, the Commission should impose such a restriction.

Q: Does the failure of PECO to commit to a long-term presence in Philadelphia suggest any other dangers to the economy of the City and State?

A: As public officials, we are all aware of the increasing prevalence of corporate mergers in our modern economy. This City has recently undergone a wave of

such mergers in the banking industry resulting in the actual disappearance of long-term business citizens of our City. This has been accompanied by a pattern of disinvestment and removal of services throughout the City, to its great detriment. PECO has long been a major partner in attracting businesses and jobs to the City because of its self-interest in having such businesses as customers. As the center of gravity of this business shifts to the West toward its larger partner, PECO's interest in the overall business climate of this region may well diminish. The effects of such a lessened interest in our local business climate could be devastating. Clearly, the new company's ability to shift its focus elsewhere is enhanced by its ability to move personnel and headquarters away. It is highly contrary to the public interest to facilitate any such potential corporate decisions to disinvest in this City and State by allowing a merger without ironclad guarantees of a continued local presence as long as it owns the distribution system.

Q: Could you summarize your testimony and recommendations?

A. I believe that this merger cannot be justifiably approved without this Commission imposing on PECO a variety of measures which would protect its customers and the residents of its service area. These would include all of the recommendations I made in my Comments and Objections to the Proposed Settlement Agreement, which I hereby incorporate by reference, and, in particular the following conditions that this Commission should impose as conditions on this merger:

a. a ban on extending the useful lives of PECO's nuclear facilities beyond the estimated 30 year life of these plants; and early retirement of unsafe nuclear facilities;

b. a commitment, in determining the present and future dangers of the new company's facilities, to provide the information, and take the health monitoring steps, described in the testimony of Joseph J. Mangano;

c. a commitment that consumers should not be burdened by paying more for decommissioning expenses than they already are.

d. a commitment by PECO to maintain the level of jobs at its current level of 1,440 at 2301 Market Street for as long as it owns the distribution system.

e. a commitment by PECO to the same long-term charitable and civic role in Philadelphia that it has historically maintained. This commitment should be tied to its profitability and should increase (not decrease in real terms) over time as its profits rise.

f. PECO should be required to provide all of its residential, commercial, and industrial ratepayers at least as high a percentage of guaranteed ongoing rate cuts as Unicom ratepayers received through Illinois' electric deregulation.

Q: Does this conclude your testimony?

A: Yes.

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Improvements in local infant health after nuclear power reactor closing

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cancer; infant health; infant mortality; nuclear reactors; radiation

Between 1987 and 1998, operations ceased at 12 U.S. nuclear power reactors. One of these, Rancho Seco, is located in a densely populated area. After the reactor closed in 1989, significant decreases in mortality (all causes and from congenital anomalies) and cancer incidence were observed for fetuses, infants, and small children. These trends contrast with a worsening of infant health status after the plant opened in 1974. The data suggest that a relationship between nuclear emissions and adverse health effects exists, especially since fetuses and newborns are most sensitive to radiation. Because Rancho Seco released low levels of radionuclides into the local environment, the issue of health effects of prolonged, low-dose radiation exposure is raised. The matter becomes increasingly important as operators of several dozen aging U.S. reactors must soon decide whether to extend their operating licenses. *Environmental Epidemiology and Toxicology* (2000) **2,** 32-36.

Model, Congressman Join Groups In Calling on Government to Consider Adverse Health Effects of Radiation When Renewing Nuclear Plant Licenses

[WASHINGTON D.C.] – Infant death rates near five U.S. nuclear plants dropped immediately and dramatically after the reactors closed, a new study shows, raising questions about the government's refusal to consider the effects of radioactive emissions from nuclear plants on local residents (see attached).

Moreover, dramatic decreases in childhood cancer cases and deaths from birth defects, which are strongly affected by radiation exposure, occurred near one of the reactors. The study suggests that the health of 42 million Americans who live downwind and within 50 miles of a nuclear plant may be affected by these reactors, according to the study's author. The study was conducted by the New York-based *Radiation and Public Health Project* and published in the spring issue of the scientific journal *Environmental Epidemiology and Toxicology*.

In light of the study, model Christie Brinkley today joined Rep. Michael Forbes (D-N.Y.) and others in calling upon the U.S. Nuclear Regulatory Commission (NRC) to immediately consider whether adverse health effects are associated with nuclear plant operations before renewing nuclear power plant licenses. Brinkley is a board member of the STAR (*Standing for Truth About Radiation*) Foundation, a group formed in 1997 by concerned Long Island residents.

"As a mother of young children who lives near nuclear facilities, I worry daily that radiation from these plants may be deadly to our children," Brinkley said. "So far, the federal government has buried its head in the sand. If closing the nuclear power plants was not responsible for the decline in infant deaths, what was?"

The NRC rules do not consider the potential adverse health effects of radioactive emissions when considering license renewal applications. Owners of twenty-eight nuclear reactors at 17 nuclear facilities around the country are scheduled to seek license renewals by 2003. The NRC has never voluntarily studied the link between radioactive emissions from nuclear plants and patterns of cancer.

The study, conducted by Joseph J. Mangano, a research associate at the *Radiation and Public Health Project*, examined infant death rates in counties within 50 miles and in the prevailing wind direction of five reactors: Fort St. Vrain (located near Denver, CO); LaCrosse (near LaCrosse, WI); Millstone/Haddam Neck (near New London, CT); Rancho Seco (near Sacramento, CA); and Trojan (near Portland, OR).

In the first two years after the reactors closed, infant death rates in the downwind counties under 40 miles from the plants fell 15 to 20 percent from the previous two years, compared to an average U.S. decline of just six percent between 1985 and 1996. In each of the five areas studied, no other nuclear reactor operated within 70 miles of the closed reactor, essentially creating a nuclear-free zone.

The study detailed the plunges in newly diagnosed leukemia and cancer cases and birth defect deaths in children under five years in the four-county local area downwind from Rancho Seco. This excessive decline has continued through the first seven years after the June 1989 closing. In contrast, the local infant death rate rose in the two years after Rancho Seco began operations in 1974.

"This article is the first to document improvements in health after a nuclear plant closes," says study author Mangano.

> **"It supports many other studies showing elevated childhood cancer near operating reactors. "The federal government allows nuclear reactors to emit a certain level of radiation, saying that the amount is too low to result in adverse local health effects. However, this study clearly calls that assumption into question, as do other studies."**

The announcement comes on the 14th anniversary of the catastrophic accident at Chernobyl, a nuclear power reactor. Increased infant cancer and death rates after Chernobyl have been documented not just in the former Soviet Union, but in Western Europe and the US, where Chernobyl fallout levels were deemed by regulators to be within safe limits.

Nuclear plants seeking re-licensing this year include Oconee Nuclear Station in northwest South Carolina; Arkansas Nuclear One in Russellville, Ark.; Edwin I. Hatch in southern Georgia; and Turkey Point near Miami, Fla. In 2001, plants expected to seek re-licensing include Catawba, which lies on the border between North Carolina and South Carolina; North Anna, located near Fredericksburg, Va.; Surry, near Virginia Beach, Va.; and Peach Bottom, located near Lancaster, Pa. Recently, the government approved a license renewal application for Calvert cliffs, located near Baltimore, Md.

Said Forbes, whose eastern Long Island district lies across the Long Island Sound from Millstone Nuclear Power Station in Connecticut:

> **"On this day, in particular, which is the fourteenth anniversary of the Chernobyl disaster in Russia, we need to address the very real and legitimate concerns of people who live near nuclear reactors. At the very least, the government has a responsibility to determine whether emissions from these plants are harming people."**

Janette Sherman, an Alexandria, Va., M.D. who specializes in internal medicine and toxicology, and has written books about the causes of breast cancer and the relationship between chemical exposure and disease, said she believes Mangano's study confirms the link between radiation and illness.

> **"This confirms the best of public health principles: that when you remove a known cause of illness, health improves," Sherman said. "The adverse effects on humans exposed to radiation are predictable. What is gratifying about the research is that it showed childhood health measures increasing so dramatically and quickly after the reactors closed."**

For some of those who live near reactors, the government's inaction has been maddening. Randy Snell, a New York resident who lives near the Brookhaven National Laboratory (BNL), learned several years ago that his 8-year-old daughter had developed a rare soft tissue cancer called rhabdomyosarcoma. Snell also has uncovered 19 other cases of the same rare cancer in Suffolk County, in one area near BNL, the rate of this cancer in children under 10 since 1994 is 15 times the national average.

"I have no doubt that radiation from nuclear reactors sickens people who live nearby," Snell said.

"What is really disheartening, though, is that state and federal public health agencies haven't lifted a finger to confirm the link between Brookhaven and all these rare child cancers. I hope this study forces them to act."

[redacted]

IMPROVEMENTS IN INFANT DEATH RATE AFTER CLOSING NUCLEAR REACTORS (decreases in death rate age 0-1)

REACTOR CLOSED	YEAR	% CHANGE IN INFANT DEATH RATE
LaCROSSE, WI	1987	-15.3%
RANCHO SECO, CA	1989	-16.0%
FORT ST. VRAIN, CO	1989	-15.9%
TROJAN, OR	1992	-18.0%
MILLSTONE, CT	1995	-17.4%
BIG ROCK POINT, MI	1997	-54.1%
MAINE YANKEE, ME	1997	-33.4%
U.S. Average	1985-96	-6.4%

OTHER IMPROVEMENTS IN INFANT HEALTH AFTER CLOSING RANCHO SECO, CA REACTOR

Percent Change in Birth Defect Death and Cancer Incidence Rates

CATEGORY	LOCAL	US
DEATHS 0-1 FROM BIRTH DEFECTS	-20.9%	-5.8%
DEATHS 1-4 FROM BIRTH DEFECTS	-29.3%	-7.0%
CANCER CASES 0-4	-37.2%	+6.2%

Two years before and after closing are compared (e.g., LaCrosse 1986-87 vs. 1988-89). All downwind counties less than 50 miles from closed reactor are included. No other reactors are located within 70 miles of above reactors. Millstone was temporarily closed from late 1995 to mid-1998. All data from U.S. Centers for Disease Control (http://www.cdc.gov) except for Big Rock Point and Maine Yankee, which are available from the states. Prepared by Joseph J. Mangano, MPH, MBA, Radiation and Public Health Project, April 19, 2000

DAVID COHEN
COUNCILMAN AT LARGE

ELECTIVE POSITIONS:

Elected Councilman at Large 1979
Re-Elected Councilman at Large 1983
Re-Elected Councilman at Large 1987
Re-Elected Councilman at Large 1991
Re-Elected Councilman at Large 1995
Re-Elected Councilman at Large 1999

Councilman 8th District 1968 - 1971
(resigned to run for Mayor)
Democratic Leader, 17th Ward

Appointed Positions in City Council:

Chairman, Law and Government Committee
Vice-Chairman, Streets and Services
Transportation and Public Utilities
Member: Rules
Labor and Civil Service
Public Safety
Education
Ethics
Fiscal Stability & Intergov. Cooperation
Finance

Profession:

Attorney-At-Law

Education:

Simon Muhr Elementary School
Northeast High School
University of Pennsylvania School of Education
University of Pennsylvania Law School
University of Pennsylvania Gowen Memorial Fellow

Military Service:

S/Sgt. U.S. Army

Family:

Wife, Florence; Children: State Representative Mark B. Cohen, Assistant District Attorney Denis Cohen, Sherrie Cohen, Esq. and Judy Heiman

Civic and Fraternal Groups:

American Jewish Congress, Maxwell Rosenfeld Chapter, Past President
Ogontz Area Neighbors Association, Past Counsel
Jewish Community Relations Council, Logan-Olney Boulevard Division, Past President
United Fund, Past District Director
Member: Philadelphia and Pennsylvania Bar Associations
Jewish War Veterans
American Jewish Congress
Pannonia Beneficial Association
Urban League
B'Nai B'Rith
NAACP

COHEN STMT NO. 2

5/10/00

PLD DD

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BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of PECO Energy Company, Pursuant to Chapters 11, 19, 21, 22 and 28 of the Public Utility Code for Approval of (1) a Plan for Corporate Restructuring, Including the Creation of a Holding Company and (2) the Merger of the Newly Formed Holding Company and Unicom Corporation	:	Docket No. A-110550F0147

DIRECT TESTIMONY OF DR. E.J. STERNGLASS

Q. Please state your name and business address for the record.

A. My name is Ernest J. Sternglass. My business address is University of Pittsburgh, School of Medicine, Pittsburgh, PA.

Q. Please state your current professional affiliation and educational background.

A. I am Professor Emeritus, Department of Radiology, University of Pittsburgh, School of Medicine. By way of background, I completed my undergraduate training in electrical engineering from Cornell University in 1944. Thereafter, I earned a master of science degree in Physics from Cornell University (1950). In 1953, I completed the requirements for my doctorate in engineering physics. The attached resume further details my educational and professional experience. See Exhibit A.

Q. Have you published any books or scientific papers concerning the health effects of exposure to radiation?

A. Yes. I have published the following books:

"Low-Level Radiation," Ballantine Books, New York, NY (1972).

"Secret Fallout: Low Level Radiation from Hiroshima to Three Mile Island," McGraw-Hill Book Co. (1981).

"Before the Big Bang: The Origins of the Universe," Four Walls Eight Windows, New York, NY (1997).

I have also published over 120 scientific papers concerning numerous topics including, the adverse effects of nuclear fission products released into the environment from nuclear weapons testing and nuclear reactors.

Q. On whose behalf are you presenting your testimony?

A. My testimony is presented on behalf of Councilmen David Cohen and in support of his position in this proceeding.

Q. What is the purpose of your testimony?

A. My testimony is proffered as technical support for the health and safety concerns raised by Councilman Cohen in his testimony and objections to the Petition for Joint Settlement in this docket. The testimony that follows identifies scientific studies that have found increased cancer incidence and mortality correlated with nuclear emissions and exposure in industrial countries. Given the results of these studies, I believe Councilman Cohen's health concerns are valid and bear further study by this Commission before proceeding to approve the proposed merger of PECO and UNICOM.

Q. Have there been recent studies on whether increases in cancer incidence and mortality in western industrial countries might be caused by nuclear energy?

A. Yes.

Q. What was the first such study, and what did it show?

A. The November 1990 volume of the Annals of the New York Academy of Sciences was dedicated to this question. In this volume, Belton A. Burrows and Thomas C. Chalmers of the Boston VA Medical Center concluded that there may well be a link between growing cancer rates and releases from atomic testing or from nuclear power plants.

Q. On what did they base this conclusion?

A. Burrows and Chalmers based their conclusion on a study of the fission product Cesium-137 in firewood ashes gathered from various parts of the world with the help of the International Physicians for the Prevention of Nuclear War (IPPNW). Their study showed a much higher concentration in the industrial countries of the

northern hemisphere than those in Australia and New Zealand, with the areas of high mountains such as the Northwest of the U.S., Austria and Germany showing the greatest concentrations relative to the naturally occurring Potassium-40. However, they pointed out that it remained to be determined whether these large worldwide differences are the result of atomic bomb testing and fallout from prevailing winds, or of more local contamination by nuclear power plants.

Q. Have there been other studies which have shown a particular link between cancer and nuclear power plants?

A. Yes.

Q. Who conducted those studies and what was their methodology?

A. Following the 1990 study, members of the New York based Radiation and Public Health Project (RHPH) decided to undertake measurements of the radioactivity in deciduous teeth of children due to another fission product, strontium-90, which concentrates along with calcium in the teeth of developing infants during fetal development and the first year of life. Such a study was first suggested by Kalckar in 1958 and implemented by the St. Louis Committee on Nuclear Information in December of that year. Because of its 28 year physical half-life, Sr-90 is a record of actual human exposure to fission products present in the bone of the mother and the infant that provides clinical proof of exposure at the time of birth. When these teeth are shed between ages 6 and 12, the measurement can be adjusted for radioactive decay since the year of birth. By recording where the child was carried and where the mother lived during the first year of the child's life by Postal Zip Code, the question of the source of the activity can be addressed, especially after the end of all atmospheric bomb testing with the last test by China in 1980.

Q. Where was the study undertaken and what result was expected?

A. The RHPH study began in Suffolk County, Long Island, New York, where there has been one of the largest increases in both incidence and mortality rates for breast cancer among women in the nation during the last 50 years as described in a 1993 article by Sternglass and Gould in the International Journal of Health Services (IJHS).The decision to measure Sr-90 in baby teeth was made after a study by the Otto Hug Radiation Institute published by the German branch of IPPNW showed a ten-fold rise of Sr-90 per gram calcium in Germany following the arrival of fallout from the Chernobyl accident that took place in the Ukraine on April 26, 1986. Since the fallout cloud, equivalent in radioactivity to a few hundred Hiroshima-sized bombs, circulated the globe and reached the U.S. two weeks later, the RPHP researchers expected to find evidence for a rise in Sr-90

during the next few years, just as was seen both in milk and deciduous teeth during the period of large-scale nuclear testing by the U.S.-U.S.S.R. and the U.K. in the 1950s and early 1960s, peaking in 1964-66.

Q. What results were actually obtained?

A. The expected result was indeed fulfilled based on some 300 teeth analyzed for Suffolk County by October 1999. But what was not expected was the large magnitude of the rise, and the fact that it began in the early 1980s, long before the Chernobyl fallout had reached Long Island. Moreover, it can be seen that this rise in Sr-90 was followed by a similar rise and decline in childhood cancer incidence for the age-group 0-4 years. This rise and decline of Sr-90 and childhood cancer was similar to that seen in the U.S., Japan, Denmark and other countries around the world following the bomb tests of the late 1950s and early 1960s.

Q. Were there differences in the level of Sr-90 based on proximity to particular nuclear facilities?

A. Yes. Because information on the residence of the mother during pregnancy and in the first year of life of the child is available, it was possible to show that the greatest concentrations of Sr-90 in deciduous teeth in the 1980s existed in the western end of Suffolk County, some 50% higher than for the eastern end. The western part of Suffolk is closest to the Brookhaven National Laboratory (BNL), where nuclear reactors have released both airborne and waterborne radioactive fission products since the early 1950s, as well as to the Indian Point nuclear plant 35 miles to the northwest on the Hudson near Peekskill, and the Oyster Creek nuclear plant some 60 miles to the southeast on the New Jersey coast, a plant that had the second largest reported releases of airborne fission products in the nation by 1987.

Q. Were there other studies showing adverse health effects of living in the western end of Suffolk County?

A. Yes. Within an area 15 miles to the west of BNL a study by the New York State Department of Health for the years 1978-87 found the largest number of communities with a breast cancer incidence above the average for Suffolk County. In the same general area, there also exists a cluster of 16 rhabdomyosarcoma cases in children, a rate that is close to twenty times the expected rate.

Q. Please summarize the overall health effects of nuclear plant proximity as shown by these and other studies.

A. These findings, together with even higher values of Sr-90 in deciduous teeth in Miami, Florida near the Turkey Point nuclear plant, support the hypothesis that the recent 36% rise in childhood cancer incidence across the U.S. and 16% in Great Britain between 1980 and 1993 described by Mangano in a 1999 article in IJHS is most likely due to releases from nuclear power plants and leakage from underground testing that continued until 1993. It therefore appears that neither chemicals, pesticides, herbicides and ordinary air pollution acting alone without the synergistic action of fission products on the immune and hormonal systems can explain the rise in cancer incidence or mortality. This conclusion is further supported by a sharp decline in all causes of child mortality in four counties downwind from the Rancho Seco nuclear plant within a few years after it ceased operation in 1989 as reported by Mangano in the March 2000 issue of the journal Environmental Epidemiology and Toxicology. Moreover, infant mortality 0-1 year was found to have declined in the downwind area of Rancho Seco and four other nuclear plants within two years of their closing by 15 to 17%, whereas it declined by only 6.4% for the U.S. as a whole while all other environmental and health-care factors remained essentially unchanged in this short period.

Q. Are you aware of any studies of adverse health effects associated with nuclear plant emissions affecting Philadelphia-area residents?

A. Yes. I authored a study entitled "Summary of Adverse Health Changes in Philadelphia Following Fission Product Releases from Three Mile Island, Limerick and Chernobyl Nuclear Plants." This study is attached and shows a significant rise in adverse health consequences correlated with releases at the Limerick facility and other nuclear plant locations.

Q. What is the significance of these studies for regulatory bodies such as this Commission?

A. With many reactors aging and requiring either extensions of their operating licenses or some form of decommissioning, the evidence that adverse effects of presently permitted releases into the environment are much greater than had been believed based on the study of Hiroshima and Nagasaki survivors would indicate that studies of recent changes in local health statistics should be required in all public hearings by regulatory bodies.

According to the Precautionary Principle, which says that when substantial scientific evidence of any kind gives us good reason to believe that a technology or substance may be harmful to the environment or human health, we should act to prevent harm. Therefore, we should phase out the operation of nuclear reactors as rapidly as possible, together with the production of all fissionable material, and

eliminate all nuclear weapons together with all other biological and chemical weapons of mass destruction.

Q. Do you concur with Councilman Cohen that there should be a commitment by PECO to undertake public health studies concerning the effects of nuclear releases in PECO's service territory?

A. Yes. PECO should undertake continuing studies examining measures sensitive to radioactivity and comparing them to radioactive releases in its service territory.

Q. Does this conclude your testimony?

A. Yes.

CURRICULUM VITA

ERNEST J. STERNGLASS, Ph.D.

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EDUCATION

B. E.E., Electrical Engineering, Cornell University 1944
M.S., Engineering Physics, Cornell University, 1950
Ph. D. Engineering Physics, Cornell University, 1953

HONORS

Vice-President, Cornell Chapter, Eta Kappa Nu, Electrical Engineering Honorary Society, 1943-44

McMullen Research Fellowship, Cornell University 1949-51

Sigma Xi, National Research Honorary Society

Sigma Pi Sigma, National Physics Honorary Society

Fellow, American Physical Society

President, Federation of American Scientists, Pittsburgh Chapter, 1962-63

Westinghouse Research Fellowship, Institute of Theoretical Physics, University of Paris, 1957-58

Westinghouse Research Fellowship, Institute of Theoretical Physics, Stanford University, 1966-1967

Citation for Excellence, Scientific Exhibit, Annual Meeting of the Radiological Society of North America, 1979

Citation for Excellence, Scientific Exhibit, Annual Meeting of the American Roentgen Ray Society, 1981

George Brunol Award for Public Service, 1982

Honorary Professor Emeritus of Radiology, University of Pittsburgh, 1983

Leo Goodman Award for Public Service, 1985

PROFESSIONAL SOCIETIES

American Physical Society
Radiological Society of North America
American Association of Physicists in Medicine
American Association for the Advancement of Science
American Astronomical Society
New York Academy of Sciences
Federation of American Scientists
Philosophy of Science Association

PATENTS

Thirteen patents in the areas of Image Intensifiers for Nuclear Medicine and Astronomy; Television Camera Tubes for Space Astronomy, Night Vision and Radiology; Nuclear Particle Detectors ; Nuclear Reactors for Space Missions; Photo- Multipliers and Computerized Radiography for dose-reduction in diagnostic examinations.

BOOKS

"Low-Level Radiation", Ballantine Books, New York, 1972.

"Secret Fallout: Low Level Radiation from Hiroshima to Three- Mile Island", McGraw-Hill Book Co., 1981.

"Before the Big Bang: The Origins of the Universe", Four Walls Eight Windows, New York, 1997.

SCIENTIFIC PAPERS

Over a hundred and twenty papers in the areas of the interaction of electrons with matter, nuclear instrumentation, particle physics, cosmology, X-ray imaging for dose reduction in medicine, and the adverse effects of nuclear fission products released into the environment from nuclear weapons testing and nuclear reactors.

PROFESSIONAL EXPERIENCE

Professor Emeritus of Radiology and Consultant, Department of Radiology, University of Pittsburgh School of Medicine, 1983 - present.

Adjunct Professor of History and Philosophy of Science, Department of History and Philosophy of Science, Indiana University, Bloomington, Indiana (1979-1984).

Professor of Radiology and Consultant, Imaging Division, Department of Radiology, University of Pittsburgh, School of Medicine (1974-1983).

Professor of Radiology and Director, Laboratory of Radiological Physics and Engineering, Department of Radiology, University of Pittsburgh, School of Medicine, 1967 - 1974.

Professor of Radiological Physics, Department of Radiation Health, University of Pittsburgh Graduate School of Public Health, 1967 - 1974.

Visiting Professor, Institute for Theoretical Physics, Stanford University, Palo Alto, California, 1966 - 1967.

Advisory Physicist and Assistant to the Vice-President for Research and Development of the Westinghouse Research Laboratories, and Scientific Director of the Apollo Lunar Scientific Station Program, Westinghouse Research Laboratories, Pittsburgh, Pennsylvania, 1960 - 1967.

Fellow Scientist, Electronics and Nuclear Physics Department Westinghouse Research Laboratories, 1958-1960.

Visiting Professor, Institute Henri Poincare, Sorbonne, Paris, France, 1957 -1958.
Research Scientist, Electronics and Nuclear Physics Department, Westinghouse Research Laboratories, 1952-1957.

Research Fellow, Cornell University, 1949 - 1951.

Instructor, Physics Department, George Washington University, Washington, D.C. 1946 - 1947.

Research Engineer, Electricity and Magnetism Department, U. S. Naval Ordnance Laboratory, White Oak, Maryland, 1946- 1952.

Science Writer, Science Service News Service, Washington, D.C. 1946.

Military Service, U. S. Navy, (Radar and Electronics), 1945 - 1946.

Teaching Assistant, Physics Department, Cornell University, 1943-1944.

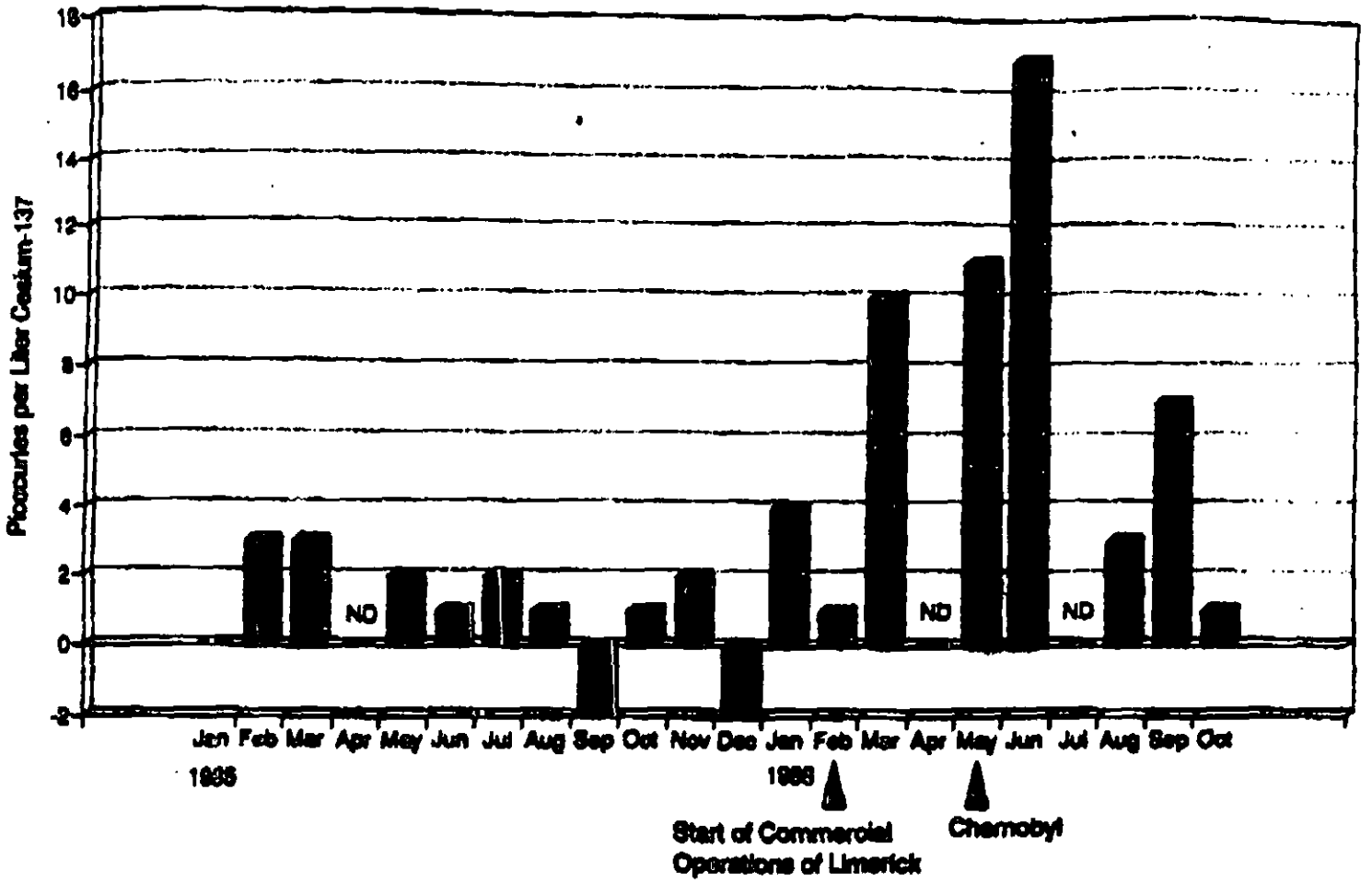
Summary of Adverse Health Changes in Philadelphia Following Fission Product Releases From the Three Mile Island, Limerick and Chernobyl Nuclear Plants

E. J. Sternglass
Professor Emeritus
Department of Radiology
University of Pittsburgh
School of Medicine

Summary of Adverse Health Changes in Philadelphia Following Fission Product Releases From the Three Mile Island, Limerick and Chernobyl Nuclear Plants

E. J. Sternglass
Professor Emeritus
Department of Radiology
University of Pittsburgh
School of Medicine

Radiation in Philadelphia Pasteurized Milk: 1985-1986

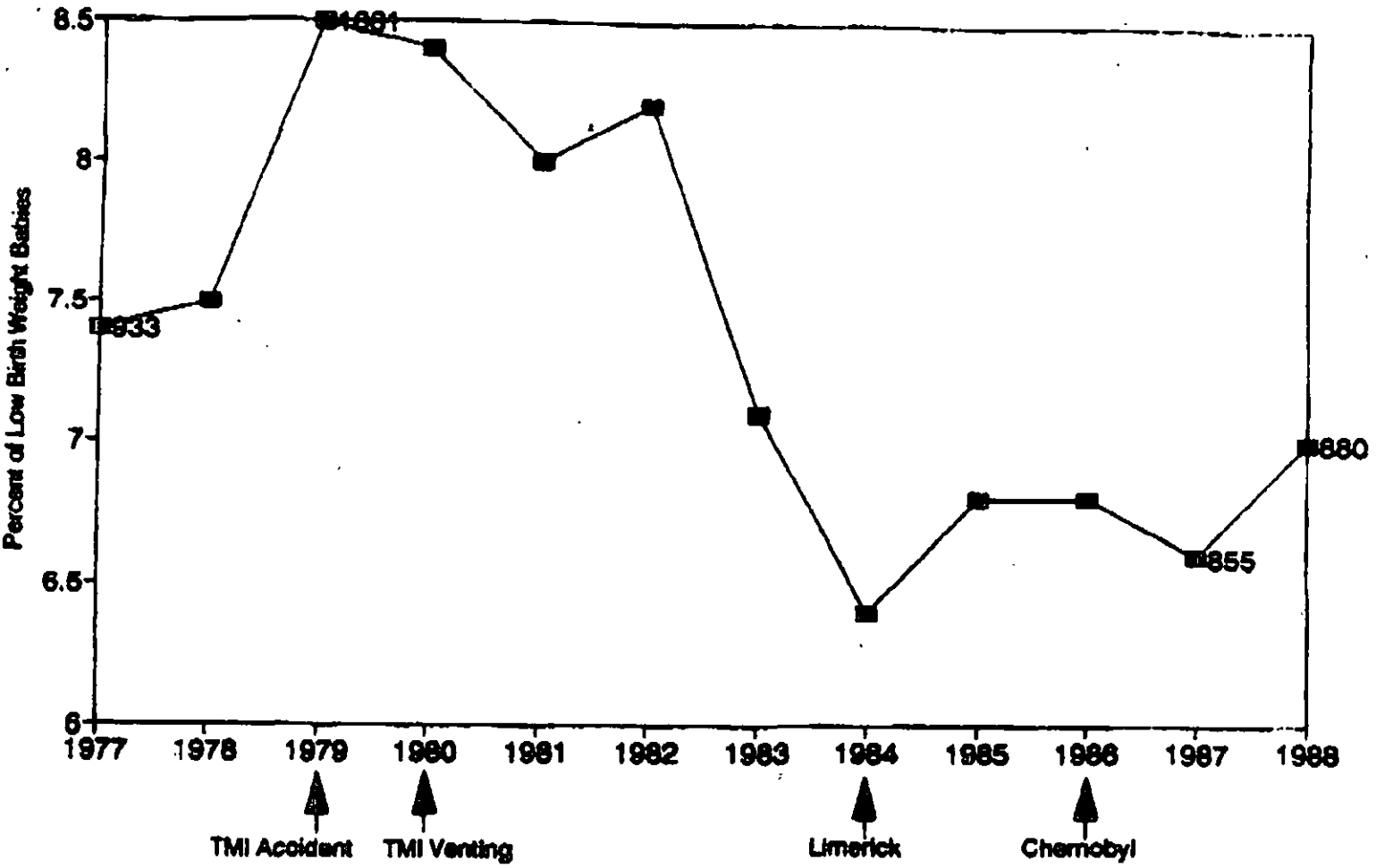


Source: Environmental Radiation Reports, EPA Quarterly Reports.

May and June 1986 values are the highest of several reported.

The graph of radiation in Philadelphia pasteurized milk shows how the measured levels of the fission product cesium-137 increased sharply by some 500 to 1000% following the start of commercial operation of the Limerick Nuclear Plant located only about 20 miles from Philadelphia in Montgomery County, which has been one of the major sources of milk for the City of Philadelphia. It is seen that the concentration of radioactivity rose from only 1-2 picoCuries per liter to 10 in March of 1986, two months before the Chernobyl fallout arrived and further increased the measured concentration. The EPA measurements reveal also that other radioactive fission products rose in the Philadelphia milk such as iodine-131 and barium-140 all through the period of low-power operation and remained abnormally high after the Chernobyl fallout had disappeared. The levels in Trenton, New Jersey some 40 miles north-east of Limerick also rose in late 1985 and early 1986, but the highest levels were reported in Philadelphia closest to the Limerick plant, thus further supporting the evidence for large releases from the Limerick reactor.

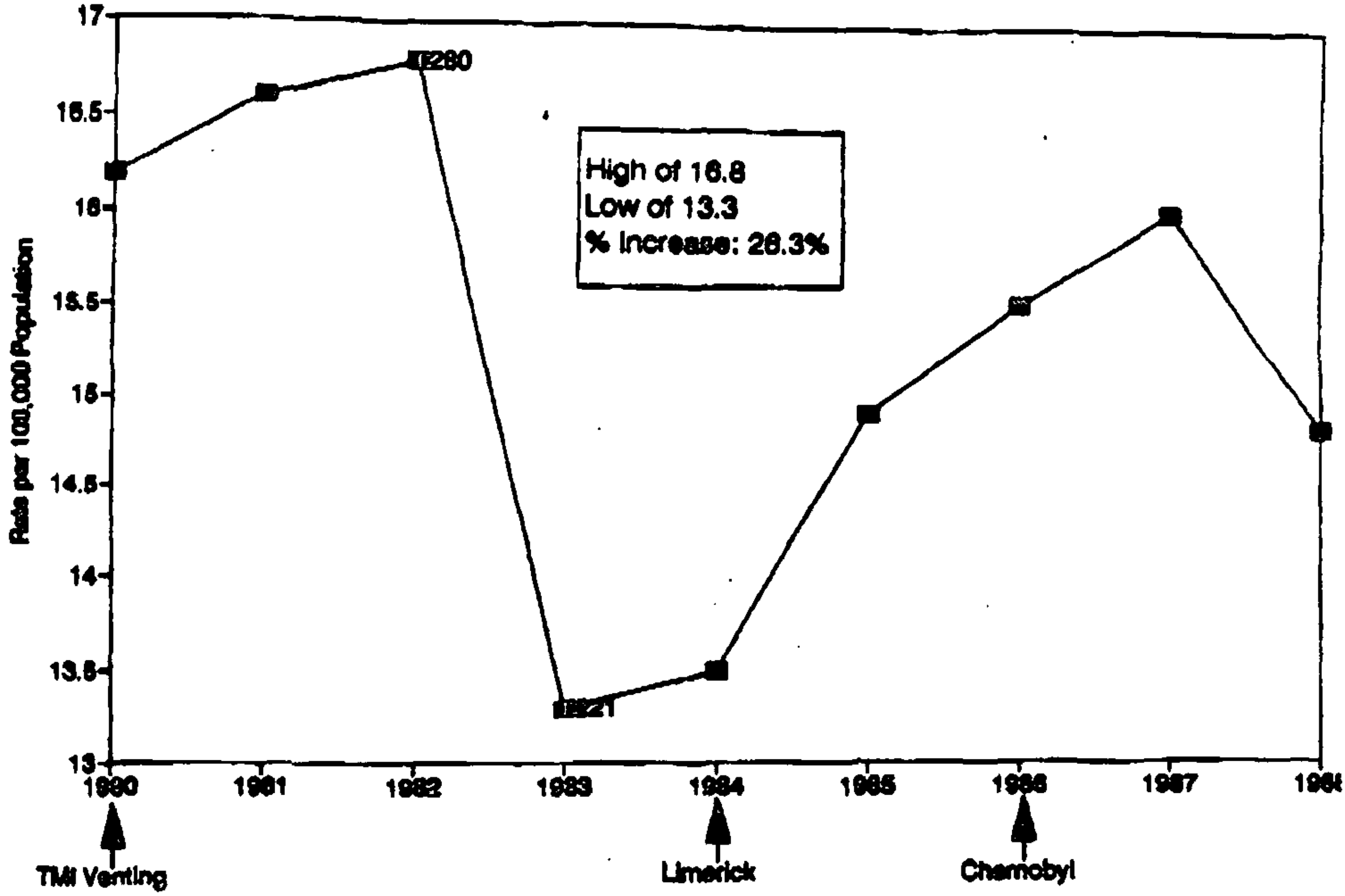
Philadelphia 1977-1988: White Population: Percent of Low Birth Weight Babies



Source: Philadelphia Department of Public Health, Vital Statistics Report 1988, City of Philadelphia

This graph shows the percent of all White infants born below normal weight of 5.5 pounds to residents of Philadelphia between 1977 and 1988. It is seen to have risen 13% between 1978 and 1979, the year of the Three Mile Island Accident, declining in the following five years by 25% when both Units I and II were shut down and the radioactivity in the environment declined again. This decline is seen to have ended in 1984 when the Limerick Plant in Montgomery County some 22 miles west of Philadelphia started its low power tests, rising 9% from its low point in 1984 when 794 White infants were born underweight to a high of 880 in 1986 after the plant had gone into full-power commercial operation in 1985, when the Chernobyl fallout also added to the radioactive contamination of the milk and diet. A similar rise in the percent of all infants born below normal weight was previously seen in studies of the Dresden reactor near Chicago and the Big Rock Point Nuclear plant in northern Michigan. A rise in underweight births was most recently seen around the Trojan reactor near Portland, Oregon as described by Gould and Goldman in the Afterword to the second edition of their book "Deadly Deceit" to be published in the spring of 1991. These changes are statistically highly significant, with similar though even larger changes for Non-White infants according to the Philadelphia Vital Statistics Report for 1988.

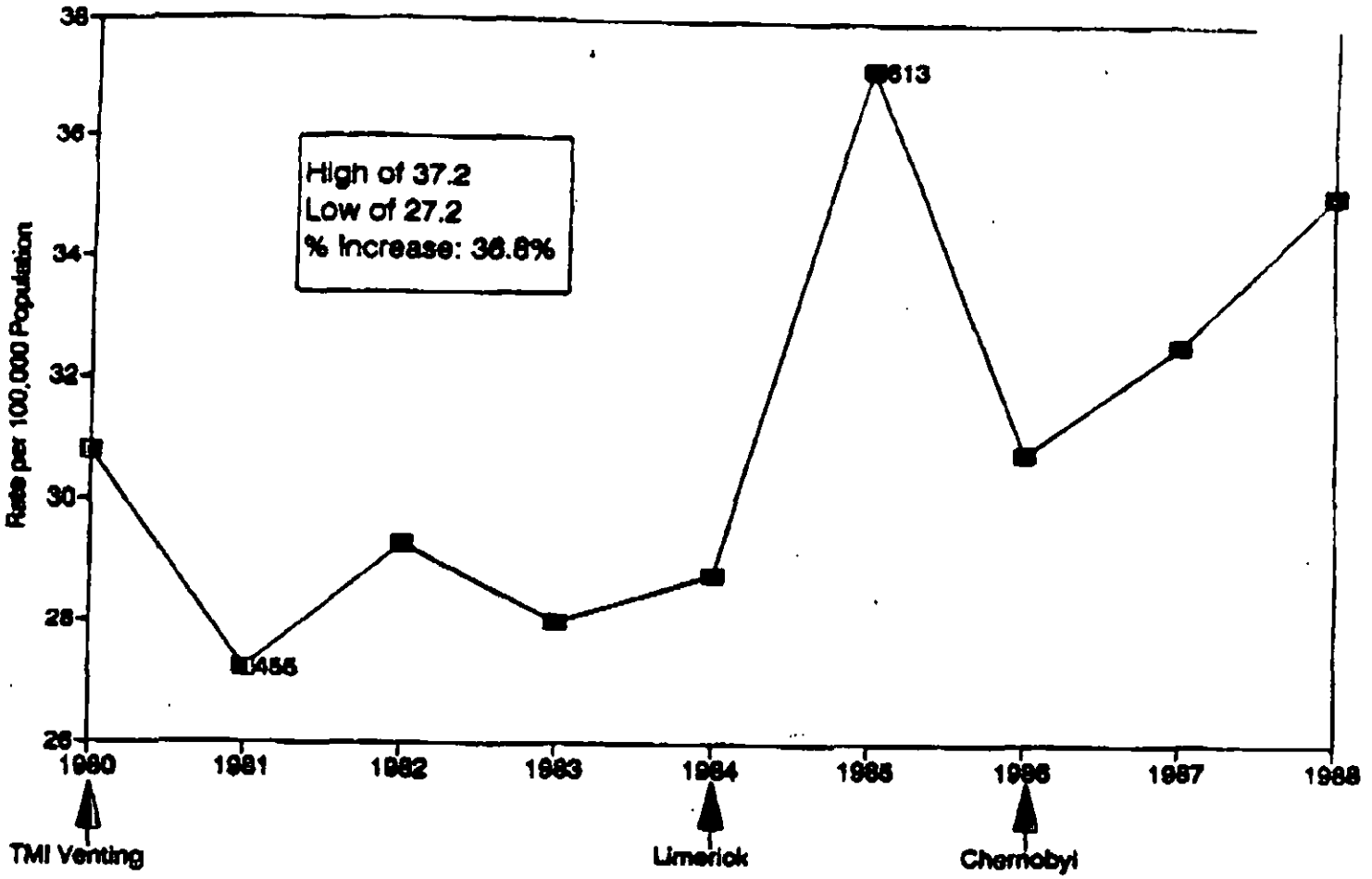
Philadelphia 1980-1988: Certain Conditions Originating in the Perinatal Period



Source: Philadelphia Department of Public Health, Vital Statistics Report 1988, City of Philadelphia

The graph of mortality from Certain Conditions Originating in the Perinatal Period for Philadelphia between 1980 and 1988 very clearly shows two distinct peaks, one for the period immediately after the Three Mile Island accident and venting and a second peak in the period 1985 to 1988 following the large increases in radioactivity in the Philadelphia milk reported by the EPA and shown in detail in another graph. The height of the peak in 1982 above the valley reached after both reactors at Three Mile Island were shut down involving a sudden decline from 280 to 221 deaths near birth illustrates the principal threat that nuclear fallout and releases from nuclear reactors present for society. For every child that dies shortly after birth there are perhaps ten who live with physical and mental impairments. Thus, many lives are affected, and there is a great economic cost for society, both direct and indirect. These deaths parallel the changes in the percent low weight births shown in another graph. They have also been found to have occurred all across the U.S. during the time of atmospheric testing of nuclear weapons, when infant mortality rises above their normal decline were found to be correlated with strontium-90 accummulating in bone. No gradual socio-economic changes or gradual rises in chemical pollutants can explain the occurrence of two distinct peaks.

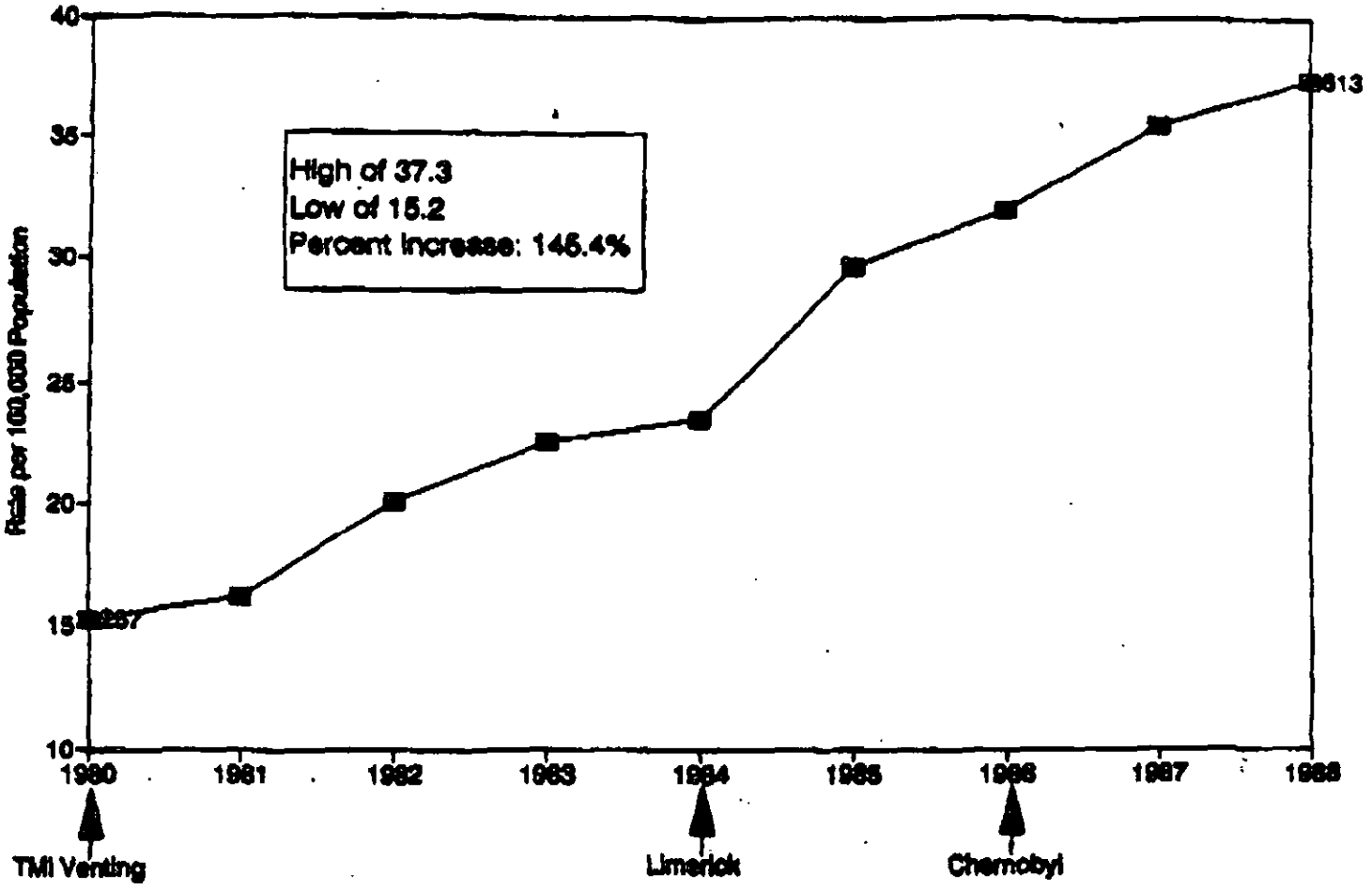
Philadelphia 1980-1988: Chronic Obstructive Pulmonary Disease



Source: Philadelphia Department of Public Health, Vital Statistics Report 1988, City of Philadelphia

The graph of mortality ~~rates~~ due to Chronic Obstructive Pulmonary Disease (COPD) ~~for Philadelphia~~ shows the same general rise from 1980 to 1988 that cancer mortality shows, but with an extremely sharp rise after the onset of Limerick ~~low-power~~ operations superimposed on the general rise. In a single year after gaseous releases began, these chronic lung diseases, which include emphysema, bronchitis and asthma, showed a 29% rise in mortalityand then declined again by 1986, only to resume their rise with the onset of full-power operation of the Limerick nuclear reactor and the arrival of the Chernobyl fallout in 1986. Such chronic lung disease has been found in many animal studies, and it also rose sharply in Oregon following releases from the Trojan reactor as shown in Figure 21 of the new afterword of "Deadly Deceit" by Gould and Goldman.

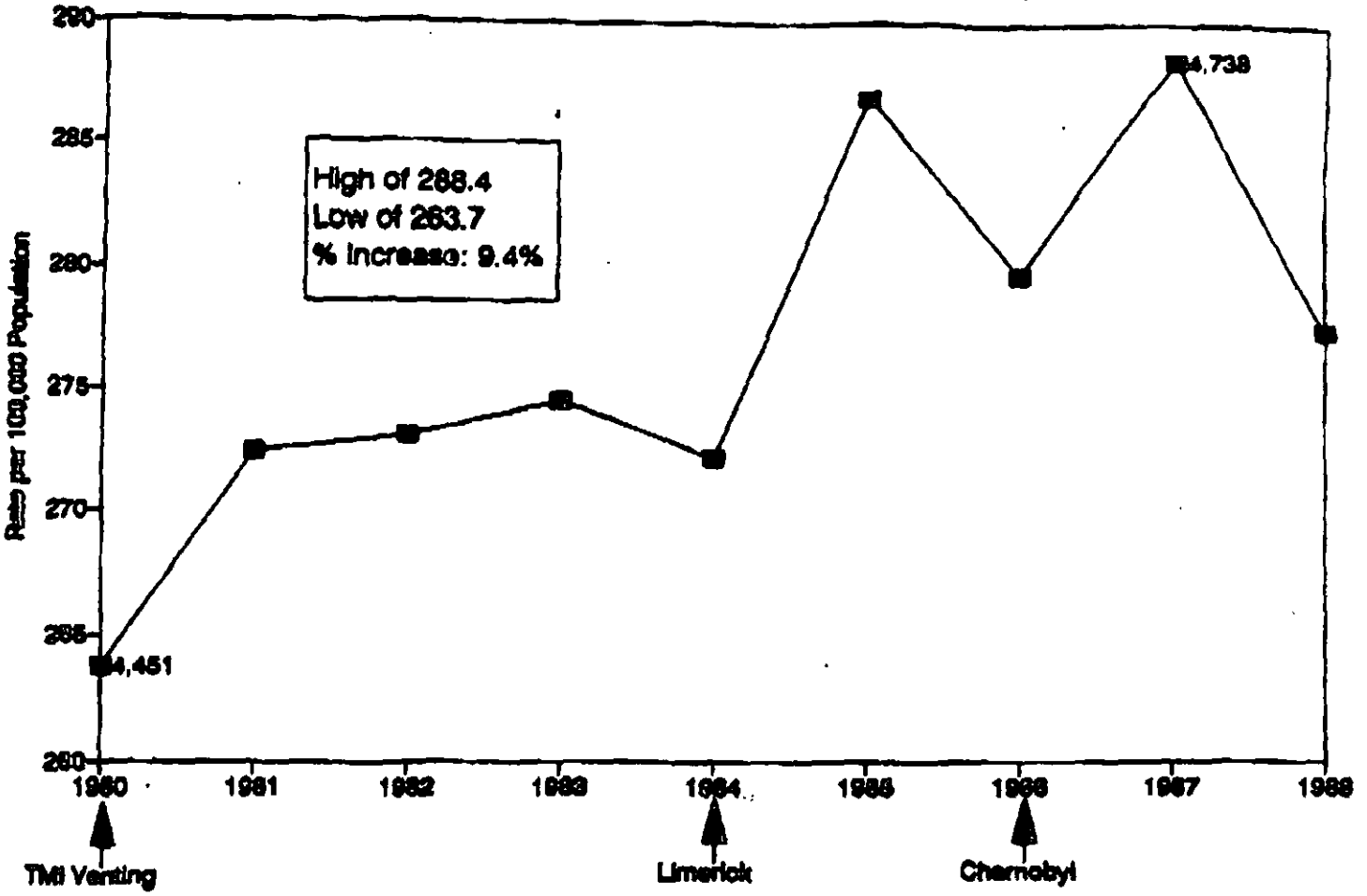
Philadelphia 1980-1988: Septicemia



Source: Philadelphia Department of Public Health, Vital Statistics Report 1988, City of Philadelphia

The graph of septicemia or mortality due to blood poisoning in Philadelphia between 1980 and 1988 illustrates the particularly serious nature of nuclear releases for the immune defenses of the body which weaken the body's ability to fight-off infectious diseases and cancer cells. As discussed in "Deadly Deceit" by Gould and Goldman, it has long been known that radiation weakens the immune system, and that bone-seeking fission products such as strontium-90, strontium-89 and barium-140 irradiate the bone marrow where they concentrate like calcium. What had not been recognized until recently is that very low doses given over long periods of time are hundreds to thousands of times more efficient in producing cell-membrane damage than the same dose given in a short burst, such in a medical X-ray. It is seen that after an initial rise following the venting from the damaged TMI reactor in 1980, there was a second rise following the start of operation of the Limerick plant near Philadelphia in in1984-85, followed by a further rise by 1985 after the start of full-power operation, the rise in Philadelphia milk radioactivity, and the Chernobyl fallout arrival in 1986. Again, the rise by 145% from 257 to 613 cases is highly significant statistically, and no other explanation is known.

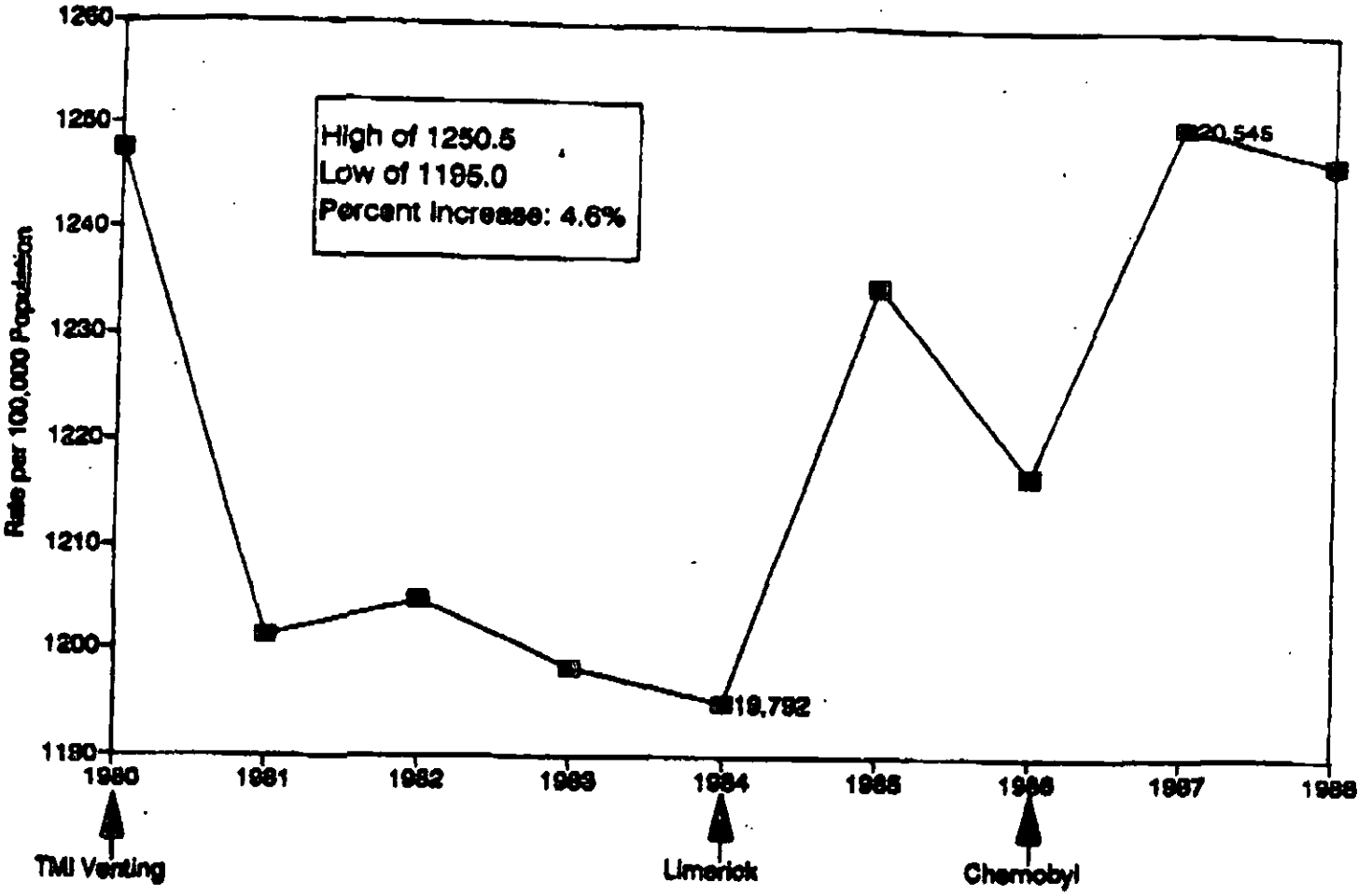
Philadelphia 1980-1988: Malignant Neoplasms



Source: Philadelphia Department of Public Health, Vital Statistics Report 1988, City of Philadelphia

This chart shows the cancer mortality rate for Philadelphia between 1980 and 1988. It is seen that the rate rose sharply from a low of 263.7 in 1980 when there were 4451 cancer deaths to a rate of 288.4 in 1987 when 4738 persons died of cancer in Philadelphia. The broad peak between 1985 and 1987 occurred six to eight years after the Three Mile accident in 1979 and the venting of radioactive gases in 1981, corresponding to the typical period of six to eight years seen for leukemia and other types of cancers such as lymphomas, melanoma or highly malignant skin cancer between exposure and death. These rates are much higher than the rate of 195.9 for the U.S. as a whole in 1987, and the recent rate of rise is nearly three times that for the U.S. of 0.7% per year. The recent sharp rise of radioactivity in the Philadelphia milk following the start of low-power operation in 1984 of the Limerick Nuclear Power Plant in 1984 followed by full operation in February of 1986 shown in another graph helps to explain the most recent rise in terms of a potentiating effect due to multiple radiation exposure that is known to accelerate the spread of cancer cells and thus the onset of death.

Philadelphia 1980-1988: Total Mortality



Source: Philadelphia Department of Public Health, Vital Statistics Report 1988, City of Philadelphia

The graph of total mortality rates in Philadelphia between 1980 and 1988 shows a peak value in 1980, the year after the TMI accident and the venting from the damaged reactor, followed by another rise in 1985. Yet another rise occurred in 1987 after the start of the Limerick nuclear reactor and the arrival of the Chernobyl fallout that was accompanied by a ten-fold increase in the levels of cesium-137 in the milk as shown in another graph. Such unexpectedly large increases in mortality due to all causes combined were observed all across the U.S. in the summer of 1986, in direct relation to the amount of radioactive fission products such as iodine-131 in the milk as described bin "Deadly Deceit" by Gould and Goldman, as well as in the case of other reactor releases in Switzerland and Oregon as described in the afterword of the second edition of this book to appear in March of 1991. They involve mainly infectious diseases and circulatory system diseases such as heart disease and stroke. The sharp increase seen in Philadelphia following the measured increases in radioactivity in the milk are consistent with the sharp rises in septicemia, cronic respiratory diseases and deaths shortly ater birth shown in other charts. It also fits to the abnormal upward change in the long-term decline of U.S. mortality rates after the start of large-scale atmospheric testing in the 1950's described in "Deadly Deceit" by Gould and Goldman, and the upward change in this rate after Three Mile Island, strongly suggesting that the principal environmental factor involved is the release of fission products into the air and water, damaging the immune system's ability to detect and destroy viruses, bacteria and cancer cells.

COHEN STMT NO. 3

5/10/00

PWB DD

RJ

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of PECO Energy Company, Pursuant to Chapters 11, 19, 21, 22 and 28 of the Public Utility Code for Approval of (1) a Plan for Corporate Restructuring, Including the Creation of a Holding Company and (2) the Merger of the Newly Formed Holding Company and Unicom Corporation	:	Docket No. A-110550F0147

DOCKETED
MAY 17 2000

DOCUMENT FOLDER

DIRECT TESTIMONY OF DR. JANETTE D. SHERMAN

Q. Please state your name and business address for the record.

A. My name is Janette D. Sherman. My business address is P.O. Box 4605, Alexandria, Virginia 22303.

Q. Please state your current professional affiliation and educational background.

A. I am a Research Associate at the City of New York, Radiation and Public Health Project, with which I have been associated since 1998. By profession I am an epidemiologist specializing in the study of environmental hazards to human health, on which subject I have lectured extensively at a wide number of colleges and universities. Please see my attached curricula vitae for details. I received my bachelor of science degree from Western Michigan University majoring in chemistry and biology, and my M.D. degree from Wayne State University School of Medicine in 1964. I received the Distinguished Alumna Award from Western Michigan University on October 14, 1989. The attached resume further details my educational background and experience. See, Exhibit A.

Q. Have you published any books or journal articles concerning nuclear power and public health?

A. Yes. I have authored a book entitled, "Life's Delicate Balance, Causes and Prevention of Breast Cancer," published by Taylor and Francis this year. I have also authored (or co-authored) a number of articles and letters, in medical journals and public health publications addressing radiation exposure

and health effects. A brief listing of relevant publications and journal articles includes the following:

"Strontium-90 in Baby Teeth as a Factor in Early Childhood Cancer," International Journal of Health Services (Summer 2000);

"The Strontium-90 Baby Teeth Study and Childhood Cancer," European Journal of Oncology. (Summer 2000);

"The Tooth Fairy Project" Women Respond to the Nuclear Threat, WISE International, Amsterdam, pp. 5-6, (1999).

Q. On whose behalf are you testifying in this proceeding?

A. I am testifying on behalf of Councilman David Cohen and in support of his position concerning public health issues and nuclear power.

Q. Would you summarize your testimony?

A. I concur with Councilman Cohen that the continued operation of current nuclear capacity and the acquisition of new nuclear plants brings with it significant health risks which, at a minimum, studied by examining measures sensitive to radioactivity and comparing them to radioactive releases.

Q. What are the health dangers of nuclear facilities when operating normally and within accepted guidelines?

A. Under normal operating conditions, nuclear power plants release radionuclides into the atmosphere. It follows the laws of chemistry and physics that it is impossible to completely seal a nuclear reactor. The radioactive chemicals released in the course of a nuclear reactor are foreign to evolution, however, they trace the same pathways as do non-radioactive chemicals and, as such, irradiate tissues wherein they lodge. One example is radioactive strontium (Sr90) which along with calcium becomes deposited in bones and teeth where it decays by beta release to radio-yttrium (y90), also a beta-releasing chemical, but this time, y90 goes to the soft tissues of the body, including the breast and pituitary (the body's master gland.) See the study by Gould, J. M. The Enemy Within. It is a study of the increase in breast cancer rates within a 50 mile radius of nearly every nuclear facility in the U. S. (The map of TMI with increase breast cancer rates is shown in my book Life's Delicate Balance, on pp. 77, 78 with discussion and footnotes following).

Q. Is there any evidence that cancer rates are affected when nuclear plants close?

A. Yes, cancer rates decrease when nuclear plants close. Please see the recent publication by J. Mangano, which showed a decline in cancer rates for the very young children at five separate sites. Additional work has demonstrated as well, a decline in cancer deaths in those older than 65 years after closure of plants.

Q. Is there any additional hazard to extending the useful life of a nuclear facility?

A. The operating time-span of a nuclear facility was originally determined to be approximately 30 years. Given the problems that arise (as identified above) during normal operation of these facilities, it would be difficult to assure the public that extending the period of operation would not bring with it greater risks. This is true for the simple reason that structural materials wear out. In addition, statistically the longer these plants operate the greater the period for releases into the atmosphere the greater exposure of the population to radiation with its attendant health risks.

Q. Does this conclude your testimony?

A. Yes.

JANETTE D. SHERMAN, M. D.
P. O. BOX 4605
ALEXANDRIA, VA 22303

PHONE 703-329-8223 FAX: 703-960-0396

(2-2000)

EDUCATION AND DEGREES:

1948-1952	Western Michigan University, Kalamazoo, Michigan Majors in Biology and Chemistry. (B. S. - 1952)
1956-1960 (part time)	Michigan State University, East Lansing, Michigan German and Mathematics
1960-1964	Wayne State University, School of Medicine, Detroit, Michigan. (M. D. - 1964)

POST GRADUATE TRAINING:

1964-1965	Women's Hospital, Detroit, Michigan Internship, with rotations through Receiving and Children's Hospitals
Sept. 1965- Sept. 1966	Metropolitan Hospital, Detroit, Michigan General Practice including Internal Medicine, Pediatrics and Emergency Room Service
Jan. 1967- Dec. 1968	Division of Research, Sinai Hospital of Detroit, Dec. 1968, Detroit, Michigan National Institutes of Health, Research Trainee Laboratory and Clinical Research of diabetes mellitus
Jan. 1969- Dec. 1969	Detroit General Hospital, (Receiving Branch) Wayne State University, Detroit, Michigan Senior Resident in Internal Medicine
1970-Present	Yearly post-graduate courses and conferences in Internal Medicine, Toxicology and Occupational and Environmental Health
HONORS:	Distinguished Alumna, Western Michigan University. Kalamazoo, Michigan. Awarded October 14, 1989.

EXPERIENCE:

1952	Atomic Energy Commission, Radiation Laboratory University of California, Berkeley, California Monitor of radiation emissions
1953	U.S. Navy Radiological Defense Laboratory Hunter's Point, San Francisco, California Biologist, research of effects of radiation, thermal burns, and acute blood loss in animals.
1955-1956	Department of Horticulture, Michigan State University, East Lansing, Michigan Analytical Chemist
1956-1959 (part-time)	Department of Physiology and Pharmacology Michigan State University, East Lansing, Michigan Gut-absorption studies, including isotopes and analytical chemistry. Induction of lactation in animals with tranquilizers
1959-1960	Department of Political Science Michigan State University, East Lansing, Michigan Mathematics and statistics of collected data
Summer 1961	Department of Physiology and Pharmacology, Wayne State University School of Medicine, Detroit, Mi. Mathematical and statistical analysis of ultra-centrifuge and diffusion data on prothrombin and auto-prothrombin C
1961-1963	Department of Anesthesiology, Wayne State University School of Medicine, Detroit, Michigan Clinical anesthesia. Research using stop-flow renal excretion studies of anoxia and hypercarbia
1970-and on-going	Private practice of Internal Medicine
1970 and on-going	Research in Occupational and Environmental Health and Toxicology

LICENSES AND BOARDS:

State of Michigan	License #26607	1965
State of Hawaii	License #3077	1977
State of California	License #C-28209	1965
National Board of Medical Examiners	License #78450	1975
State of Virginia	License #0101-043202	1988

TEACHING AND CONSULTING:

1967 (part-time)	Department of Physiology and Pharmacology, Wayne State University School of Medicine. Detroit, Mi. Lecturer to medical students 1967-1972
1967-1972	Michigan Diabetes Association and Sinai Hospital of Detroit, Detroit, Michigan Lecturer to lay groups and patients on diabetes
1967-1975	Department of Medicine, Sinai Hospital of Detroit, Detroit, Michigan Teaching physical diagnosis for medical students, and clinical teaching rounds for residents and interns
1970-1976	Grace Hospital, Detroit, Michigan Clinical teaching (diabetes) to residents and interns
1973-1976	Department of Labor Education, School for Workers, University of Wisconsin, Madison, Wisconsin Adjunct Associate Professor, teacher and in occupational medicine and toxicology
1973-1974	Harvard University and W.E. Upjohn Institute for Employment Research, Washington, D.C. Consultant on toxicology and occupational diseases
1973 and on-going	Lecturer in Occupational and Environmental Medicine and Toxicology at:

University of Indiana, Bloomington, Indiana
University of Alabama, Birmingham, Alabama
University of Alabama, Mobile, Alabama
Michigan State University, East Lansing, Michigan
University of W. Virginia, Morgantown, W. Virginia
Hebrew University, Jerusalem, Israel
University of Michigan, Ann Arbor, Michigan
University of Texas, Galveston, Texas
Wayne State University, Detroit, Michigan
American Trial Lawyers Association, Toronto, Canada, 1982
American Trial Lawyers Association, Honolulu, Hawaii, 1983
American Trial Lawyers Association, Washington, D.C., 1983
American Association of Orthopedic Medicine, Phoenix, Arizona, 1984
Catholic University, Washington, D.C., 1992, 1993, 1994
Millersville University, Millersville, Pennsylvania

Speaker at Educational, Health Professional, Legal, Medical, and Labor Groups regarding occupational and environmentally caused diseases, and toxicology.

1974-1986 The Cooperative Primary Care Preceptorship, Schools of Medicine for University of Michigan, Wayne State University and Michigan State University; Teaching medicine to students in office practice setting.

1975 Testimony, U.S. Congressional Sub-Committee on Hearing and Noise

1976-1982 Clinical Assistant Professor, Department of Oncology, Wayne State University, Detroit, Michigan

1977-1980 Consultant to Environmental Protection Agency on Pesticides, Human Effects Monitoring Branch

1976- Member of 16 person Advisory Committee, U.S. 1982
Environmental Protection Agency for
Toxic Substances Control Act

Chairperson of Risk Benefit Assessment Sub-Group, 1977-1979
Member, Carcinogen Policy Sub-Group, 1977-1981

1979-1980 Pacific Biomedical Research Center, University of Hawaii, Honolulu, Hawaii
Research of blood dyscrasias and pesticides

1983- Clinical Assistant Professor, Department of 1988
Medicine, Wayne State University, Detroit, Michigan

1988- Editorial Board. Dangerous Properties of Industrial Materials Report. Jan C. Prager, Ph.D., Ed.-in-Chief

1988- Advisory Board. Association of Birth Defect Children, Inc. Orlando, Florida.

1988- Editorial Board. Citizens Clearinghouse for Hazardous Wastes. Arlington, Virginia.

1990-1992 National Coalition Against the Misuse of Pesticides, Board of Directors.

1991 Invited testimony before the U. S. Senate, The Subcommittee on Toxic Substances, Environmental Oversight, Research and Development to amend S-849, the Emergency Planning and Community Right-To-Know Act of 1986. (Lawn care chemicals) Hearing of 5-9-91

1991-1995 American Legion, Science Panel
Washington, D.C.

1992 Invited participant Wingspread Conference on Environmental Health and Stewardship: A strategic plan

for health professionals: Sponsored by Medical College of Wisconsin

1992- Member: Western Michigan University Foundation Kalamazoo, MI

1993- Appointment as Adjunct Professor of Sociology and Associate Member in the Graduate Faculty Western Michigan University, Kalamazoo, MI Consultation and research with staff, faculty, and graduate students concerning Worker's Compensation Study.

1993 Invited Participant Collegium Ramazzini Conference on Present Knowledge on the Health Hazards of Conventional and New Gasolines. Carpi, Italy, October 1993

1994- Rachel Carson Council Board of Directors, Chevy Chase, Maryland

1994 Co-Chair. American College of Toxicology Symposia I and IV - Toxicology of Bio-reactive Materials. Williamsburg, VA. October 24, 1994

1995 19th Annual Family Practice Review. Temple University School of Medicine with Lancaster General Hospital March 27th
Lecture: Pesticides and Their Disease Causing Effects.
Workshop: Chemicals and Their Effects on Illness and Health.

1995 Society for the Advancement of Socio-Economics. Environmental Effects on Ability Effects of Environment and Ability on Health, Behavior, and Performance.

1995 Scholar-In-Residence. Millersville University, Department of Chemistry, Millersville, PA

1998 Invited participant, Collegium Ramazzini, Chlorpyrifos (Dursban) Exposure and Birth Defects, Theory of Action, and Medical and Social Aspects. Carpi, Italy, October 1998

1998 - on-going Radiation and Public Health Project Research Associate

1998 - on-going STAR Foundation - Research Associate

GOVERNMENTAL PEER REVIEW:

1994 Agency for Toxic Substances and Disease Registry (ATSDR) Research Grant review

1995 U.S. Environmental Protection Agency, Research Grants review panel

1996 U.S. Environmental Protection Agency, Research Grant review panel - pesticides and children

JOURNAL AND PUBLISHER PEER REVIEW:

Archives of Environmental Health
Consulting Editor
Toxicology and Industrial Health
International Journal of Occupational Medicine and Toxicology
Van Nostrand Reinhold
Random House
Taylor and Francis

MEMBERSHIPS:

American Thoracic Society (Member, Planning Committee for Environmental and Occupational Health Assembly) 1973-1989
Society for Occupational and Environmental Health, 1974-
Governing Council, 1985-1988
American Association for the Advancement of Science, 1970-
American Diabetes Association, 1968-1980
Michigan Diabetes Association, 1968-1976
American Academy of Family Practice. 1965-1984
New York Academy of Science, 1976-
Michigan Lung Association (Board of Directors of Southeast Michigan Division), 1973-1981
American Public Health Association, 1975-
Society for Preventative Oncology, 1977-1983
American College of Toxicology, 1981-1995
American Society of Law and Medicine, 1983-
Hawaii Thoracic Society, 1979-1987
American Lung Association, Hawaii Division, 1981-1987
Sierra Club, 1965- (Life Member 1984)
Friends of the Earth, 1973-
Wilderness Society, 1976-
Union of Concerned Scientists 1980-
Physicians for Social Responsibility, 1983-
Sylvia Society, 1983-(life member)
International Physicians for the Prevention of Nuclear War 1985-

International Physicians for the Prevention of Nuclear War 1985-
International Society of Exposure Analysis, 1991-
The American Association of University Women, 1993-
Society for The Advancement of Socio-Economics, 1995

PUBLICATIONS:

Davis, M. D., Bigelow, J. D. and Alpen, E. L.
Changes in red cell volume and osmotic fragility of erythrocytes in the rat following acute blood loss.
American Journal of Physiology. 178:17, 1954

Bigelow-Sherman, J. D. and Foa, P. P.
Lactic acidosis, diabetes mellitus and the biguanide compounds.
Acta Diaberologica Latina 6:507, 1969

Bigelow-Sherman, J. D., Shima, K., Penhallegon, R., Foa, P. P.
The response of serum glucose, free fatty acids and immunoreactive insulin to oral glucose and intravenous tolbutamide in normal, potentially diabetic and diabetic subjects. Acta Diaberologica Latina 7:68, 1970

Sherman, J. D., Wolfe, S., Hricko, A., Mets, M.
A health research group study on disease among workers in the auto industry (largely foundry workers).
Distributed by Public Citizen, Inc. Washington, D.C., September, 1973

In proceedings: Conference on Women in the Workplace.
Editor: E. Bingham, Society for Occupational and Environmental Health, pp. 216-218, June, 1976.

Sherman, J. D. Cancer: Our Social Disease.
Environmental Review, C.B.E., pp. 7-9, June, 1978.

In: Dusts and Disease. Editors: R. Lemen and J. M. Demeux
Pathotox Publishers, Inc., Park Forest, IL, pp. 484-485, 491, 1979

Occupational Diseases in the Auto Industry. In proceedings: American Trial Lawyers Association, Toronto, Canada, pp. 461-472, July, 1982

Recognizing Environmentally Caused Diseases: In Proceedings: American Trial Lawyers Association, Honolulu, Hawaii, January, 1983

Chemically Caused Diseases: In Proceedings: American Trial Lawyers Association. Washington, D.C., July 1983

Sherman, J. D., Women As Expert Witnesses: Trials and Tribulations. Trial 19 (8): 46-47, August 1983
Glotta, R. D., Sherman, J. D., Learning from the Lessons of the Asbestos Tragedy, Trial 19 (11): 68-72, 134-135, November, 1983

Within A Reasonable Degree of Scientific Certainty. American College of Toxicology, 6th Annual Meeting Abstracts, Washington, D.C., November 5-7, 1985

Recognizing Pesticide-caused Diseases in Farm Workers: American Public Health Association Abstracts, Washington, D.C., pp. 227, November 17-21, 1985

Sherman, J. D., Formaldehyde Associated Cancer, Two Case Reports: J. American Toxicology 4(2): 225, Summer 1985

Sherman, J. D., Formaldehyde, Cancer and Associated Diseases, American College of Toxicology, 7th Annual Meeting Abstracts, Philadelphia, Pennsylvania, November 16-19, 1986

Sherman, J. D., Chlordane Neurotoxicology. American College of Toxicology. Ninth Annual Meeting Abstracts. Baltimore, MD Oct. 31 - Nov. 1, 1988

Sherman, J. D., Chlordane Toxicology. Dangerous Properties of Industrial Materials Report. 7(6): 2-11, 1987.

Sherman, J. D., Chlordane neurotoxicology. World Federation of Neurology, Abstracts. Cincinnati, OH., April 1988

Sherman, Janette D., Chemical Exposure and Disease: Diagnostic and Investigative Techniques, (ISBN #0-442-23334-5) Van Nostrand Reinhold, New York, 1988

Sherman, J. D., It's only oil, It's only money!!! American Journal of Public Health, 81(1): 113, 1991

U. S. Senate Committee on Environment and Public Works. Hearing on Bill S. 849, before the Subcommittee on Toxic Substances, Environmental Oversight, Research and Development. The Emergency Planning and Community Right-To-Know Act of 1986: Lawn Care Chemicals. U. S. Govt. Printing Office. pp. 27-28, 85-98, May 9, 1991

Sherman, J. D., Polybrominated biphenyl exposure and human cancer: Report of a case and public health implications. Toxicol. Indust. Health 7(3): 197-205, 1991

Sherman, J. D., Chlordane/Heptachlor Neurotoxicity. World Federation of Neurology, Abstracts, Meeting: United Nations, New York City, April 1993

Sherman, J. D., What Have We Learned? PSR Quarterly (3):142, 1993

Sherman, J. D., Pesticide-induced neuropathies: A serious public health problem. Neuroepidemiology. Abstract. World Federation of Neurology Meeting, p. 17-18, 1994.

Sherman, J. D., Tamoxifen: Structure-Activity and Public Health Concerns. Journal of Occupational Medicine and Toxicology, 3(1): 91-94, 1994

Sherman, J. D., Geothermal Emissions - Hawaii: Environmental Inequity. Sixth Conference of the International Society for Environmental Epidemiology. Abstract #185, 1994.

Sherman, J. D., Indoor-Air Pollution: Pesticide-Induced Neuropathy. Sixth Conference of the International Society for Environmental Epidemiology. Abstract #186, 1994.

Sherman, J. D., Structure-Activity Relationships of Chemicals Causing Endocrine, Reproductive, Neurotoxic, and Oncogenic Effects - A Public Health Problem. Toxicol. Indust. Health, 10(3): 163-179, 1994.

Sherman, J. D., Geothermal Emissions - Hawaii - A Public Health Problem. Amer. Pub. Health Assoc., Annual Meeting, Washington, D.C., Abstract #1191, October 31, 1994.

Sherman, J. D., Pesticide Induced Illnesses - A Public Health Problem. Amer. Pub. Health Assoc., Annual Meeting, Washington, D.C. Abstract #3018, November 2, 1994.

Sherman, J. D., Chemical Exposure and Disease: Diagnostic and Investigative Techniques - The Professional and Layperson's Guide to Understanding Cause and Effect. Princeton Scientific Publishing Co., Inc. Princeton, N.J., 1994.

Sherman, J. D., Gulf War Illnesses: The Need for a Toxicological Investigation. Health and Environment Digest, 8(11): 87-89, 1995.

Sherman, J. D., Organophosphate Pesticides - Neurological and Respiratory Toxicity. Toxicology and Industrial Health, 11(1): 33-39, 1995.

Sherman, J. D., Pesticides and Their Disease Causing Effects. 19th Annual Family Practice Review. Temple University School of Medicine with Lancaster General Hospital Syllabus. Pages 1.0 to 1.13, 1995.

Sherman, J. D., Chemicals and Their Effects on Illness and Health. 19th Annual Family Practice Review. Temple University School of Medicine with Lancaster General Hospital Syllabus. Pages 72.0 to 72.13, 1995.

Sherman, J. D., Gulf War Syndrome - Civilian Syndrome: A Link? Synthesis/Regeneration: A Magazine of Green Social Thought. 7/8: 37-38, 1995.

Sherman, J. D., Multiple chemical sensitivity and neurotoxicity: A pesticide link. APHA, Poster session #1032, Nov. 1995.

Sherman, J. D., Gulf War Syndrome and civilian illness - A toxic link. APHA Abstract # 2116, Nov. 1995.

Sherman, J. D., Hormonal, carcinogenic, neurotoxic and teratogenic chemicals - A link to wide-spread illnesses. APHA. Abstract # 3209, Nov. 1995.

Sherman, J. D., Chlorpyrifos (Dursban) associated birth defects - Report of four cases. Arch. Environ. Health: An Internat. Journal. 51(1): 5-8, 1996.

Sherman, J. D., Chlorpyrifos (Dursban) associated birth defects: A proposed syndrome, report of four cases, and discussion of the toxicology. Internat. J. Occup. Med. and Toxicol. 4(4): 417-431, 1995.

Sherman, J. D., Dursban (Chlorpyrifos)- caused neurotoxicity: No respecter of age. Neuroepidemiology. Regional North American Annual Meeting of the World Federation of Neurology - Research Group of Neuroepidemiology, Abstract No. 23, p. 16, March 29, 1996.

Sherman, J. D, Birth defects and in utero exposure to Dursban - Case reports and theory. Invited presentation at International Society for Environmental Epidemiology, University of Endmonton, Alberta, Canada. September 1996.

Sherman, J. D., Endocrine disrupting chemicals in food and the environment - Public health risks and societal concerns. Invited presentation from Deutsche Forschungsgemeinschaft, University of Kaiserslautern, Germany. Presented October 1996.

Sherman, J. D., The Canadian - U, S. border: Sieve for toxic chemicals, carcinogens, birth defect agents, and endocrine disruption. Invited presentation from Canadian Association for American Studies: Culture and Identity after NAFTA. Toronto, Canada. October 1996.

Sherman, J. D., Breast cancer and pesticides - Science, economics, and politics. Invited presentation from Rachel Carson Council, Inc. Conference on Cancer and Pesticides. Chevy Chase, MD. October 1996.

Sherman, J. D., Pesticide-Induced birth defects: Medical/societal aspects. Abstract #1075. American Public Health Association, New York, New York, November 18, 1996.

Sherman, J. D., Birth defects in gulf war and civilian children: Is there is connection? Can we prevent them? Abstract #3156. American Public Health Association, New York, New York, November 20, 1996.

Donnay, A., Sherman, J. D., Multiple chemical sensitivity associated with exposure to chlorpyrifos. American Public Health Association, Abstract #3205, New York, New York, 1996.

Allen, R. H., Gottlieb, M., Clute, E., Pongsiri, M. J., Sherman, J.D., Obrams, G. I., Breast cancer and pesticides in Hawaii: The need for further study. Environmental Health Perspectives, Vol. 105 (Supp. 3): 679-683, 1997.

Sherman, J. D., Reply to Dr. J.P.J. Maurissen's letter to the editor, Toxicology and Industrial Health, 13(1): 95-97, 1997.

Sherman, J. D., Dursban revisited: Birth defects, U.S. Environmental Protection Agency, and Centers for Disease Control. Environmental Health, Archives of 52(5):332-333, 1997.

Sherman, J. D., Letter to the Editor, Toronto Globe and Mail, July 26, 1997.

Sherman, J. D., Breast cancer: Effects masquerading as "Risks". Abstract. World Conference on Breast Cancer. Kingston, Ont. Canada. July 1997.

Sherman, J. D., Tamoxifen: Breast cancer prevention or medical meddling? Abstract. World Conference on Breast Cancer. Kingston, Ont. Canada. July 1997.

Sherman, J. D., Nuclear radiation, chemical carcinogens and breast cancer. World Conference on Breast Cancer. Kingston, Ont. Canada. July 1997.

Sherman, J. D. Endocrine disrupting chemical in food and the environment - Public health risks and societal concerns. Hormonally Active Agents in Food Symposium. Deutsche Forschungsgemeinschaft. Wiley-VCH, Germany, pages 240-252, 1998.

Sherman, J. D. Tamoxifen and prevention of breast cancer. Toxicology and Industrial Health. 14(4): 485-499, 1998.

Sherman, J. D. Dursban Revisited, Birth Defects, U. S. Environmental protection Agency. And Centers for Disease Control. Archives of Environmental Health. 52(5): 332-333, 1997.

Sherman, J. Chlorpyrifos (Dursban) and Dow employees. Environmental Health Perspectives: 107(3): A-132-134, 1999.

Sherman, J. D. Chlorpyrifos (Dursban) exposure and birth defects: Report of 15 incidents, evaluation of 8 cases, theory of action, and medical and social aspects. European Journal of Oncology. In press.

Sherman, J. D. Lifes' Delicate Balance: Causes and Prevention of Breast Cancer. Taylor and Francis. New York. 273 pages. ISBN 1-56032-869-X. Published Feb. 2000.

Sherman, J. D. Why chlordane and the cyclodiene pesticides must be banned worldwide. Environmental Epidemiology and Toxicology. 1:132-147, 1999.

Signatory: Consensus Group on Multiple Chemical Sensitivity, Multiple Chemical Sensitivity: A 1999 Consensus. Archives Environmental Health. 54(3):147-149, 1999.

Gould, J. M., Sherman, J. D. The Tooth Fairy Project. Women Respond to the Nuclear Threat, WISE International, Amsterdam, p. 5-6, 1999.

Sherman, J.D. Abstract: Risks in Breast Cancer are Really Effects. Abstract: Nuclear Radiation, Chemical Carcinogens and Breast Cancer. Abstract: Tamoxifen: Breast Cancer Prevention or Medical Meddling? World Conference on Breast Cancer, Ottawa, Canada, July 26-30, 1999.

Gould, J. M., Sternglass, E. J., Sherman, J. D., Brown, J., McDonnell, W., Mangano, J. J. Strontium-90 in baby teeth as a factor in childhood cancer. International Journal of Health Services. Summer 2000. In press.

Gould, J. M., Sternglass, E. J., Mangano, J. J., McDonnell, W., Sherman, J. D., Brown, J. The Strontium-90 baby teeth study and childhood cancer. European Journal of Oncology. Summer 2000. In press.

Mangano, J. J., Sternglass, E. J., Gould, J. M., Sherman, J. D., Brown, J., McDonnell, W. Strontium-90 in Newborns and Childhood Disease. Archives Environmental Health. Spring 2000. In press.

Mangano, J. J., Sherman, J. D., Brown, J. Cancer in baseball players: A new outbreak? Pesticides, People and Nature. Spring 2000. In press.

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BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Application of PECO Energy Company, Pursuant to Chapters 11, 19, 21, 22 and 28 of the Public Utility Code for Approval of (1) a Plan for Corporate Restructuring, Including the Creation of a Holding Company and (2) the Merger of the Newly Formed Holding Company and Unicom Corporation	:	Docket No. A-110550F0147

DOCKETED
MAY 17 2000

DOCUMENT FOLDER

DIRECT TESTIMONY OF JOSEPH J. MANGANO

Q. Please state your name and address for the record.

A. My name is Joseph J. Mangano. My address is 786 Carroll Street, Brooklyn, New York.

Q. Please state your current professional affiliation and educational background.

A. I am a Research Associate at the City of New York, Radiation and Public Health Project, where I have been employed since 1989. By way of background, I attended the U.S. Military Academy at West Point and was honorably discharged from military service in 1974. I graduated from North Carolina State University in 1976 with a bachelor of arts degree in political science. Thereafter, I earned a master's degree in public health at the University of North Carolina-Chapel Hill in 1978. Finally, I completed work on my master's degree in business administration at Fordham University in 1985.

Q. Have you published any books or journal articles concerning nuclear power and public health?

A. Yes. I have authored a book entitled, *Low-Level Radiation and Immune System Damage: An Atomic Era Legacy,* published by CRC Press/Lewis in 1998. I have also authored (or co-authored) numerous articles and letters in medical journals and public health publications (with four more soon to be published) all addressing radiation exposure and health effects. A brief listing of relevant publications and journal articles includes the following:

"Strontium-90 in Baby Teeth as a Factor in Early Childhood Cancer," International Journal of Health Services (Summer 2000);

"Improvements in Local Infant Health After Nuclear Power Reactor Closing," Journal of Environmental Epidemiology and Toxicology (Spring 2000);

"A Rise in the Incidence of Childhood Cancer in the U.S.'" International Journal of Health Services (Spring 1999);

"Strontium-90 in Newborns and Childhood Disease," Archives of Environmental Health (Spring 2000);

"A Post-Chernobyl Rise in Thyroid Cancer in Connecticut," European Journal of Cancer Prevention (February 1996);

"Cancer Mortality Near Oak Ridge, Tennessee," International Journal of Health Services (Summer 1994).

Q. On whose behalf are you testifying?

A. My testimony is presented on behalf of Councilman David Cohen and in support of his position concerning public health issues and nuclear power.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to identify public health issues in connection with nuclear power which should be addressed prior to the approval of the proposed merger of PECO and UNICOM.

Q. In the context of PECO's proposed merger, should it provide information on health effects on the population living near nuclear plants?

A. Yes. Medical literature contains numerous reports of excess cancer and other diseases in populations near nuclear reactors. For example, I am aware of at least ten published articles documenting high levels of cancer among children living close to reactors in Europe and America. In addition, I have recently published an article on changes in infant health after nuclear reactors close. In areas near each of seven plants, infant mortality dropped at about three times the national rate in the first two years after nuclear

plant closings. All of the above would indicate that a commitment to provide public health information is critical to an assessment of how consumers are potentially burdened by the merger which will entail the continued operation and acquisition of nuclear facilities.

Q. What specific information on health effects should be requested as a condition of the merger?

A. Information should be provided as to the following on plant workers and the surrounding communities:

1. Measurements of external radiation absorbed by nuclear workers;
2. Measurements of radioactive chemicals emitted into the air or water;
3. Measurements of environmental radioactivity in the local area, to include (at least) the water, air, and milk. (A utility can substitute measurements that regulatory bodies have taken.)
4. A record of what percentage of the time each reactor was not operating;
5. Each reactors' compliance with NRC standards, including how often each was placed on the NRC "Watch List";
6. Evidence that the utility or other health organization studied the health status of its nuclear workers, and demonstrated no excess risk from nuclear operations. (Examples of health status include cancer and other immune diseases.)
7. Evidence that the utility or other health organization studied the health status of the local population, and demonstrated no excess risk from nuclear operations. Such demonstration should include:
   a. Comparisons of disease/death rates before and after each reactor began operating;
   b. Comparisons of current disease/death rates with state and national standards;
   c. An inclusion of all cancers, plus radiosensitive malignancies like thyroid cancer, leukemia, multiple myeloma, and breast cancer;
   d. An inclusion of all counties situated in the prevailing wind direction from the reactor;
   e. An inclusion of persons most sensitive to radiation, namely infants/young children and the elderly;
8. An accounting of how much nuclear waste is stored on the site, how it is secured, and plans of how to secure it in the future;
9. An action plan for operations and maximization of public safety in the event of an accident, including backup operating systems, evacuation plans, etc.

Q. What general criteria should be used to judge whether or not the proposed merger between the two utilities should be approved in light of the health and safety risks posed by operational negligence and error?

A. As a pre-condition to proceeding with the proposed merger, both utilities should meet, at a minimum, the following requirements as to its nuclear facilities:

1. Sound methods of conducting operations;
2. An established mechanism of objectively evaluating operations and making needed changes;
3. An effective management system;
4. Financial viability, both current and in terms of expected expenses (including decommissioning);
5. A detailed plan of how the merger will affect operations, management, and finances.

Q. Does this conclude your testimony?

A. Yes.

Environmental Epidemiology and Toxicology (2000) 2, 32–36

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Improvements in local infant health after nuclear power reactor closing

JOSEPH J. MANGANO

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Between 1987 and 1998, operations ceased at 12 U.S. nuclear power reactors. One of these, Rancho Seco, is located in a densely populated area. After the reactor closed in 1989, significant decreases in mortality (all causes and from congenital anomalies) and cancer incidence were observed for fetuses, infants, and small children. These trends contrast with a worsening of infant health status after the plant opened in 1974. The data suggest that a relationship between nuclear emissions and adverse health effects exists, especially since fetuses and newborns are most sensitive to radiation. Because Rancho Seco released low levels of radionuclides into the local environment, the issue of health effects of prolonged, low-dose radiation exposure is raised. The matter becomes increasingly important as operators of several dozen aging U.S. reactors must soon decide whether to extend their operating licenses. *Environmental Epidemiology and Toxicology* (2000) 2, 32–36.

Keywords: cancer, infant health, infant mortality, nuclear reactors, radiation.

Introduction

From 1987 to 1998, utilities permanently closed 12 U.S. nuclear power reactors (U.S. Nuclear Regulatory Commission, 1999). No new orders have been placed since 1978, and thus, many units are aging; 36 of them began operations 25–30 years ago. Utilities running these units must soon decide whether to apply to the U.S. Nuclear Regulatory Commission for a new operating license or to close reactors.

To date, the principal issues associated with reactor closings have been waste management and plant decommissioning. Little consideration is given to health status among local residents. After the Partial Test Ban Treaty ended atmospheric atomic bomb testing in Nevada, and dietary levels of long-lived radioactive chemicals from fallout declined after peaking across the U.S. in 1964 (U.S. Public Health Service, 1968), progress in several infant health indicators accelerated. Long-term declines in fetal and infant mortality abruptly slowed during the atmospheric test era, but fell sharply thereafter (Wiyte, 1992). The percentage of American babies born less than 2500 g, which rose 2% for whites and 35% for nonwhites from 1950 to 1966, plunged during the next decade (Mangano, 1998). Cancer incidence ages 0–4 in Connecticut, the only state with an established tumor registry, rose 61% from the early 1940s to the early 1960s before falling 24% in the first five years after the test ban (National Cancer Institute, 1986).

The fetus and infant are most susceptible to effects of radiation and other toxic chemicals. The developing fetus undergoes rapid cell growth, self-programmed cell death (apoptosis), and cell re-arrangement. The developing infant is similarly susceptible to cellular and metabolic damage. Unrepaired damage becomes magnified with time, increasing the risk of cancer, congenital malformations, underweight births, and fetal/infant deaths (Sherman, 1994).

Five of the 12 closed reactors are in areas at least 70 miles from any other nuclear power plant. In the first two years after closing, infant mortality rates in the closest counties downwind from the reactors fell 15 to 20% at each site (Appendix 1). The average U.S. two-year decline in infant mortality from 1985 to 1996 was 6.4%.

This report assesses potential health impacts of the closing of the Rancho Seco reactor (one of the five cited) on local fetuses and infants. Rancho Seco is located close to a highly populated area (25 miles southeast of Sacramento, California), making detection of significant trends more feasible. It had a large capacity of over 2700 megawatts (thermal), which could potentially affect the local population's health more than a small unit. No other nuclear reactor lies within 200 miles. It has been closed since June 7, 1989 (initial criticality began on September 16, 1974 and commercial operations on April 17, 1975), permitting a long-term analysis of subsequent health patterns to be made.

The opening of Rancho Seco corresponds with an increase of local *in vivo* radioactivity. Estimates of dietary intake of Strontium-90 in urban west (mostly San Francisco) adults were made from 1961 to 1982, based on

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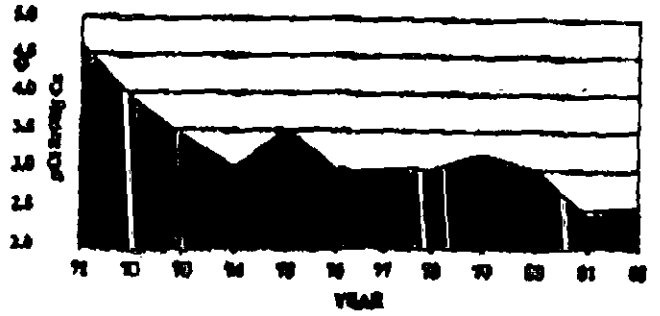

Figure 1. Adult Dietary Intake, Sr-90, Urban West.

post-mortem measurements of human bone. In the early 1970s, Sr-90 concentrations were falling, but from 1974 to 1980, the rate remained at or above 3.0 pCi of Sr-90 per gram of calcium in bone (Figure 1). During the same period, concentrations in urban northeast (mostly New York City) adults declined 22% (Klusek, 1984). It is possible that Sr-90 levels in San Francisco were affected by emissions from Rancho Seco; the reactor lies just 70 miles from the city, while a substantial portion of San Francisco food is grown in the nearest agricultural area, the Sacramento Valley.

Rancho Seco's closing reduced local levels of dietary radioactivity. In 1987, when the reactor was temporarily closed for repairs, an average of 1.91 pCi of Iodine-131 was present in Sacramento's pasteurized milk. After restart, levels rose to 2.67 and 2.54 in 1988 and 1989, but fell to 1.82 in 1990 (National Air and Radiation Environmental Laboratory, 1987–1990).

Methods

The analysis focuses on all-cause mortality for fetuses, infants, and young children; mortality from birth defect ages 0–4; and cancer incidence ages 0–4. County-specific data on California underweight births are unavailable before 1993, and thus not used. The source for mortality information is the National Center for Health Statistics annual compilation *Vital Statistics of the United States* (now available from 1979 to 1996 on the World Wide Web at http://www.cdc.gov, CDC Wonder). Cancer incidence is obtained from the California Cancer Registry. Population figures are decennial U.S. Census counts and estimates for all other years.

Those at greatest potential risk of adverse health effects from radioactive releases live in Amador, El Dorado, Placer, and Sacramento counties. The 1990 population in the region was 1.37 million, of whom three-fourths reside in Sacramento County. Most or all of the population in each county live within 50 miles of Rancho Seco, downwind (north and east) from the reactor (Bair, 1992). Although the Sacramento metropolitan area lies to the northwest, and technically not downwind of the reactor, it is included in the study because of its extreme proximity (10–15 miles). No data are available at the sub-county level.

Trends in infant health when the reactor began operating and when it closed were analyzed. Data for 1972–1973 were compared with 1974–1975, when radioactivity was introduced into the local food and water, and data from 1988 to 1989 (the last reported release) were contrasted with 1990–1991. The first emissions from Rancho Seco reported to the U.S. Nuclear Regulatory Commission occurred in 1975, at 0.01 Ci of airborne radionuclides with half lives of

Table 1. Changes in health status before and after Rancho Seco closing, Amador, El Dorado, Placer, Sacramento Counties, 1988–1989 vs. 1990–1991.

	Four CA counties				U.S.			
	Number		No./1000 births		No./1000 births		Odds ratio	
Indicator	1988–1989	1990–1991	1988–1989	1990–1991	1988–1989	1990–1991	Local	U.S.
Fetal deaths, gestation > 20 weeks	371	288	6.1	5.0	7.5	7.4	0.987	0.987
Deaths < 1 year	424	307	9.9	8.0	9.9	9.1	0.843 ($p<0.09$)	0.919
Deaths < 1 year, congenital anomalies	99	79	2.0	1.6	2.0	1.9	0.791	0.942
[a]Death ages 1–4, excluding accidents, homicide, suicide	51	43	31.1	24.7	28.3	26.8	0.794	0.946
[a]Death ages 1–4, congenital anomalies	14	11	8.6	6.0	6.3	5.9	0.707	0.930
[a]Cancer cases, ages 0–4	39	27	23.7	14.9	19.8	21.0	0.628 ($p<0.07$)	1.062[b]

[a]Rate expressed as cases/deaths per 100,000 populations.
[b]Change in 11 U.S. states and cities.

Gardner et al., 1990; Viel and Richardson, 1990; Goldsmith, 1992; Michaelis et al., 1992; Schmitz-Feuerhake et al., 1997). In the U.S., elevated childhood cancer rates (Johnson, 1981; Goldsmith, 1989; Jablon et al., 1991) and unexpectedly high fetal deaths, infant deaths, and underweight births (DeCrout, 1972; Sternglass, 1972) have been documented near American reactors. Rises in U.S. infant mortality, leukemia, and hypothyroidism after Chernobyl, which added only slightly to the radioactivity in milk and water, have been reported (Gould and Sternglass, 1989; Mangano, 1996, 1997). Each of these reports addresses the presence or addition of environmental radioactivity, suggesting that a negative correlation between adverse health effects and removal of reactor emissions might exist.

There are several limitations to this analysis. Information on uptake of radioactivity is limited; measurements of Sr-90 in vertebrae ended in 1982, while monthly milk concentrations of Barium-140, Cesium-137, and Iodine-131 reported in 60 U.S. cities ceased in 1990. The study mostly covers death rates; aside from cancer, no local disease incidence registries exist. No examination is made of effects to the adolescent and adult populations. Finally, radiation exposure is just one of many potential factors affecting infant health, and it is very difficult exactly to determine what proportion of disease rate declines is due to Rancho Seco's closure.

Future assessments should address not just the Rancho Seco area's infants and children, but persons of all ages living near closed plants. Studies should move beyond the scope of statistical analysis, and measure *in vivo* levels of radioactivity, similar to the study of Sr-90 in St. Louis baby teeth in the 1950s and 1960s (Reiss, 1961; Mangano et al., 2000). With many reactors aging, a thorough knowledge of the relationship between long-term low-dose exposure and health effects to humans is a critical factor in the decision whether or not to continue operations (Nussbaum and Kohnlein, 1990).

Appendix 1

Change in Infant Mortality, Two Years Before and After Reactor Closing, Downwind Counties Within 50 Miles of Reactor, Areas with No Other Power Reactors Within 70 Miles

Reactor (Closing Date) / County	Infant Deaths Before	Infant Deaths After	Per 1000 Births Before	Per 1000 Births After	% Change
(1) LaCrosse (1967)	36	30	10.27	8.69	−15.3
-LaCrosse WI					
-Vernon WI					
(2) Rancho Seco (1989)	418	380	9.59	7.89	−16.8
-Amador CA					
-El Dorado CA					
-Placer CA					
-Sacramento CA					
(3) Fort St. Vrain (1989)	83	72	8.53	7.22	−15.9
-Larimer CO					
-Weld CO					
(4) Trojan (1992)	253	204	8.34	6.85	−18.0
-Columbia OR					
-Multnomah OR					
-Clark WA					
-Cowlitz WA					
-Washington WA					
(5) Millstone/Haddam Neck (1995)	166	130	7.46	6.16	−17.4
-Middlesex CT					
-New London CT					
-Tolland CT					
-Windham CT					
-Kent RI					
-Washington RI					
U.S. Average, 1985-94					

(6) BIG ROCK POINT
(7) MAINE YANKEE

-6.4
-5.4, 1%
-33, 4%

References

Bair F. (Ed.). Weather of U.S. Cities, 4th edn. Gale Research, Detroit, 1992.

Brookhaven National Laboratory. Radioactive Materials Released from Nuclear Power Plants: Annual Reports. Washington, DC, 1970–1992.

DeCrout M. Statistical Studies of Low-level Radiation from Nuclear Reactors on Human Health. Proceedings of the Sixth Berkeley Symposium on Mathematical Statistics and Probability. Berkeley and Los Angeles, 1972.

Gardner M., Hall M., Hall A., et al. Results of a case-control study of leukaemia and lymphoma among young people near Sellafield nuclear processing plant in West Cumbria. *Br Med J.* 1990; 300: 423–429.

Goldsmith J. Childhood leukemia mortality before 1970 among populations near two U.S. nuclear installations. *Lancet* 1989; 340: 1443–1444.

Goldsmith J. Nuclear installations and childhood cancer in the UK: mortality and incidence for 0–9-year-old children 1971–1980. *Sci Total Environ.* 1992; 127: 13–35.

Gould J., and Sternglass E. Low-level radiation and mortality. *CHEMTECH* 1989; 1: 18–21.

Hatch M., and Susser M. Background radiation and childhood cancers within ten miles of a U.S. nuclear plant. *Int. J. Epidemiol.* 1990; 19: 346–352.

Heasman M., Kemp J., Urquhart J., and Black R. Childhood leukemia in Northern Scotland. *Lancet* 1986; 2: 265.

Jablon S., Hrubec Z., and Boice J. Cancer in populations living near nuclear facilities. *J. Am. Med. Assoc.* 1991; 265: 1403–1408.

Johnson C. Cancer incidence in an area contaminated with radionuclides near a nuclear installation. *Ambio* 1981; 10: 176–182.

Kharit C., 1994. Strontium-90 in Human Teeth in the U.S., 1963. U.S. Department of Energy Environmental Measurement Laboratory, New York.

Table 2. Changes in health status before and after Rancho Seco closing, Arnador, El Dorado, Placer, Sacramento counties, 1988–1989 vs. 1990–1996.

Indicator	Number 1990–1996	Odds ratio Local	U.S.	Significance
Fetal deaths, gestation >20 weeks	No data available after 1992			
Deaths <1 year	1214	0.761	0.840	0.02
Deaths <1 year, congenital anomalies	367	0.799	0.876	0.23
[a]Cancer cases, ages 0–4	153	0.746	1.066[b]	0.0003
[a]Deaths 1–4, excluding accidents, homicide, suicide	146	0.689	0.836	0.05
[a]Deaths 1–4, congenital anomalies	27	0.460	0.796	0.06

[a]Rate expressed as cases/deaths per 100,000 population.
[b]Change in 11 U.S. states and cities from 1988–1989 to 1990–1993.

over 8 days including barium-140, cesium-137, iodine-131, strontium-89, and strontium-90. The last emissions were reported in 1989, at a level of 0.0003 Ci (Brookhaven National Laboratory, 1970–1992). The post-closure period is also extended to 1990–1996 to assess longer-term trends. No data are yet available after 1996.

Death rates for infants under 1 year are expressed as deaths per 1000 births, while death and cancer incidence rate ages 1–4 are per 100,000 persons. Odds ratios are used to express rate changes in the periods before and after reactor startup/closing. A ratio of 0.900 represents a 10% decline in rate.

Results

Available fetal/infant health measures show a lack of progress from 1972–1973 to 1974–1975 in the four county region. Locally, the fetal death rate (gestation over 20 weeks) fell 1.8% (O.R.=0.982) versus a 7.5% drop in the U.S. (O.R.=0.925). The infant death rate rose 1.9% (O.R.=1.019), while the national rate declined by 9.4% (O.R.=0.906). The number of deaths from congenital anomalies increased 18.6% (O.R.=1.186) while falling 6.9% nationally (O.R.=0.931); no age-specific data by cause at the county level exist, but the majority of congenital anomaly deaths occur in infancy.

By the late 1980s, more fetal/infant health data had become available. The California Cancer Registry initiated a comprehensive database of all cancers diagnosed in the state beginning in 1988. Age-specific congenital anomaly death records became available from the National Center for Health Statistics beginning in 1979. Table 1 shows trends in these radiation-sensitive disorders plus all-cause death rates from 1988–1989 to 1990–1991, before and after the closing of Rancho Seco.

Immediately after the reactor closed, local rates of deaths from all causes, deaths from congenital anomalies, and cancer cases declined faster than the U.S. average. The fall in mortality was especially sharp for congenital anomaly deaths ages 0–1 and 1–4 (O.R. 0.791 and 0.707). Cancer cases age 0–4 also experienced a rapid decline (O.R. 0.628) at a time when the national rate was rising in the 11 U.S. states and cities with available data (Mangano, 1999). When the post-closing period was extended to 1990–1996, local decreases continued to surpass national trends (Table 2). Declines for all but one measure, are statistically significant.

Discussion

Fetal and infant health near Rancho Seco lagged following reactor startup, and improved significantly for at least 7 years after closing. In the Rancho Seco area, fetuses were exposed to radioactive emissions consumed in the maternal diet from 1974 to 1989. Radioisotopes with a short physical half-life disappear soon after emissions cease, while levels of longer-lived radioisotopes diminish gradually.

Because rates declined for children aged 1–4 in the first 2 years after closure, it appears that reducing exposures after birth to those exposed *in utero* may arrest the development of cancer or delay the onset of death almost immediately.

Like other U.S. nuclear power reactors, Rancho Seco emitted low levels of radiation, meaning only small doses were received by the local population. Over its 15-year operating life, 0.1397 Ci of airborne radioactivity with half-lives over 8 days were reported. This figure is about 1/100th of the 14.2 Ci escaping from Three Mile Island during its partial meltdown in late March 1979 (Brookhaven National Laboratory, 1970–1992).

Harmful effects of low-dose radiation exposure to the very young were first demonstrated in the 1950s, when *in utero* pelvic X-rays were associated with an elevated risk of the child developing cancer before age 10 (Stewart et al., 1958). Subsequently, childhood cancer has been positively correlated with other low-dose exposures, including background gamma radiation (Knox et al., 1968; Hatch and Susser, 1990) and emissions from various European reactors (Heasman et al., 1986; Roman et al., 1989;

Knox E., Stewart A., Gilman E., and Kneale G. Background radiation and childhood cancers. *J. Radiol. Prot.* 1988; 8: 9–18.

Mangano J. Chernobyl and hypothyroidism. *Lancet* 1996; 347: 1482–1483.

Mangano J. Childhood leukaemia in U.S. may have risen due to fallout from Chernobyl. *Br Med. J.* 1997; 314: 1269.

Mangano J., 1998. Low-level Radiation and Increase Disease: An Anemic Bio Legacy. Lewis Publishers, Boca Raton, FL, pp. 96–97.

Mangano J. A rise in the incidence of childhood cancer in the United States. *Int. J. Health Services* 1999; 29: 393–408.

Mangano J., Sherwood S., Gould, J., et al. Strontium-90 in newborns and childhood disease. *Arch. Environ. Health* 2000, in press.

Michaelis J., Keller H., Haaf G., and Kaatsch P. Incidence of childhood malignancies in the vicinity of West German nuclear power plants. *Cancer Causes and Control* 1992; 3: 255–264.

National Air and Radiation Environmental Laboratory. Pollution Data Report, Vols. 69–64. U.S. Environmental Protection Agency, Montgomery, AL, 1987–1988.

National Cancer Institute. Forty-five Years of Cancer Incidence in Connecticut, 1935–1979. NIH Publication 86-2852. U.S. Department of Health and Human Services, Bethesda, MD, 1986.

Nussbaum R., and Kalstein W. Inconsistencies and open questions regarding low-dose health effects of ionizing radiation. *Environ. Health Perspect.* 1994; 102: 658–667.

Reiss L. Strontium-90 absorption by deciduous teeth. *Science* 1961; 134: 1669–1672.

Ramon G., Bural V., Carpenter L., et al. Childhood leukaemia in the West Berkshire and Swindon and North Hampshire Authorities in relation to nuclear establishments in the vicinity. *Br Med. J.* 1989; 294: 597–602.

Schmitz-Feuerhake I., Dornheim B., Heinzow A., et al. Leukaemia in the proximity of a German boiling-water nuclear reactor: evidence of population exposure by chromosome studies and environmental radioactivity. *Environ. Health Perspect.* 1997; 105: 1499–1504.

Sherman J. Chemical Exposure and Disease. Princeton Scientific Publishing, Princeton, NJ, 1994.

Stewartson E. Environmental Radiation and Human Health. Proceedings of the Sixth Berkeley Symposium on Mathematical Statistics and Probability, Berkeley and Los Angeles, 1972: 145–216.

Stewart A., Webb J., and Hewitt D. A survey of childhood malignancies. *Br Med. J.* 1958; 1: 1495–1508.

U.S. Nuclear Regulatory Commission, Washington, DC. 1999.

U.S. Public Health Service. Discharge and Inhalation of Isotopes for the Row Mills Network, January 1963–December 1966. *Radiol. Health Data Rep.* 1968; 9: 484–488.

Vini J., and Richardson S. Childhood leukaemia around the La Hague nuclear waste reprocessing plant. *Br Med. J.* 1990; 300: 380–381.

Whyte R. Five day neonatal mortality since 1935: re-examination of the Cross hypothesis. *Br Med. J.* 1992; 304: 343–346.

THE EFFECT OF STRONTIUM-90 IN BABY TEETH ON HUMAN HEALTH

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THE EFFECT OF STRONTIUM-90 IN BABY TEETH ON HUMAN HEALTH

The November 1990 volume of the Annals of the New York Academy of Sciences was dedicated to the problem of why cancer incidence and mortality other than that linked to smoking and hazardous occupational exposures has been rising in western industrial countries. In this volume, Belton A. Burrows and Thomas C. Chalmers of the Boston VA Medical Center suggested that this trend may in part be due to past nuclear bomb tests and releases from nuclear power plants.

Burrows and Chalmers based their conclusion on a study of the fission product Cesium-137 in firewood ashes gathered from various parts of the world with the help of the International Physicians for the Prevention of Nuclear War (IPPNW). Their study showed a much higher concentration in the industrial countries of the northern hemisphere than those in Australia and New Zealand, with the areas of high mountains such as the Northwest of the U.S., Austria and Germany showing the greatest concentrations relative to the naturally occurring Potassium-40. However, they pointed out that it remained to be determined whether these large worldwide differences are the result of atomic bomb testing and fallout from prevailing winds, or of more local contamination by nuclear power plants.

For this reason, members of the New York based Radiation and Public Health Project (RHPH) decided to undertake measurements of the radioactivity in deciduous teeth of children due to another fission product, strontium-90, which concentrates along with calcium in the teeth of developing infants during fetal development and the first year of life. Such a study was first suggested by Kalckar in 1958 and implemented by the St. Louis Committee on Nuclear Information in December of that year. Because of its 28 year physical half-life, Sr-90 is a record of actual human exposure to fission products present in the bone of the mother and the infant that provides clinical proof of exposure at the time of birth. When these teeth are shed between ages 6 and 12, the measurement can be adjusted for radioactive decay since the year of birth. By recording where the child was carried and where the mother lived during the first year of the child's life by Postal Zip Code, the question of the source of the activity can be addressed, especially after the end of all atmospheric bomb testing with the last test by China in 1980. Unfortunately, NIH funding for the St. Louis study ended by 1970, and measurements of Sr-90 in adult bone and teeth was stopped by the Department of Energy's Environmental Measurement Laboratory in New York City in 1982 shortly after the Three Mile Island accident in 1979, when there was a rise in Sr-90 in the eastern urban diet, followed by a sharp decline in the next two years after both TMI reactors had been shut down.

The RHPH study began in Suffolk County, Long Island, New York, where there has been one of the largest increases in both incidence and mortality rates for breast cancer among women in the nation during the last 50 years as described in a 1993 article by Sternglass and Gould in the International Journal of Health Services (IJHS).The decision to measure Sr-90 in baby teeth was made after a study by the Otto Hug Radiation Institute published by the German branch of IPPNW showed a ten-fold rise of Sr-90 per gram calcium in Germany following the arrival of fallout from the Chernobyl accident that took place in the Ukraine on April 26, 1986. Since the fallout cloud, equivalent in radioactivity to a few hundred Hiroshima-sized bombs, circulated the globe and reached the U.S. two weeks later, the RPHP researchers expected to find evidence for a rise in Sr-90 during the next few years, just as was seen both in milk and deciduous teeth during the period of large-scale nuclear testing by the U.S.-U.S.S.R. and the U.K. in the 1950s and early 1960s, peaking in 1964-66.

This expectation was indeed fulfilled based on some 300 teeth analyzed for Suffolk County by October 1999, as shown in Figure 1, part of a study to be published in the July 2000 issue of IJHS. But what was not expected was the large magnitude of the rise, and the fact that it began in the early 1980s, long before the Chernobyl fallout had reached Long Island. Moreover, it can be seen that this rise in Sr-90 was followed by a similar rise and decline in childhood cancer incidence for the age-group 0-4 years. This rise and decline of Sr-90 and childhood cancer was similar to that seen in the U.S., Japan, Denmark and other countries around the world following the bomb tests of the late 1950s and early 1960s.

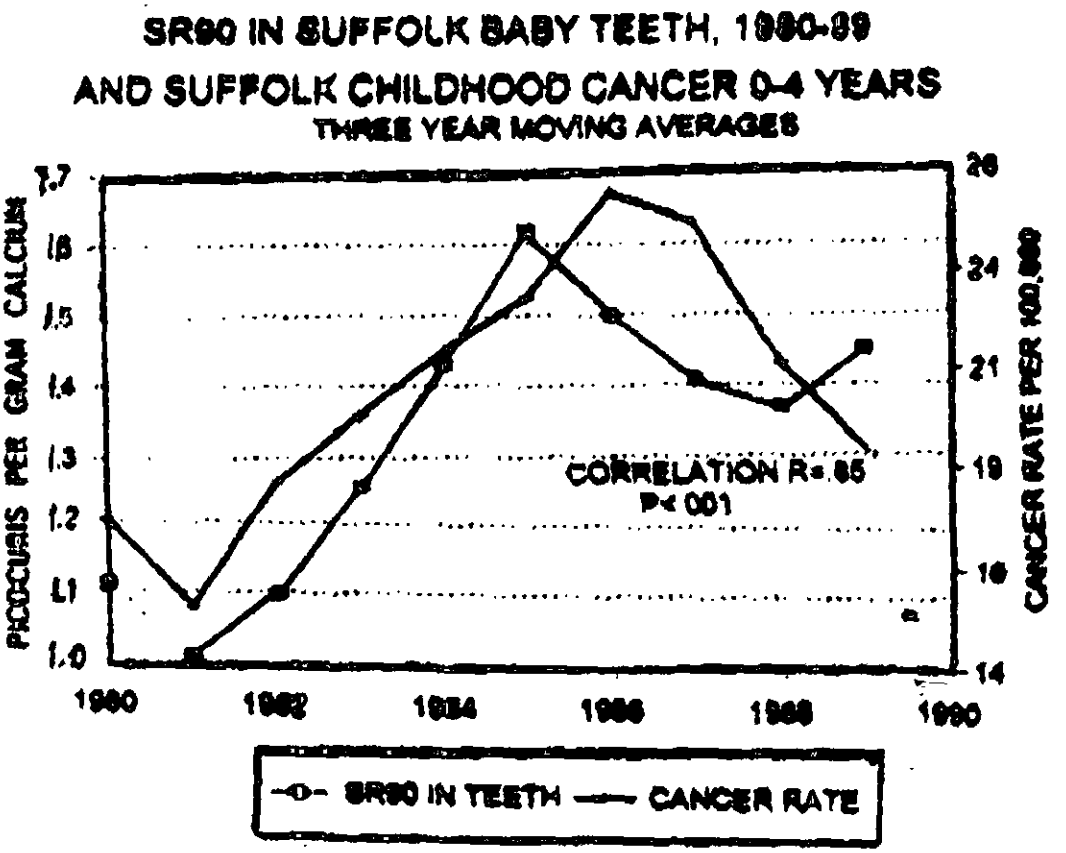
Because information on the residence of the mother during pregnancy and in the first year of life of the child is available, it was possible to show that the greatest concentrations of Sr-90 in deciduous teeth in the 1980s existed in the western end of Suffolk County, some 50% higher than for the eastern end. The western part of Suffolk is closest to the Brookhaven National Laboratory (BNL), where nuclear reactors have released both airborne and waterborne radioactive fission products since the early 1950s, as well as to the Indian Point nuclear plant 35 miles to the northwest on the Hudson near Peekskill, and the Oyster Creek nuclear plant some 60 miles to the southeast on the New Jersey coast, a plant that had the second largest reported releases of airborne fission products in the nation by 1987. Within an area 15 miles to the west of BNL a study by the New York State Department of Health for the years 1978-87 found the largest number of communities with a breast cancer incidence above the average for Suffolk County. In the same general area, there also exists a cluster of 16 rhabdomyosarcoma cases in children, a rate that is close to twenty times the expected rate.

These findings, together with even higher values of Sr-90 in deciduous teeth in Miami, Florida near the Turkey Point nuclear plant, support the hypothesis that the recent 36% rise in childhood cancer incidence across the U.S.and 16% in Great Britain between 1980 and 1993 described by Mangano in a 1999 article in IJHS is most likely due to releases from nuclear power plants and leakage from underground testing that continued until 1993. It therefore appears that neither chemicals, pesticides, herbicides and ordinary air pollution acting alone without the synergistic action of fission products on the immune and hormonal systems can explain the rise in cancer incidence or mortality.This conclusion is further supported by a sharp decline in all causes of child mortality in four counties downwind from the Rancho Seco nuclear plant within a few years after it ceased operation in 1989 as reported by Mangano in the March 2000 issue of the journal Environmental Epidemiology and Toxicology. Moreover, infant mortality 0-1 year was found to have declined in the downwind area of Rancho Seco and four other nuclear plants within two years of their closing by 15 to 17%, whereas it declined by only 6.4% for the U.S. as a whole while all other environmental and health-care factors remained essentially unchanged in this short period.

With many reactors aging and requiring either extensions of their operating licenses or some form of decommissioning, the evidence that adverse effects of presently permitted releases into the environment are much greater than had been believed based on the study of Hiroshima and Nagasaki survivors would indicate that studies of recent changes in local health statistics should be required in all public hearings by the Nuclear Regulatory Commission.

The evidence accumulated in numerous studies over the past thirty years also strongly indicates that plutonium and fission products which would be released by a resumption of nuclear testing or the use of nuclear weapons and nuclear-tipped anti-ballistic misailes would have a far greater impact on human health worldwide than has been assumed so far. This is particularly the case for the newborn and the elderly whose immune systems are weaker than in healthy adults, increasing the risk of both chronic and infectious diseases produced by bone-seeking radioactive elements by factors of a hundred to a thousand times greater than external exposures to X-rays or gamma rays.

According to the Precautionary Principle, which says that when substantial scientific evidence of any kind gives us good reason to believe that a technology or substance may be harmful to the environment or human health, we should act to prevent harm. Therefore, we should phase out the operation of nuclear reactors as rapidly as possible, together with the production of all fissionable material, and eliminate all nuclear weapons together with all other biological and chemical weapons of mass destruction.


SR90 IN SUFFOLK BABY TEETH, 1980-89
AND SUFFOLK CHILDHOOD CANCER 0-4 YEARS
THREE YEAR MOVING AVERAGES
PICOCURIES PER GRAM CALCIUM
CANCER RATE PER 100,000
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
26
24
21
19
16
14
1980
1982
1984
1986
1988
1990
CORRELATION R=.65
P<.001
SR90 IN TEETH
CANCER RATE