

Re: FOIA-90-173

APPENDIX D
DOCUMENTS ALREADY IN THE PDR

HUMBER	DATE	DESCRIPTION
1.	05/24/85	Memorandum from Kerr to Denton, Subject: Financial Review of General Public Utilities Corporation - Operation of Three Mile Island, Unit No. 1 (9 pages) PDR Accession No. 8506210075

APPENDIX E
DOCUMENTS BEING PLACED IN THE PDR

NUMBER	DATE	DESCRIPTION
1.	undated	TMI-1 Chronology (4 pages)
2.	undated	Article: Three Mile Island Nuclear Accident and its Effect on the Surrounding Population (16 pages)
3.	undated	Three Mile Island Unit 1 is World's Most Efficient Nuclear Energy Plant (1 page)
4.	undated	News Articles (2) (4 pages)
5.	02/1987	Backgrounder - Three Mile Island Unit 2 by GPU Nuclear Communications Division (5 pages)
6.	06/1987	Backgrounder - Three Mile Island Unit 1 by GPU Nuclear Communications Division (5 pages)
7.	03/20/89	News Article (7 pages)
8.	03/20/89	News Article (4 pages)
9.	03/21/89	News Article (2 pages)
10.	03/28/89	News Article (5 pages)

201-79-

TMI-1 CHRONOLOGY

- SEPT. 74 - COMMERCIAL
- 1974 - 79 - FOUR OPERATING CYCLES
 - . CAPACITY FACTOR 77.2 %
- MAR. 79 - OCT. 85 - REGULATORY SHUTDOWN
 - . ASLB HEARINGS
 - . TOTAL REORGANIZATION (GPU NUCLEAR)
 - . INCREASED STAFFING
 - . IMPLEMENTED LESSONS TMI-2 ACCIDENT (NUREG 0737)
 - . NEW EMPHASIS TRAINING
 - . REVISED PROCEDURES (ATOG)
 - . MAJOR IMPROVEMENT EMERGENCY PREP.
 - . INCREASED EMPHASIS MAINTENANCE (PM)
 - . ENLARGED COMMUNICATION STAFFING & EFFORTS
 - . STEAM GENERATOR REPAIRS
 - . OPERATOR CHEATING
- MAY 85 - COMMISSIONERS APPROVE RESTART (4 - 1)
- OCT. 2, 85 - SUPREME COURT APPROVES RESTART (8 - 1)
- OCT. 3, 85 - REACTOR CRITICAL

E/1

OCT. - DEC. 85

- 90 DAY EXTENSIVE TEST PROGRAM
 - . AROUND-THE-CLOCK NRC MONITORING
 - . REGION I ADMINISTRATOR'S PERMISSION AT VARIOUS STEPS
 - . 30 DAYS AT 45 % POWER
TRAINING & EQUIPMENT CHECKOUT
 - . 30 DAYS AT 70 % POWER
TRAINING & EQUIPMENT CHECKOUT
 - . 2 PLANNED TRIPS
 - . NATURAL CIRCULATION TESTING
 - . INITIALLY LIMITED TO 85 % (SECONDARY FOULING)
 - . SUCCESSFULLY COMPLETED ON SCHEDULE

JAN. - OCT. 86

- CYCLE 5 OPERATION
 - . CAPACITY FACTOR 1986 71 %
(INCLUDES 5 WEEK EDDY CURRENT OUTAGE
AND 2 MONTHS REFUELING OUTAGE)
 - . FORCED OUTAGE RATE 4.5 %
 - . UNPLANNED TRIPS 4
(NONE LAST 5 MONTHS)
 - . 4 RESIDENT INSPECTORS
 - . 2 PAT INSPECTIONS
 - . 3 SALP EVALUATIONS
 - . INPO EVALUATION
 - . OCT. 31 SALP - 6 ONES, 4 TWOS

OCT. 85 - MAR. 87

- 5 MONTH OUTAGE
 - . REFUELING - 18 MONTH CYCLE
 - . RX BLDG. LEAK RATE TEST
 - . STEAM GENERATOR TESTING
 - . APPENDIX R FIRE PROT. MOD.
 - . HSPS MOD. (SAFETY GRADE EMERG. FEED)
 - . REPACK 500 VALVES
 - . SIGNIFICANT MAINTENANCE & MODIFICATIONS
 - . COMPLETED ON SCHEDULE
 - . NO SIGNIFICANT PROBLEMS
 - . SMOOTH STARTUP
 - . LOWER THAN ANTICIPATED MAN-REM EXP.

MAR. - OCT. 87

- CYCLE 6 OPERATION TO DATE
 - . CAPACITY FACTOR CYCLE 92.2 %
 - . CAPACITY FACTOR YEAR 66.8 %
 - . FORCED OUTAGE RATE 7.3 %
 - . 3 UNPLANNED REACTOR TRIPS
 - . 9 LERS
 - . VIOLATIONS
 - 0 CATS 1, 2, 3
 - 5 CAT 4
 - 0 CAT 5

OCT. 87 -

- FUTURE PLANNING
 - . CONTINUE 100 % OPERATION

(CONTINUED)
OCT. 87 -

- . SALP REPORT (PERIOD ENDS OCT. 31)
- . INPO JAN. 88
- . REFUELING OUTAGE JULY 1, 88 (64 DAYS)
 - NUREG 197
 - STEAM GENERATOR INSP.
 - TURBINE GENERATOR OVERHAUL
 - MAINTENANCE WORK
 - STEAM GENERATOR WATER SLAP
- . KNOWN POTENTIAL MATERIAL PROBLEMS
 - STEAM GENERATOR SECONDARY FOULING
 - LETDOWN COOLERS
 - 1 REACTOR COOLANT PUMP SEAL

Chapter Twenty-Five

THREE MILE ISLAND NUCLEAR ACCIDENT AND ITS EFFECT ON THE SURROUNDING POPULATION

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On the morning of March 28, 1979, a series of "unlikely events" at the Three Mile Island (TMI) nuclear plant led to a loss-of-coolant accident which became the most serious accident yet to occur in commercial nuclear power generation. For several hours after the reactor first tripped, the reactor core was allowed to overheat. Up to 10 million curies of radioactivity have been estimated to have escaped into the atmosphere during a tense week of worldwide concern over the fate of the nuclear plant and its surrounding population.²⁻³

The maximum possible dose to a hypothetical person standing unprotected anywhere along the border of the plant site for the duration of the accident was estimated as no more than 100 millirems⁴, the approximate equivalent of one year natural background radiation in the area. The average likely dose to persons living within 5 miles of the plant was estimated at 9 millirems⁴. At these low doses of radiation, no major health effects on the exposed population can be expected. The long-term health effects from the TMI radiation exposure to the more than 2,164,000 persons living within 50 miles of the plant at that time was projected as one excess cancer death over the lifetimes of these residents. The total number of excess health effects from TMI radiation, including all cases of cancer (fatal and nonfatal) and genetic ill health to all future generations, was estimated as two⁴.

Despite these radiation estimates and learned opinions of several technical groups, including those from government, industry, national laboratories and universities, substantial amount of anxiety was created and resultant apprehension remained in the area. The public questioned the validity of the estimated

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radiation dose to local residents and also the health risk from that dose. The apprehension was due, in part, to the fact that radiation is invisible and its effects potentially pernicious. It was felt that even nonlethal doses are capable of causing immediate detrimental effects, especially on the unborn and the very young, as well as latent cancers and other chronic conditions. Many local residents actually believed that they received very high doses of radiation and some of them in fact developed a "radiation syndrome," a form of iatrogenic disease.

Health authorities in both the Commonwealth of Pennsylvania and the Federal government agreed that, because of the confusion and uncertainty surrounding the TMI accident from the beginning and because the nuclear accident was the first of its kind, the exposed population should be followed and studied for many years in order to monitor any possible changes in health status.⁶⁻⁷ Also, because of the high levels of psychological distress experienced by the local residents during the crisis period and the likelihood of distress continuing over the many years needed to clean up the damaged reactor, psychological health and its sequelae were perceived as important outcomes to monitor independently of the issue of radiation exposure.

Psychological Stress and Health

Stress is an organismic state that can contribute, under the proper circumstances, to changes in body function, which, if intense or chronic, may lead to disease. In other words, stress can trigger a multiplicity of organismic reactions, some of which may contribute to illness, while others may result in normal adaptive responses.

Psychophysiological studies⁸ indicate that life situations which threaten the security of the individual would evoke attempts at adaptive behavior and also evoke significant alterations in the function of most bodily tissues, organs and systems. These physiological changes, in turn, will lead to a lowering of the body's resistance to disease. It is assumed that certain events require more intense and prolonged coping efforts than do others. The greater the strains on the coping mechanisms, the more likely that an inadequate or inappropriate response will be utilized, thus eliciting idiosyncratic or pathological physiological reactions.

It is also important to recognize that an understanding of a life event's impact must take into account the physical susceptibility of the individual, the meaning of an event, the person's ability to cope with a variety of stresses and the individual's social support network. With the exception of extreme and sudden life-threatening situations, no raw stimulus is a universal stressor. The true consequences of stress arise from the manner in which the organism responds to the presumed danger. It is the way in which the organism handles perceived stressors—the defenses it mobilizes and the alarm reactions ignited—that constitutes the true nature of the stress.⁹

The psychosomatic approach,¹⁰ on the other hand, identifies certain personality type and life history that would make them more vulnerable to certain diseases. Whenever a stimulus is perceived to threaten a fundamental human need, the stress response also will be initiated. Imagination can produce its own stressors and prompt a neuroendocrine-autonomic response that itself poses a real threat to the organism.

Stress can cause disease by lowering or exaggerating the immune response,¹¹ creating endocrine problems through either hypoactivity or hyperactivity;¹² altering the balance of autonomic control, resulting in changes in the cardiovascular, respiratory, secretory, and visceral system;¹³ altering sleep patterns, with attendant impact on protein metabolism, hormone secretion and other vegetative functions;¹⁴ and by affecting the functions of the brain itself, which can have profound impact upon health through a variety of mechanisms, including changes in eating and health habits, such as exercise, drug, alcohol or cigarette consumption.¹⁵ Numerous studies have shown that the pituitary-adrenal axis may be activated or inhibited by fear, anger, rage, pain or adverse environmental conditions.

The stress associated with the TMI nuclear accident cannot be considered as a single unique experience because the prolonged recovery period following the accident gives rise to numerous additional stressors. However, it is unlikely that any given psychological stressor will be etiologically specific for any given disease. The important point is that a range of health outcomes, both mental and physical, need to be assessed in studies of stress or disaster since certain individuals may be more susceptible to health sequelae than others.

There are a number of studies in humans which have found an association between prenatal anxiety/stress and gestational, perinatal, and developmental pathology including complications of pregnancy¹⁶⁻¹⁷ and infant growth and development.¹⁸ These findings suggest a number of practical and scientific questions to be addressed within the context of the TMI Health Effects Research Program. The *first* is whether or not the local population, including pregnant women, as a whole experienced any detectable stress effects. The *second* question concerns factors which render individual pregnant women, particularly vulnerable to stress effects. As reviewed earlier, stress may be associated with morbidity only in the absence of supportive interpersonal relations.

While the specific mechanism of stress induced morbidity is not yet fully understood, there may be several different explanations with respect to pregnancy outcome; e.g., stress-anxiety induced changes (1) in maternal behavior, such as increased smoking, drinking or medication while pregnant, (b) in obstetric practice, such as increased prescription of analgesics and psychotropic drugs or use of special diagnostic procedures, (c) in maternal-infant bonding and child-rearing practices, and (d) in the hypothalamic-adrenocortical mechanism.¹⁹

Subsequent to the TMI nuclear accident, the Pennsylvania Department of Health developed a comprehensive plan for a variety of epidemiologic and

sociological studies designed to assess the impact, both immediate and long-term, of the accident upon the local population. Some of the short-term studies are still in progress while long-term followup studies are being planned. Investigators of other organizations and institutions have also conducted short-term studies. In this paper, findings from certain major studies are briefly summarized in three categories: (a) psycho-behavioral studies, (b) physical health studies, and (c) long-term epidemiologic surveillance.

Psycho-Behavioral Studies

Although no immediate radiation health effects were recognized during the nuclear accident, and probably no delayed or late radiation health effects are to be expected, what emerged from this experience was that the major health effect of the accident appears to have been on the mental health of the people living in the region of TMI and of the workers at the nuclear power plant.

There was immediate mental distress produced by the accident among certain groups of the general population living within 20 miles of Three Mile Island.²⁰ The highest levels of distress were found among adults living within 5 miles of TMI, or those with preschool children; and among teenagers living within 5 miles of TMI, those with preschool siblings, or whose families left the area. Workers at the TMI nuclear plant experienced more distress than workers at the Peach Bottom nuclear plant in Pennsylvania which was studied for comparison purposes. The level of distress was higher among the nonsupervisory employees and stress continued in the months following the accident.

Health-related behavioral studies conducted by the Pennsylvania Department of Health in collaboration with the Hershey Medical Center²¹ indicated that persons who are younger, more educated, married and female were especially distressed during the crisis. The greater responsiveness of younger, married persons was probably due to their concerns about the effects of radiation on their present and future children and, since radiation effects often have a long latency, concerns about their own future health. However, these demographic variables did not relate to changes in the level of distress over time. People who actively coped had high distress during the crisis and tended to maintain that distress over time. Persons with poor mental or physical health tended to have high distress scores and to maintain their distress over time.

The number of persons with severe distress dropped shortly after the crisis, but between 10% and 20% of local residents residing close to TMI remained distressed nine months after the crisis. Persons residing close to TMI used more alcohol, tobacco, sleeping pills and tranquilizers during the two week period immediately following the crisis than before, but the use of these substances which were mediated through coping with the crisis situation did not persist beyond that time.

The October 1980 survey conducted by the Pennsylvania Department of Health in collaboration with the Hershey Medical Center indicated that the

level of anxiety and stress declined more among residents within 5 miles of TMI than among those living more than 40 miles away. Thus, 18 months after the accident, the previously significant differences in stress-related symptoms, both behavioral and somatic which existed between the close and the far groups were no longer present. However, differences still persisted through October, 1980 as far as perceived threat of TMI and attribution of the recognized symptoms to TMI were concerned.

An in-depth epidemiologic study of psychological impact in a more *psychiatric context* was conducted by Bromet at the Western Psychiatric Institute.²² Her study covered three selected "high risk" groups in the TMI area, namely, (a) TMI employees, (b) mothers with preschool children, and (c) mental health clinic patients. People residing around the undamaged nuclear plant at Shippingport in western Pennsylvania were used as controls for comparison. One year after the accident, the condition of psychiatric outpatients near TMI did not differ significantly from that of counterpart in the control group. She also found that TMI workers experienced only slightly higher rates of clinical depression and anxiety as compared with Shippingport workers. But, mothers of preschool children living within 5 miles of TMI suffered far more anxiety and depression than did mothers living near Shippingport. Bromet also found that mothers who evacuated in the height of the accident had more distress one year later than mothers who did not evacuate. Mothers living within 5 miles of TMI reported more distress symptoms than mothers living farther away from the plant. It was concluded that manifestations of clinical levels of mental health effects occurred primarily during the 2-month period after the accident, but sub-clinical levels of symptomatology were elevated as late as one year following the accident. There was evidence that social support bore an important relationship to these symptoms. Bromet's findings support a view that the burden of the stress was determined more by the actual experience, such as actual living in the vicinity of TMI, rather than by the perception of the stressful situation.

Related to the psychological stress caused by the TMI accident was *crisis evacuation* during the accident by local residents. Although the level of radiation exposure was minimal, a substantial number of residents in the vicinity of the TMI plant left the area primarily because of their perception of imminent danger associated with radiation. The Governor of Pennsylvania advised pregnant women and small children to evacuate. Within hours of the Governor's advisory and with mounting media coverage of the accident, which was often confusing, mass evacuation occurred. Some 64% of the population in the 5-mile area left their homes some time during the nuclear crisis. It is important to document individual evacuation as it can be related to estimating radiation exposure and the future health effects studies.

A total cross-sectional population census conducted by the State Health Department supported by the Federal Centers for Disease Control and Bureau

of the Census shortly after the accident within five miles of the plant revealed that evacuation behavior was related to several demographic variables. Specifically, more younger people evacuated and for longer periods than older people. More females evacuated than males. The more educated and white collar workers evacuated somewhat more than the less educated and blue collar workers. The strongest predictor of evacuation was the presence of one or more preschool children in the household. Distance of residence from the damaged plant was inversely correlated with the decision to evacuate. There were no major differences in the pattern of evacuation between medical personnel and other residents in the same community, i.e., nurses and young women behaved similarly while physicians and middle-age men were alike in their evacuation behavior.

Radiation Exposure and Health Risks

Nuclear accidents, such as the 1979 episode at TMI, are potentially harmful to health if the amount of ionizing radiation absorbed by humans is substantially high. However, whether health is affected by exposure at the low levels characteristic of natural background radiation is a matter of conjecture. Observations at higher radiation intensities have implied, but are difficult to measure, that the risk of certain health effects may be increased even at the lowest dose levels. These effects may include any one or combination of the following: (a) damage to genes and chromosomes, or *mutagenic* effects, (b) damage to the growth and development of the embryo and fetus, or *teratogenic* effects, and (c) damage to cells that increases the risk of their forming cancer, or *carcinogenic* effects²³⁻²⁴.

However, since health effects of radiation at the levels of natural background cannot be distinguished individually from similar effects produced by other causes, the effects of low-level radiation are estimated only by extrapolation from observations at higher radiation doses and dose rates, based on tentative assumptions about the relevant dose-effect relationships. In the present state of our knowledge, such estimates must be regarded as highly uncertain at best²⁵⁻²⁶.

The accidental radiation received by people residing in the vicinity of Three Mile Island (TMI) came almost entirely from xenon-133 (half-life, 5.3 days), xenon-135 (half-life, 9.2 hours), and traces of radioactive iodine (principally iodine-131, half-life, 9.0 days), which escaped intermittently from the plant as gases²⁷⁻²⁸. These radioactive gases followed prevailing winds and increased the level of ionizing radiation along their path. However, the increase was short-lived because xenon dispersed rapidly and because radioactive iodine was present only in barely detectable amounts. No release of long-lived fission products, such as strontium-90, cesium-137, and plutonium-239, was detected.

Based on the available measurements, it is estimated that the maximum cumulative whole-body gamma radiation dose to anyone off site was less than 100 mrem, that the average cumulative dose to those within 10 miles of the plant

was approximately 8 mrem, and that the average cumulative dose to those within 50 miles of the plant was about 1.5 mrem. Because these estimates make no allowances for shielding, they are generally considered to represent overestimates^{27,28}. Additional exposure of the population came from the *beta radiation dose to the skin* and from the *inhalation dose to the lung*. It is estimated that the total dose to the skin could have been much larger than the whole-body gamma dose by a factor of 3 to 4 if the protective effects of shelter and clothing are neglected.²⁷ The inhalation dose is estimated to have constituted no more than 3% to 7% of the dose to the whole body.

The risk of cancer is generally assumed to be increased by low-level radiation, but it is clear from observations at intermediate-to-high dose levels that the risk may vary depending on the type of cancer in question, age at the time of irradiation, the quality of radiation, and other factors. According to a linear, nonthreshold extrapolation model, with no allowance for biological repair at low doses and low dose rates, cancer risks are regarded by many experts as being likely to overestimate the risks of low-level radiation. For this reason, some experts prefer a linear-quadratic model, which yields risk estimates that tend to be 25%-50% smaller^{29,30}. If these risk coefficients are applied to the population of about 2.2 million people residing within 50 miles of Three Mile Island, they predict a lifetime risk of less than one extra fatal cancer and less than one extra nonfatal cancer.

It is generally assumed that irradiation can cause genetic damage in human germ cells that is transmissible to future generations in the form of various inherited diseases. It has been estimated that the incidence of genetic abnormalities in humans would be doubled by a dose of 20 rem -200 rem^{25,26} and, that the number of descendants of the population within 50 miles of TMI who are likely to be affected by genetic disorders resulting from the TMI accident would be approximately one.

The risks of teratogenic effects of radiation on the human embryo and fetus are more difficult to estimate, owing to the paucity of relevant data. The evidence at hand implies, however, that the risks of such effects are smaller per unit dose than are the risks of carcinogenic and mutagenic effects^{25,26}. On this basis, it may be inferred that such effects are unlikely to result from the TMI accident in view of the small magnitude of the radiation dose.

Physical Health Studies

Although increased risks of cancer, birth defects, and genetic abnormalities are potential long-term consequences of low-level irradiation, few if any such effects of the TMI accident are likely to be observed, because the collective dose of radiation received by the population within a 50-mile radius of the plant was so small.

In order to evaluate the potential effect of radiation and/or acute stress upon reproductive process, an epidemiologic study was conducted to determine

whether the incidence of *spontaneous abortion* was greater than expected near the Three Mile Island nuclear plant during the months following the March 28, 1979 accident. All persons including those who were pregnant living within five miles of TMI were registered shortly after the accident, and information on pregnancy at the time of the accident was collected. After one year, all pregnancy cases were followed up and outcomes ascertained. Using the life table method, it was found that, given pregnancies after four completed weeks of gestation counting from the first day of the last menstrual period, the estimated incidence of spontaneous abortion (miscarriage before completion of 16 weeks of gestation) was 15.1 percent for women pregnant at the time of the TMI accident. Combining spontaneous abortions and stillbirths (delivery of a dead fetus after 16 weeks of gestation), the estimated incidence was 16.1 percent for pregnancies after four completed weeks of gestation. Both incidences are comparable to baseline studies of fetal loss, indicating that the effects of the TMI accident upon spontaneous abortion was negligible, if any.

The crisis at Three Mile Island presented a natural experiment in disaster response, although this disaster was substantively different from any before it. Not only was this the first to involve a nuclear plant, but no one was bodily hurt, no property outside the nuclear facility was physically damaged and, it is generally believed, no excess deaths or illness will be detected as a result of the accident. Nevertheless, a disaster situation was experienced psychologically and emotionally by the nearby population.

A study was conducted by the Pennsylvania Department of Health to determine the effect of the 1979 nuclear accident at Three Mile Island on *residential mobility* and subsequent population composition. The entire population living within five miles of TMI was registered shortly after the accident and traced one year later to identify movers. The results of this analysis showed that the rate at which people moved remained the same the year after the accident as before, and that approximately 15% of those who moved (changed address) gave TMI as the main reason for their decision to move. The study also found that those moving because of TMI had attributes highly associated with mobility in general. When those attributes were controlled in analysis, attitudes about TMI were virtually the same among movers and nonmovers. On the other hand, demographic characteristics of new people moving into the area were not different from those who had moved out. However, attitudes about TMI were significantly more positive among the newly moved-in people than among the moved-out people.

Probably the most important study developed shortly after the accident was to determine if the TMI nuclear accident has had any measurable impacts upon *pregnancy outcome* and *infant health* in the vicinity of the damaged nuclear reactor. The embryo, the fetus and the infant are highly sensitive to environmental insults, such as ionizing radiation and maternal psychological stress, depending upon the severity or intensity of the insults, the mode of exposure, and

the gestational-postnatal age at exposure.

A carefully designed retrospective cohort study of pregnancy outcome was initiated in August, 1979. This study covered all pregnant women residing within a 10-mile radius of the TMI plant, who gave births between March 28, 1979 and March 27, 1980. This study cohort consisting of some 4,000 deliveries was compared with a control cohort of another 4,000 deliveries which took place during the immediately following one year period for women who also resided in the same 10-mile area communities.

Measures of adverse pregnancy outcome investigated were: *fetal deaths* (stillbirths with 16-week or more gestation including abortions after 16-week gestation), *neonatal deaths* (deaths within 28 days postpartum), *hebdornadal deaths* (deaths within seven days postpartum), *perinatal deaths* (combined measure of fetal and neonatal deaths), *prematurity* (gestation less than 37 weeks), *immaturity* (birth weight 2,500 grams or less), *congenital anomalies* (one or more developmental defects observed at birth), and *low Apgar score* (less than seven at one minute of delivery).

Since there are numerous factors other than radiation and stress that are known or suspected to influence the course of pregnancy and fetal outcome, it is important that the influences of such factors be considered. Detailed data on these factors have been collected, including maternal characteristics (sociodemographic, behavioral, and medical-obstetric histories), health care provider characteristics, and prenatal care attributes. The influences of all these factors were taken into account when maternal stress and/or radiation exposure were related to any of the various pregnancy outcome measures under study.

Maternal stress during and immediately following the TMI accident has been measured by overt personal statements of "anxiety-fear" as experienced and reported by individual pregnant women, and by actual stress-coping patterns described, such as taking extra medications (tranquilizers, sleeping pills, anti-hypertensive preparations, etc.) because of anxiety and fear.

Maternal radiation exposure during the 10-day crisis following the nuclear accident has been estimated by the Department of Radiation Health, University of Pittsburgh. For this purpose, already documented, reliable thermoluminescent dosimetry (TLD) and other source data including time-dependent dose-rate distribution compiled by government and non-government agencies were used to estimate *maximum possible* and *most likely* doses, to each individual pregnant woman, of whole-body gamma, thyroid doses to the mother and the fetus as well as combined gamma and beta doses to the skin. For estimating *maximum possible* doses the evacuation factor was not considered, but for determining *most likely* doses this factor was taken into account, i.e., those who evacuated during the accident were assigned smaller doses depending upon when and how long evacuation took place on an individual basis.

When pregnancy outcome measures were compared between the exposed study cohort and the unexposed control cohort, no significant differences were

noted for any of the various outcome measures under study indicating that the impact of the TMI nuclear accident upon pregnancy outcome was negligible, if any. After adjusting for the influences of the many maternal and provider characteristics described earlier, the incidences of fetal and neonatal mortalities, congenital anomalies, prematurity, immaturity, and of low Apgar score within the study cohort were not significantly different from those within the control cohort.

A separate analysis of the comprehensive data by multivariate logistic analysis indicated that neither radiation exposure nor psychological stress as such was significantly correlated to the incidence of fetal-neonatal mortality, congenital anomalies, prematurity, immaturity or low Apgar score within the exposed study cohort.

It should be noted, however, that the excess medication taken by those pregnant women who were severely stressed during and/or shortly after the accident was significantly correlated to the incidence of low Apgar score which was measured at one minute postpartum, and to the incidence of immaturity, i.e., the risk of low birth weight. This was interpreted to mean that the one-minute Apgar scores among newborns were significantly influenced by maternal excess medication of tranquilizers, sedatives, and anti-hypertensives which was mediated through the accident-caused stress and anxiety. Our data also indicated that the low Apgar score at 5 minutes postpartum was not significantly correlated to the same maternal excess medication while pregnant. This may suggest that the low Apgar score is a negative, but only a very short-term prognostic indicator with probably minimal clinical significance. However, the stress-mediated low birth weight can be a potentially significant long term health effect which requires special attention.

Apart from the above observations on pregnancy outcome, there was one other potentially important observation to be made particularly with respect to the effect of radioactive iodine upon thyroid function among newborn infants. Since State Health Department initiated a statewide screening program for congenital hypothyroidism in mid-1978, the available data were analyzed in relation to the March 28, 1979 nuclear accident.

During the March 28, 1979—March 27, 1980 period, only one case of *congenital hypothyroidism* was identified within a ten-mile radius of TMI among approximately 4,000 newborn infants. This incidence rate is well within a normal range of expectation.

An apparent clustering of seven cases of congenital hypothyroidism reported in Lancaster County during 1979 presented serious interests among epidemiologists and was subjected to a special in-depth analysis and investigation because of physical proximity of the county and timing of the TMI nuclear accident. From this investigation the following diagnostic and epidemiologic features emerged: (a) One of the seven cases identified was reported prior to the TMI accident, thus cannot be related to the nuclear accident. (b) One with

severe multiple central nervous system anomalies was born three months after the accident; this case is unlikely to have been associated with the TMI accident because of the late gestation period of the fetus when exposed to the accident, and also of coexisting other developmental anomalies which are unlikely to be related to radiation. (c) One case was of dysgenesis, representing one of discordant Amish twins, thus, non-supportive of the etiology secondary to radiation exposure. (d) One case of dyshormonogenesis from an Amish family where the condition (lack of enzyme to synthesize thyroxine) was inherited from the parents. (e) Another case of dysgenesis in whom the thyroid glands were displaced from the normal position. (f) For the remaining two cases thyroid scan was not conducted, thus, exact diagnostic entity remains unknown.

Having completed detailed diagnostic analysis and epidemiologic assessment of all cases reported in Lancaster during 1979, it was concluded that reported cases of congenital hypothyroidism were not related to the TMI nuclear accident, i.e., these types of anomalies are not expected to have resulted from direct or indirect exposure of the fetus to radioiodine. This conclusion was also supported by an independent Hypothyroidism Investigative Committee organized by the State Health Department, which included expertise in the fields of epidemiology, pediatric endocrinology, obstetrics, medical genetics, biostatistics, and radiation physics.

Apart from the incidence analysis described above, there was also an important biological consideration with respect to radiation in relation to congenital hypothyroidism.

First, after March 28 through December 31, 1979, no single case of congenital hypothyroidism was reported in Dauphin, Cumberland, Perry, Northumberland, Juniata, Snyder, Mifflin, and Union Counties, the areas downwind (N, NW, NNW) from the Three Mile Island during the first 48 hours of the accident, when probably the largest amount of radioactive releases took place, thus the largest amount of contamination including I^{131} .

Second, the maximum combined (inhalation and ingestion) human thyroid dose of radioactive iodine in the vicinity of the TMI following the March 28, 1979 accident through April 1979 is estimated to be 7.5 mrad (Editorial: *Annals of Internal Medicine*, Vol. 91, No. 3, September 1979). At least 1,000 times greater thyroid doses (i.e., 7.5 rads) would be required to have significant acute damages to the thyroid glands; however, even at this dose level, many of the damaged cells may be repaired. Based on the experiences of the Marshallese exposed to fresh radioactive fallout and atomic bomb victims, it is considered likely that as much as 50 rads to 100 rads fetal thyroid doses would be necessary to cause irreversible tissue damages, such as congenital hypothyroidism and/or thyroid cancer. Acknowledging the fact that the fetal thyroid is much more sensitive to radioiodine than is the maternal thyroid (a conservative upper bound estimate is that the thyroid dose to a fetus may be as high as ten times the maternal thyroid dose), the maximum likely fetal thyroid dose of approximately 75

mrad and the maximum possible fetal thyroid dose of 190 mrad to 200 mrad in the vicinity of the damaged nuclear plant are still far too small to have caused congenital hypothyroidism.

In any epidemiological investigation of possible "cluster" of a disease or morbid condition, it is important to recognize the technical difficulty and methodological limitations associated with such investigations. It is the overall consistent pattern of observations that provides useful clues for conclusion, rather than a single isolated change or difference, which in most cases occurs without substantive epidemiologic significance. This is particularly true when relatively small populations are being studied. One may or may not find a "statistically significant" change, difference, or clustering in morbid rates in an area depending upon how such population is delineated geographically and/or temporally. It is equally important that investigators carefully examine the observed relationships and determine if such relationships are consistent with the known biological theory or orientation, which is based on the previous studies and experiences. Our conclusions regarding congenital hypothyroidism around the TMI nuclear plant have been based on both the overall pattern of epidemiologic observations and in reference to existing scientific knowledge.

LONG-TERM EPIDEMIOLOGIC SURVEILLANCE

TMI Population Registry

Within three months after the March 1979 nuclear accident, a cross-sectional population census of some 36,000 persons living within 5 miles of the plant was undertaken jointly by state and federal governments.¹¹ The information collected through the census provided baseline data for future epidemiologic studies of possible health effects of the TMI accident. The data base, known as the *TMI Population Registry*, is comprised of demographic characteristics on each resident and a brief medical history of cancer diagnoses, thyroid disorders, prior radiation therapy and exposure to ionizing radiation on the job. Smoking histories were also included for teenagers and adults. In addition, each person's daily travel in and out of the 5-mile area during the 10-days after the accident was recorded so that TMI-related radiation doses could be estimated from the already documented time-place dependent radioactivity distribution in the area. After two months of data collection, the TMI Population Registry was considered to be 95 percent complete in coverage. For each resident included in the Registry, two radiation dose estimates (maximum possible and most likely) were given with respect to wholebody gamma and thyroid tissue respectively. Living status and whereabouts of the registrants are updated annually for future contacts.

TMI Mother-Child Registry:

Within five months following the TMI accident, a carefully designed retrospective cohort study of pregnancy outcome was initiated.²² This study included two separate cohorts, the exposed study group and the unexposed control group, all residing within 10 miles from the damaged nuclear plant. In each group there were approximately 4,000 mother-child pairs which constitute the *TMI Mother-Child Registry*. For each registered pair, detailed information regarding maternal characteristics and perinatal characteristics of the index infant were recorded. For the exposed study pairs estimated radiation doses (wholebody gamma and thyroid tissue) and the proxy measure of maternal stress during and shortly after the accident were documented on an individual basis, which can and will be related later to the various measures of possible long-term health effects. The TMI Mother-Child Registry includes 94% of all eligible cases of pregnancy in the area and provides the necessary baseline data for long-term epidemiologic studies. Living status and whereabouts of all registrants are updated annually in preparation for such studies.

Objectives of Long-Term Studies

The aim of the TMI Health Effects Research Program is to provide factual information based on such studies which are epidemiologically sound and/or sociologically justified with respect to possible health effects of the TMI accident upon local residents. Based on the available TMI radiation exposure data and from the previously reported epidemiologic studies of low dose radiation, major adverse health effects from the TMI accident are not expected. Although this may provide assurance to many people at potential risk, the assurance is only as good as the radiation data itself, which has become a subject of debate. There is also a possibility that psychological stress from the accident and its aftermath, which has been well documented, will cause some adverse health effects among the TMI residents.

Although the effect of psychological stress is difficult to predict, these public health concerns should be addressed. We are taking a precautionary route by carefully documenting both the exposed population and its health experiences after the nuclear accident. The already established TMI Population Registry and the TMI Mother-Child Registry will provide reliable data bases for long-term followup studies of the health effects (physical, psychological and behavioral), if any, from the TMI nuclear accident for both the general population and for the special cohort of pregnant women and their in-utero exposed children. Causes of death and cancer diagnoses will be routinely ascertained by linkage to the State mortality and cancer incidence files. Data for other physical, psychological and behavioral health indices will be collected every five years, on the basis of a random sample through prospective followup surveys for both cohorts.

Regardless of the results of a variety of short-term and long-term studies

undertaken, the primary mission of the TMI Health Research Program is to fulfill the need to respond to the much publicized, potentially important public health concerns. Because of the uniqueness of the TMI nuclear accident, thus its historical significance, as well as the scientific need to document health effects of very low dose radiation in humans, the rare opportunity presented by the TMI nuclear accident should not be lost in the pursuit of these important epidemiologic studies.

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Three Mile Island Unit 1 is World's Most Efficient Nuclear Energy Plant



HENRY HUKILL, vice president and director of TMI-1, credits excellent operations, maintenance and safety for TMI's top efficiency ranking.

Three Mile Island Unit 1 in Middletown, Pennsylvania, led the world's nuclear electricity plants in efficient power generation in 1989, according to an independent newsletter that tracks plant performance worldwide.

A recent issue of McGraw Hill's *Nuclear Week* ranks the capacity factor of 359 nuclear electricity plants in 22 nations for 1989. TMI topped the list with a capacity factor of slightly higher than 100 percent.

Capacity factor is a key indicator of plant efficiency. It expresses a plant's electricity output as a percentage of what it could produce operating constantly. TMI Unit 1 was able to exceed 100 percent of its capacity factor because of extraordinary operating efficiency and minimum shutdowns.

The second-ranked plant was Ohi Unit 2 in Japan, with a capacity factor of 99.18 percent. The leading U.S. plant behind TMI-1 was Wolf Creek in Kansas, with a capacity factor of 96.82 percent. The average 1989 capacity factor for world plants was 64.8 percent.

TMI's capacity factor has averaged 85 percent for the past five years, well above industry averages.

"Capacity factor is just one indicator of how well a plant is operating," said Henry Hukill, vice president and director of TMI-1. "To have a safe run with an outstanding capacity factor, you also must have good maintenance, good operations, good chemistry support—every employee in every department has to be working as a team."

TMI Unit 1 produced 7.2 billion kilowatt-hours of electricity in 1989, enough to serve 500,000 homes for one year. This is a record for GPU Nuclear Corp., which operates the plant.

"The safe and exemplary operation of TMI-1 in 1989 reflects the ability and professionalism of the GPU Nuclear team associated with all aspects of the plant," said Hukill.

TMI Unit 1 is an 872-megawatt pressurized water reactor owned jointly by Metropolitan Edison Co., Jersey Central Power & Light Co., and Pennsylvania Electric Co., subsidiaries of General Public Utilities Corp. The GPU system provides electricity to approximately 1.8 million customers in Pennsylvania and New Jersey.

For more information, contact K. P. Law, Congressional Information Program Manager, at (202) 484-2670.



IT'S THE TOPS. TMI-1, consistently a leader in efficiency, had the world's best capacity factor in 1989.

4/4

for non-party candidates. Agence France-Presse reported.

In contrast to the Communist Party daily Pravda, which grumbled that many people who voted for independent voters, page A8

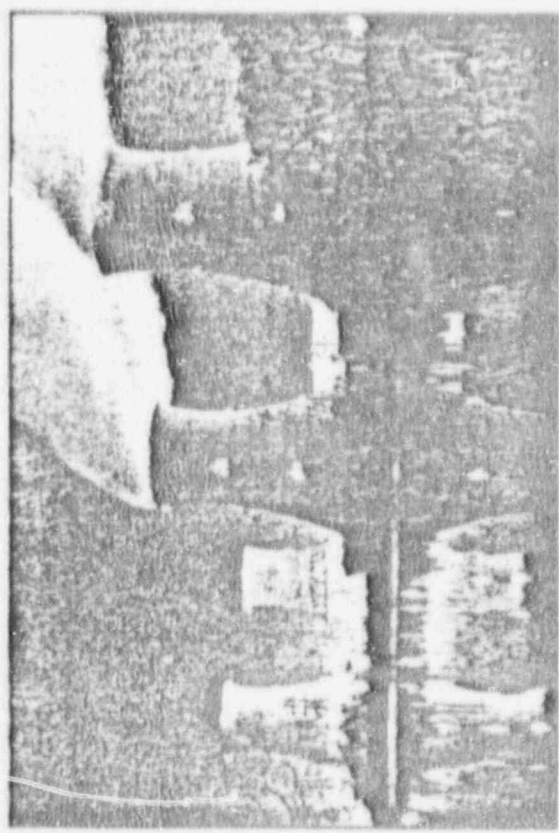
Boris Yeltsin says his victory proves a need to speed up Gorbachev's perestroika reform programs. Page A10.

buses carrying American school children were stopped on March 3 by armed Panamanian troops at different points around Panama City because the vehicles were improperly registered.

The incident followed a government action, page A6

see CANAL, page A6

Decade later, consequences of Three Mile Island linger



Early in the morning 10 years ago today a stuck valve caused a nuclear accident at the No. 2 plant (left towers) at Three Mile Island. It is still down.

By Deborah Papier
THE WASHINGTON TIMES

MIDDLETOWN, Pa. — The walls bristle with the warnings found in those places where men and machines attempt to coexist: "Danger. High Voltage." "Warning: Men Working Above."

The signs that point to the kind of work going on here are not nearly so easy to spot, or to understand. A closed door marked "Decon." The even more cryptic "Radioactive Dispersion/Recovery Syst."

This is Unit 2 of the Three Mile Island Nuclear Plant, 10 miles south of Harrisburg in heavily populated middle Pennsylvania and site of the worst — and most highly publicized — commercial nuclear accident in American history.

see PLANT, page A6

Panama Canal Commission Chairman William R. Gianelli yesterday raised the possibility that canal traffic would be changes in the military — including the dismissal of Gen. Noriega — if government opponents

LASER BULLET
A generation tactical weapon that will allow American soldiers to handily hit enemy tanks.

The laser rod, containing a dye, emits a visible laser beam, capable of disarming enemy tank's electronic surveillance/ targeting equipment.

Light energy enters plasma laser rod.

Shock wave slams into cylinder containing inert gases producing white light energy.

The entire shell is destroyed within 20 millionths of a second after the firing action begins.

Created by Ed Heaton, The Washington Times

ments on the condition they not be identified. These weapons use high explosives to direct pulsed laser beams against targets.

For several years, the Soviet government officials who are developing and, in some cases, testing the field, according to Defense Department officials who are discussing laser development.

see LASERS, page A8

Yugoslavia imposes curfew as 2 police die

By Andrej Gustjinc
REUTERS NEWS AGENCY

PRISTINA, Yugoslavia — The federal government ordered a curfew in Belgrade and other cities after two police officers were killed in a shooting.

A total ban on movement was to be imposed in certain places at certain times, it said without elaborating. Yugoslav radio broadcast the news.

INDEX

Tuesday, March 28, 1989
Volume 8, Number 62
6 Sections, 52 Pages

PLANT

From page A1

At 4 p.m. on March 29, 1979, a valve stuck, allowing reactor coolant to escape. By the time operators realized what had happened, a million gallons of contaminated water had spilled into the building's basement, and the exposed fuel core had partially melted.

Stirred by news reports, as many as 200,000 people living within 50 miles of the plant left the area. Pennsylvania Gov. Dick Thornburgh urged pregnant women and pre-school children within five miles of the island reactor in the Susquehanna River to flee.

Today, a decade later, General Public Utilities Corp., the New Jersey utility that owns the plant, is still dealing with the aftermath of the accident.

There is the physical debris — the radioactive waste — that must be recovered and disposed of, requiring the invention of a new decontamination (Decon) technology. There are the thousands of lawsuits that have been filed against the company for alleged health damage from radiation released during the accident. There are the accusations that the cleanup itself poses a further health threat to the community.

How much radiation was released can never be known precisely, since the monitoring devices were among the equipment that failed. But from the condition of the radioactivity within the reactor, scientists believe they can extrapolate how much escaped.

According to studies done by state and federal agencies, the amount of escaped radiation was minimal, far too low to cause any health problems.

"The conclusion of all the studies is that the health effects weren't significant," says Victor Stello, executive director for operations at the Nuclear Regulatory Commission. Nonetheless, GPU, while not admitting culpability, settled about 300 claims against it in 1985, at a cost of \$14.3 million. The largest amount — \$1 million — went to a woman who bore a child with Down's Syndrome nine months after the accident.

Since those awards were reported, 2,100 new claims have been filed for physical and psychological distress. GPU has no intention of settling with these plaintiffs, utility spokesman Carol Clawson says.

So far, cleaning up the stuck valve has cost \$1 billion. McJannet Mayor Robert Field said recently that in his town of 9,500 people "the things we feared never happened. The economy is better than ever. We have people moving in, not out."

TMI itself is a tourist site, drawing an estimated 500,000 people to its visitor center. It also employs more than 1,000 workers and supplies electric power from the one plant unit restarted in 1985.

The cleanup goes on 24 hours a day, seven days a week. At any time, there is a crew working on a platform suspended above the contaminated water, using long-necked tools to break up the debris at the bottom of the reactor.

At the moment, they are cutting through the last of five elliptical flow plates at the base of the fuel core. The pieces will be hauled up and packed in canisters, which are then put into casks and shipped by rail to a Department of Energy laboratory in Idaho.

Outside the reactor building are rows of canisters, waiting to be filled. Shrouded in green, they look like caskets in the afternoon mist, grim reminders of what might have been.

But inside Unit 2, the mood is joyful. Clad in radiation suits, the cleanup workers, who put in a four-hour stint on the platform every two to six weeks, receive their instructions by walkie-talkie. From the command booth, the controller watches them on TV screens, and talks to them slowly through the procedure.

Controller: "Everybody got gloves on? Okay, we're going to yank it up. I'd like to review what we're going to do to get in the yank position. First, turn it clockwise. . . . Clockwise, you go \$50^{\circ}\$5."

Worker below: "What makes you think I can tell time?"

He's just kidding. But one of the lessons of Three Mile Island is that machines are only as good as the people who operate them.

At TMI, two hours passed before the mechanical problem was correctly diagnosed. The system was essentially working — but the operator was being protected — but the operators, confused by ringing alarms and contradictory gauge readings, shut it down, causing the partial core meltdown.

"We learned many lessons from the accident," says Mrs. Clawson.

3

WATER FLOW STOPS

On March 28, 1979, water flow to the core was cut off. Pressure increased rapidly, causing a safety valve to open. The reactor was shut down automatically.

2

COOLANT FLOODED

Coolant flooded out through the open valve. Part of the core became uncovered and fuel elements were damaged, causing them to release fission particles.

1

FUSION PARTICLES ESCAPE

Radioactive material escaped into the containment structure and flowed into an auxiliary building. The radioactive material escaped into the air through a filter.

4

EMERGENCY CORE COOLDOWN

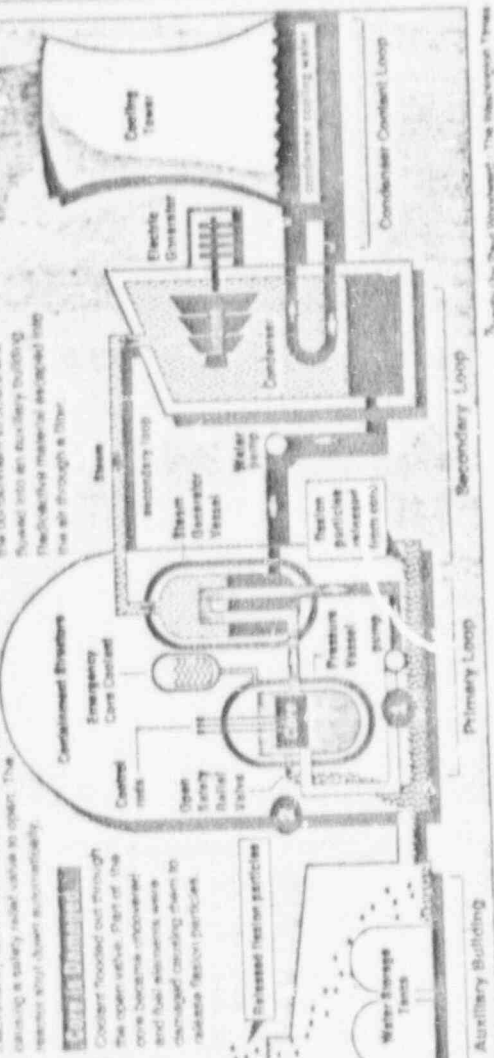
Emergency Core Cooling System (ECCS) was activated. The reactor was cooled and the pressure was reduced.

5

REACTOR SHUT DOWN

The reactor was shut down and the containment structure was sealed. The radioactive material was contained within the structure.

Work by Paul Woodhead - The Washington Times



"We've redesigned our control rooms. Our alarm panels are reconfigured. . . . We painted the room green — alarms show up better on a green background."

They've also constructed a simulated control room, an exact replica of the real one, where operators spend one week out of six in training.

"We run operators through all kinds of scenarios," Mrs. Clawson says. "We videotape them, and have them critique themselves. . . . And the focus of training has been changed. Before, if a piece of equipment was down, the emphasis was on getting it back up. The training is more reactive. Now it's more analytical and diagnostic."

But putting its house in order is one thing; winning over the anti-nuclear elements in the community is another.

"One of the most difficult things for us to deal with is the allegations of health effects," says Mrs. Clawson. "We're sensitive to the fact that the accident was a traumatic experience for people in the area. Many believed they suffered from the radiation released."

Scott Peters, spokesman for the pro-nuclear U.S. Committee for Energy Awareness, contends that the residents of the area only received a dose of radiation from the accident comparable to what someone would receive on a plane trip from New

Work to Los Angeles

Mr. Peters claims further that "in the 30 years the nuclear power industry has been producing electricity, there has not been a single radiation injury to a citizen or worker."

However, he does not minimize the importance of what happened at TMI. "We thought the likelihood of such an occurrence was so infinitesimal that it wasn't worth worrying about," Mr. Peters says. "It was very graphically demonstrated to us that was not the case. We realize now that these things can happen, so we're on guard a lot more than we were. We've learned an awful lot."

People who 10 years ago were told to evacuate the area a day after being reassured that everything was under control are understandably skeptical of GPU's efforts.

"I only hope they know what they're doing," says Frances Stulnick, a member of the Susquehanna Valley Alliance, formed to prevent GPU from dumping waste water into the river on which the power plant is located.

The Alliance was successful in that effort, and is now fighting GPU's plans to vaporize the waste water and release it into the atmosphere over a two-year period.

TMI Alert was formed two years before the accident. At that time, its founders were concerned about

what it perceived to be inadequate radiation monitoring, the lack of a cancer registry and the absence of evacuation plans.

After the accident, TMI Alert, which speaks an Eric Epstein says has 500 dues-paying members, became active in the Nuclear Regulatory Commission hearings to determine the future of the plant.

"The utility's priorities were all wrong," says Mr. Epstein. "Their priority was getting Unit 1 on line. The cleanup was secondary."

"As far as they're concerned, their economic well-being takes precedence over the well-being of the community," he charges. "The big enemy is that the democratic system is failing the community. There was overwhelming opposition to the start-up of Unit 1. In a referendum, three counties wide, the vote was 2 to 1 against re-start."

Now, Mr. Epstein says, there is no real opposition to the vaporization plan, which nonetheless is likely to take place.

But while Mr. Epstein objects to the proposed disposal methods, he also opposes the plan for Unit 2 to become what GPU calls a "monitored storage unit" — and what the anti-nuclear activist calls an "unsafe radioactive waste repository."

Clearly, GPU is damned if it does and damned if it doesn't.

Activists say TMI's lessons forgotten

(Continued from Page A-1)

He said information has been suppressed that would show radiation from Three Mile Island increased infant mortality in Pennsylvania, New York and Maryland and caused thousands of other excessive deaths by lowering people's immunity.

"This needs to be investigated by Congress," he said. "We have a scandal here of incredible proportion."

"His allegations are not new," said George Tokuhata, research director for the Pennsylvania Health Department. "They are absolutely untrue. It's ridiculous. We don't have an ax to grind. We're trying to report what we find."

Falith Schottenfeld, spokeswoman for the New York State Department of Health, called Mr. Sternglass' allegations "absurd, an insult and totally inappropriate."

Several people who live near the plant gathered at the Capitol to recall the accident and the marks it has left on their lives.

Deborah Baker of Middletown, who won a \$1 million settlement from the plant owners' insurance company, said her own research has convinced her the accident caused her son to be born nine months later with Down's Syndrome.

"I must have asked myself a hundred times why my son was affected," said the mother of two. "My knowledge of Down's Syndrome was that it happened most often to women over the age of 35. I was 23 at



Associated Press
Protestors hold a "Shut TMI" sign as they rally at the front gate of Three Mile Island nuclear power plant near Middletown, Pa., on Monday on the eve of the 10th anniversary of the TMI accident. In background are the undamaged Unit One cooling towers. Unit one is still in operation.

the time."
About 2,000 damage claims are still pending against the plant owner, General Public Utilities Corp.

"While GPU and the nuclear industry would like to look forward and forget March 28, 1979, this community will live in the shadow of the accident for the next several generations," said Eric Epstein, spokesman for Three Mile Island

Artic refine slideshow April 7

of Thursc
The Locketts Rural Informational Committee will hold an informational meeting at the Locketts Community Center, Locketts, Va., on Thursday, 7 p.m. to discuss plans for a burning power plant at Rocky, the Peppo plant explosion and the mass burn incident. Dickerson.

Snyder
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Theodore H. Snyder 85
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15947 Freder
• Sales • Rentals
• Appraisals • Estimating

SPECIAL
New Pianos • Organs
• Consoles begin \$1895
• Studios begin \$3299
• B. Grands begin \$4595
• Digital Pianos begin \$1995
• Home Organ begin \$1995

20 MIN
A Large Selection

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chance, but to have alternatives ready. People may find the extra fee less painful if it's figured in with their tax bill, he said.
The commissioners are considering contracting with haulers who would pick up trash in particular areas. The county would pay the haulers and collect the cost directly from residents.
"If we add it to the tax bill, people would be paying even if they take their own trash to the landfill," Commissioner Mark Hoke said.
Peter Eckel, the commissioners' administrative

... a public dumping fee and being charged, to pay for a new landfill the county will need within a year or two.
Mr. Eckel and John Mathias, an attorney, will report back to the commissioners next week on whether they have the authority to give haulers exclusive franchises and on how other counties handle trash pick-ups.
Also next week, the commissioners will meet with trash haulers who are worried about how the dumping fee will affect them.



Staff photo by Kelly Hal...

Driver injured

Bruce O. Baer, Sr., 56, of Willowdale Drive, was in Frederick Memorial Hospital's emergency room Tuesday morning after his Ford pickup truck ran into a building on South Street. Police believe he blacked out due to a medical condition and lost control of his truck in the 7 a.m. accident.

stay open kruptcy

The company filed under Chapter 11 of the Bankruptcy Code owing to the company's inability to reach agreement with principal lenders on a financing plan to enable the company to restructure, according to a company statement dated March 25. The company has retained Bear, Stearns & Co. Inc., investment bankers, to seek a purchaser for the company or merger partner, the statement said.
Glosser Brothers, which was taken over in 1985 by a management-led group, has experienced financial difficulties from 1987 through 1988 from

(Continued on Page A-3)

e News

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Three Mile Island: 10 years after

HARRISBURG, Pa. (AP) — Anti-nuclear activists marked the 10th anniversary of the Three Mile Island nuclear plant accident with renewed warnings Monday that the health effects were hidden and the lessons forgotten.
Scientists and nearby residents held news conferences at the state Capitol and a vigil was planned outside the plant late Monday and for 4 a.m. Tuesday, the time the accident began.
"The so-called accident at TMI was an act of violence against mankind, an act of violence against the unborn," said Jane Lee, an activist from nearby Etters, referring to the March 28, 1979, incident.

The nation's worst nuclear accident occurred when a series of human and mechanical errors allowed the plant's 150-ton radioactive core to lose cooling water. Half the core melted and 20 tons of molten material raced to the bottom of the reactor before it was held in check by a remaining pool of water. Radioactive gas was released to the atmosphere.
"This marks a decade of false denials and outright lies on the part of the utility that owns and operates Three Mile Island . . . and on the part of the state of

IRS there — even after attack

WASHINGTON (AP) — It will take something more than a nuclear attack to wipe out your obligations to the Internal Revenue Service.
However, an addition to the Internal Revenue Manual, which is supposed to guide the conduct of all IRS employees, acknowledges that tax collection might suffer if the bomb is dropped. Once the emergency is over, the manual declares, "operations will be concentrated on collecting the taxes which will produce the greater revenue yield."
IRS spokesman Johnell Hunter said Monday that the new section — titled "National Emergency Operations" — was added to the manual in response to a directive to government departments from the Federal Emergency Management Agency. The two-page policy statement is dated Dec. 14, 1988.
"In the event of a national emergency (especially resulting from nuclear attack) the primary function of the service is to support the secretary of the Treasury," the manual states. "This support as a

minimum will consist of analyzing and reporting upon emergency tax legislation, prescribing regulations and forms, issuing rulings and technical information of an emergency nature."
Within 30 days after an attack emergency, the agency would expect to resume assessing and collecting taxes. At that time, the manual states, many employees might find themselves reassigned to carry out essential functions "regardless of and without any effect on the current positions or grades of the employee."
"On the premise that the collection of delinquent accounts would be most adversely affected, and in many cases would be impossible in a disaster area, the service will concentrate on the collection of current taxes," the manual says. "However, in areas where the taxpaying potential is substantially unimpaired, enforced collection of delinquent accounts will be continued."

Pennsylvania, which has systemically obfuscated and hidden any real statistics about the deaths that have occurred in the wake of the accident at TMI," said Harvey Wasserman, who wrote a book, "Killing Our Own," about the health effects of nuclear power.

He said 73 percent of the nation's commercial reactors haven't completed modifications required in the wake of the accident.
A spokesman for the federal Nuclear Regulatory Commission said he could not immediately respond to Mr. Wasserman's

charge.
Ernest Sternglass, a University of Pittsburgh radiation physics professor, reiterated claims that the federal and state governments are covering up the true health effects of the accident.

(Continued on Page A-14)

BACKGROUND

PREPARED BY GPU NUCLEAR COMMUNICATIONS DIVISION

Three Mile Island Unit 2

UNIT 2 IN PROFILE

THE ACCIDENT

-- The TMI-2 accident of March 28, 1979, was the result of equipment malfunctions and inadequate operator response due to inadequate training.

-- The accident severely damaged the TMI-2 fuel core and led to minor releases of radiation from the plant. Post-accident studies, including that of "The President's Commission on the Accident at Three Mile Island" concluded that there will be no significant health effects to the public as a result of the accident.

-- GPU Nuclear Corporation is dedicated solely to the operation and maintenance of the GPU System's nuclear stations. The 12 top officers of GPU Nuclear have a total of more than 265 years of collective experience in both military and civilian nuclear management.

CLEANUP ORGANIZATION

-- Cleanup of TMI-2 represents a uniquely demanding engineering challenge. It required creation of a recovery team with both engineering and operational depth, as well as revision of TMI-2 operating procedures that were unsuited to TMI-2 as a damaged, shut-down plant.

-- GPU Nuclear Corporation and Bechtel, GPU Nuclear's prime contractor in the cleanup, integrated their TMI-2 organizations in 1982 to improve the administration of the cleanup.

-- The cleanup organization draws on the expertise of many individuals and organizations, including the TMI-2 Technical Assistance Advisory Group, TMI-2 Safety Advisory Board, TMI-2 General Office Review Board, GPU Nuclear support divisions, Bechtel off-site groups, Babcock & Wilcox, Westinghouse Electric Corporation, Electric Power Research Institute, U.S. Department of Energy (DOE), and DOE's TMI-2 site contractor, EG&G Idaho, Inc.

-- Organization and staffing for TMI-2 cleanup is completely independent from TMI-1.

CLEANUP FUNDING

-- Estimated to cost about \$1 billion. About \$728 million was spent by the end of 1986.

-- Cleanup funding developed under a cost-sharing formula proposed in July 1980 by Pennsylvania Governor Dick Thornburgh.

-- Major funding sources through 1986 were GPU, customers of GPU in Pennsylvania and New Jersey, U.S. Department of Energy, Commonwealth of Pennsylvania, State of New Jersey, Japanese nuclear power industry, domestic investor-owned nuclear utility industry (via EEI) and rebates from Babcock & Wilcox in settlement of GPU's lawsuit against B&W.

CLEANUP STATUS

-- Cleanup has succeeded in maintaining plant safety while reducing health risks.

-- The Fifth Annual Report of the TMI-2 Safety Advisory Board (SAB) -- covering the period from April 1985 through March 1986 -- said "TMI-2 is in a stable condition and does not pose any measurable risk to public or worker health and safety."

-- Dr. James C. Fletcher, former SAB chairman, has said, "The Safety Advisory Board has been increasingly impressed with the quality of the TMI-2 recovery work in progress. . . It is gratifying that, as each milestone is achieved, the radiation exposures to the workers are proving to be less than those projected originally."

-- In a study released in September 1985, the Pennsylvania Department of Health found no evidence of increased cancer among area residents due to the TMI-2 accident. (See separate Backgrounder on Radiation and Health Effects.)

-- The U.S. Department of Energy began rail shipments of core debris from the reactor defueling in the summer of 1986.

-- Completion of the cleanup is scheduled for 1988.

-- Disposition of the plant - refurbishment or decommission - remains to be decided.

MAJOR CLEANUP MILESTONES

-- August 1979, first low-level, accident-generated waste shipped to Richland, Washington.

-- October 1979, cleaning of contaminated water in basement of auxiliary building begins.

-- November 1979, first television and radiation inspections of inside of reactor building.

-- July 1980, venting of 43,000 curies of radioactive krypton gas from reactor building accomplished safely.

-- July 23, 1980, first manned entry into reactor building.

-- September 23, 1981, cleanup of radioactive water from basement of reactor building begins.

-- May 21, 1982, first waste from cleaning of reactor building water shipped from TMI.

-- July-August 1982, first television camera inspection of the damaged reactor fuel inside the reactor vessel.

-- Spring 1983, program to lower radiation exposure to workers achieves substantial reductions in radiation dose rates in reactor building.

-- August 30, 1983, last solid waste from the processing of original accident-related water shipped from TMI.

-- August-October 1983, further exploration inside reactor vessel produce first samples of damaged fuel core and sonar mapping of the core void.

-- February 29, 1984, TMI-2 polar crane successfully load-tested for lifting the reactor head.

-- June 28, 1984, first manned entry into reactor building without a protective breathing respirator. Respirators still are required for work involving activities such as the use of tools, that tend to increase levels of airborne contamination.

-- July 24-27, 1984, head of reactor vessel removed and reactor shield installed to provide first ready access to internal components of reactor in preparation for removal of the damaged fuel.

-- November 1984, first entry into reactor building basement made by a robot.

-- February 1985, first television inspection of bottom of the reactor vessel shows significant amounts of core debris below the normal core region. Also, Department of Energy scientists report first evidence of temperature high enough to melt uranium dioxide fuel in the reactor.

-- May 1985, reactor plenum removed and safely stored underwater in reactor containment building.

-- September 1985, robot obtains sediment samples from floor of reactor building basement.

-- November 1985, first defueling canisters loaded. Robot obtains samples of concrete from basement of reactor building.

-- May 1986, latest NRC Systematic Assessment of Licensee Performance (SALP); said: "Overall, the licensee has carried out its cleanup and shutdown activities in a safe and technically competent manner. The licensee's emphasis on safety has been demonstrated by a conservative approach and a generally high degree of management involvement in TMI-2 issues."

-- July 1986, first full-length, two-inch diameter borings taken from reactor's fuel core for analysis at U.S. Department of Energy's Idaho National Engineering Laboratory.

-- July 1986, first DOE shipment of core debris to Idaho National Engineering Laboratory.

-- November 1986, more than 1,000,000 curies of radioactivity have been collected in the plant, packaged and shipped off site since the cleanup began. General radiation levels in the reactor building have been reduced to under 100 millirems per hour, less than 1/6th of what they were when the first entries were made after the accident.

-- April 1987, approximately 90,000 pounds or about 31% of a total of 290,000 pounds of core debris have been loaded into canisters so far under the defueling and shipping program.

BACKGROUND

PREPARED BY GPU NUCLEAR COMMUNICATIONS DIVISION

Three Mile Island Unit 1

UNIT 1 IN PROFILE

OPERATIONAL HISTORY

-- TMI-1 operated from 1974 to 1979 at a capacity factor of 77.2 percent, significantly above the industry average of 65 percent.

-- TMI-1 began a lengthy restart process on October 3, 1985. When the restart process was completed in April 1986, the plant's capacity factor through October 30, 1986, when the plant shut down for a scheduled refueling outage, was 99.8 percent. In 1986, the average capacity factor for U.S. nuclear plants was about 59 percent.

ORGANIZATION

-- General Public Utilities Corporation is a holding company. Its subsidiaries include Metropolitan Edison Company, Pennsylvania Electric Company, Jersey Central Power & Light Company, GPU Service Corporation and GPU Nuclear Corporation. Metropolitan Edison owns 50 percent of TMI-1, and the Pennsylvania Electric Company and the Jersey Central Power & Light Company each own 25 percent.

-- Since January 1, 1982, TMI-1 has been run by a dramatically new organization, GPU Nuclear Corporation. GPU Nuclear also is the licensed operator of TMI-2 and the Oyster Creek Nuclear Generating Station.

-- The GPU Nuclear Board of Directors includes three highly qualified outside directors. They form a Nuclear Safety and Compliance Committee that has been given independent staff resources to monitor the safety and compliance of nuclear operations.

-- The President, Executive Vice President, and six of the other officers of GPU Nuclear have joined the GPU System since 1979.

-- GPU Nuclear Corporation is dedicated solely to the operation and maintenance of the GPU System's nuclear stations. The 12 top officers of GPU Nuclear have a total of more than 265 years of collective experience in both military and civilian nuclear management.

STAFFING AND TRAINING

-- There are more than 900 people in GPU Nuclear devoted to TMI-1 activities -- including 700 located full-time at TMI -- a three-fold increase from the number employed in 1979.

-- The staffing include major increases in Training, Quality Assurance, Radiological and Environmental Controls, and Engineering. All TMI-1 operators have been examined and licensed or relicensed by the NRC since 1981. Operators are on a six-shift rotation schedule allowing one week in every six for training.

-- Training programs and operating procedures have been revised to reflect lessons from the TMI-2 accident. In December 1986, the National Academy for Nuclear Training admitted GPU Nuclear Corporation to full membership based on the excellence of its training programs. The GPU Nuclear Training Center at TMI is a campus of the National Academy for Nuclear Training.

-- The management and staff of GPU Nuclear have been examined and endorsed by the NRC's Atomic Safety and Licensing Board (ASLB) and by the late Admiral Rickover, the former head of the U.S. Navy's nuclear power program.

PLANT OPERATION AND REGULATION

-- TMI-1 operates under strict technical specifications, procedures and environmental release limits. Contained in an appendix to its NRC license, the plant's technical specifications describe the technical requirements and conditions under which the plant operates.

-- Unit 1's operations are monitored by GPU Nuclear's quality assurance, safety review and environmental monitoring groups, the U.S. Nuclear Regulatory Commission's resident inspectors, the U.S. Environmental Protection Agency, staff members of the Pennsylvania Department of Environmental Resources and the Pennsylvania Public Utility Commission and the Institute of Nuclear Power Operations.

REGULATORY HISTORY

-- TMI-1 was ordered shut down by the NRC in the summer of 1979 without benefit of a prior hearing. Legal justification for this was the "extraordinary circumstances" surrounding the TMI-2 accident in March 1979.

-- There were extensive hearings in Harrisburg, Pennsylvania, involving intervenors and input from the public. The hearings explored Management, Emergency Preparedness, Separation of Units 1 and 2, and Design and Procedure issues. The ASLB found in favor of restart on all issues.

-- Emergency preparedness plans for TMI-1 and the surrounding counties were certified by the NRC and the Federal Emergency Management Agency.

-- In July 1984, the NRC staff concluded "that there is reasonable assurance that GPU Nuclear can and will conduct its licensed activities in accordance with regulatory requirements and that GPU can and will operate TMI-1 without undue risk to the health and safety of the public."

-- In February 1985, the NRC decided that no further hearings were necessary in the TMI-1 restart proceeding, beyond those that had recently been completed before the TMI-1 Licensing Board.

RESTART

-- In February 1985, INPO released a favorable evaluation of TMI-1 operations based on a two week inspection of the plant in October 1984. INPO said: "Within the scope of this evaluation, the team determined that TMI-1 is being maintained in a safe manner by qualified personnel."

-- On May 29, 1985, the NRC voted 4-1 to lift the 1979 shutdown orders and allow restart subject to two conditions which GPU Nuclear met in early June. The four commissioners voting to allow restart said that the most extensive examination in NRC's history "...has shown that the present GPU Nuclear management is fundamentally sound." They also said "...the current company and management have the necessary competence and integrity to provide reasonable assurance that TMI-1 will be operated consistent with public health and safety and the Commission's requirements."

-- Immediately after the NRC vote, William G. Kuhns, GPU Chairman and Chief Executive Officer said: "Safety is our number one priority. It is a trust we will not violate and we will demonstrate that to the country." Philip R. Clark, GPU Nuclear's President and Chief Executive Officer said: "The plant and its staff are ready to restart. The process will be a gradual and deliberate procedure, carried on with great care and attention to detail. It is time now to move ahead."

-- On September 19, 1985, the full U.S. Third Circuit Court of Appeals in Philadelphia, in a 10-2 decision, lifted the stay on TMI-1 operation effective September 25, pending action by the U.S. Supreme Court.

-- On October 2, 1985, the Supreme Court, in an 8-1 decision, denied the requests to continue the stay on TMI-1 operation.

-- On October 3, 1985, at 1:30 p.m., after receiving NRC authorization, operators reinitiated criticality in the TMI-1 reactor. After a planned series of tests, operators escalated power to 15 percent and put the turbine on line October 9, 1985.

-- TMI-1 continued to escalate in power and, on October 18, 1985, had met criteria for returning to the rate base by operating at greater than 35 percent power for 100 consecutive hours.

-- On January 2, 1986, the plant's three-month startup program was officially completed.

-- On January 6, 1986, TMI-1 reached 100 percent power, generating approximately 860 megawatts of electricity. At 100 percent power, TMI-1 generates enough electricity to power 500,000 homes.

-- In March 1986, the NRC's Region 1 issued a special SALP on the restart program. Of the seven categories evaluated, five areas received the highest achievable rating and two areas received the second highest achievable rating. "Overall, licensee management prepared their operators and the plant well for restart in light of the long shutdown," the NRC reported.

-- On March 21, 1986, TMI-1 shut down for previously scheduled electronic testing of a broad sampling of its steam generator tubes, as a followup to repairs that were made in 1983. An NRC licensing board has found that the generators have been returned to their original design condition.

-- On April 25, 1986, TMI-1 returned to service, reaching 100 percent power on April 26, 1986.

6R REFUELING AND MAINTENANCE OUTAGE

-- On November 1, 1986, TMI-1 shut down for a scheduled refueling and maintenance outage and resumed producing electricity on March 26, 1987. The outage was completed on time and within budget. Major work included refueling the reactor and performing modifications to enhance the fire protection system.

-- As a result of modifications done to increase the efficiency of the plant's turbine-generator, TMI-1 is now producing electricity in the range of 860 to 880 megawatts. Unit 1's previous peak generating level was 842 megawatts.

-- With the completion of the outage, the plant switched to an 18-month fuel cycle from a 12-month refueling cycle.

-- The next refueling outage is scheduled for the summer 1988.

NRC PERFORMANCE REVIEWS

-- In January 1987, the NRC's Region 1 issued its latest SALP report on TMI-1. "Overall," the NRC team reported, "the licensee has continued to operate TMI-1 safely with a generally strong orientation toward nuclear safety. The organization is comprised of highly-qualified and well-trained personnel. Many licensee initiatives go beyond regulatory requirements."

-- The SALP report covers the period May 1, 1986 to October 31, 1986. Six of the 10 areas inspected during that reporting period were rated in Category 1, the highest of three categories. Four areas were rated in Category 2. Plants typically undergo one SALP review every two years. In 1986, NRC logged approximately 6000 inspection hours at TMI-1.

IF SEARCHING FOR ANSWERS

10 years later, new fears join old

Three Mile Island legacy

Proposal for toxic water stirs concern

By Brad Burnsted and Rae Tyson
USA TODAY

MIDDLETOWN, Pa. — The accident has left scars — not the kind that are visible, but scars nonetheless. "They may not talk about it (Three Mile Island) all the time, but it's always in the back of their minds," says Robert Reid, mayor of Middletown. Ten years after the USA's worst commercial nuclear accident, TMI's operators are re-visiting some concerns.

Today is the deadline for the Nuclear Regulatory Commission to rule on a TMI plan to vent 2.8 million gallons of toxic water — generated during the accident and cleanup — by boiling it into steam.

Small amounts of radioactive tritium would be released.

"The exposures from evaporation are as close to zero as language will reach," says utility spokesman Doug Bedell.

"I don't go along with it," says Reid, mayor since 1974. "I don't believe we should be putting radioactive substances into the environment."

That's part of TMI's legacy: Many area residents "do not trust the so-called experts," says Reid.

A small, vocal group of residents decry "expert" studies that find no appreciable, long-term health damage from the accident. Some suggest the government and plant operators conspired to cover up the truth.

"For 10 years, Pennsylvania has suppressed public health data about the accident," says activist Jane Lee, adding that government is "never going to let this information out. They've locked all the doors."

Some criticize the government for a perceived lack of thorough health studies. At least one expert says it isn't too late for a comprehensive study of present, former residents.

"Even if nothing is found it might help relieve a lot of anxiety," says former Pennsylvania Health Commissioner Gordon MacLeod, now a University of Pittsburgh medical professor.

But Dr. George Toth, Pennsylvania's director of epidemiology research, defers to quality of research.

"We found no evidence of being unusual," he says, looking toward the camera.

As a foreigner conclusion, General Public Utilities bought evaporation equipment before public hearings began.

A sampling of reaction:
► Al Manik, 69, a retired aircraft worker, is worried that radioactive material will "lay on our riverbank, wash into the river" and eventually get into drinking water.

"How many cancers will come out of this?" he asks.

Others fret over the possibility of another nuclear accident. In 1985, a compact reactor was restarted.

► Anxiety and tension led to physical symptoms: high blood pressure, insomnia, nervousness and fatigue.

► An increase in the number of underweight newborns was



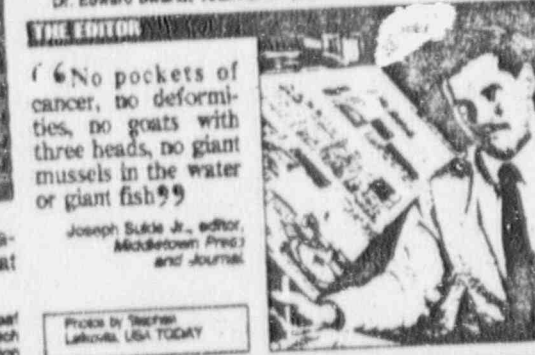
"I don't care what the (radiation) dose was. It caused what happened."

Mary Osborn, with 31-inch dandelion leaf that sprouted after the accident, which some experts say may be due to radiation



"I probably see more animals in the area than any other veterinarian ... I haven't noticed anything"

Dr. Edward Swartz, veterinarian practicing within two miles of plant



"No pockets of cancer, no deformities, no goats with three heads, no giant mussels in the water or giant fish"

Joseph Sukle Jr., editor, Middletown Press and Journal

Photos by Stephen Lohovits, USA TODAY



"I don't refer to it as the stupidity of the operators and owners. This didn't have to happen."

Elizabeth Sharvey, with husband Manuel, have sued plant operators for health problems. Still-operating Three Mile Island 1 in background.



"I don't think the NRC isn't in bed with the nuclear industry?"

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Uncertainty breeds stress, ailments

By Rae Tyson and Brad Burnsted
USA TODAY

HARRISBURG, Pa. — Emotional suffering — stress, sometimes triggering physical ailments — is the clearest medical legacy of the accident. "For many, the worst of the ... has been the uncer-

conducted a 1980 survey, comparing Middletown residents to a standard psychological symptom check list: anger, anxiety, depression and somatization (converting worries to symptoms such as retching, headaches, ringing in the ears).

"The people in Middletown have responses about two- to three times that of others,

anger, they were concerned about the value of their homes; they were questioning whether they wanted to raise their families around here."

And for some, as the plant's cleanup process continues into the mid-1990s, so do concerns and stress-related illnesses.

Among key findings from extensive stress studies:

will become ill.
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from a Middletown newspaper store and is married to a TMI foreman, said the plant workers are "kicker. They're certainly not going to jeopardize their families' lives."

► Barbara Burkett, 46, mother of two and manager of a sporting goods store, like most area residents, has come to terms with living downwind

SEARCHING FOR ANSWERS

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Photos by Stephen Lefkowitz, USA TODAY



“I don’t refer to the Three Mile Island accident. I refer to the stupidity of the operators and owners. This didn’t have to happen.”

Elizabeth Chaney, with husband Manuel, have sued plant operators for health problems. Still-operating Three Mile Island 1 in background.



“A lot of people in this area are leery about their government regulatory agencies, like the NRC... You don’t think the NRC isn’t in bed with the nuclear industry?”

Middletown Mayor Robert Reid

Proposal for toxic water stirs concern

By Brad Burnsted and Rae Tyson USA TODAY

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Incertainty breeds stress, ailments

Rae Tyson USA TODAY

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An increase in the number

10 years later, new

Three Mile Island legacy



Nuclear power: Debate heated
In the first of two reports, we look at the fears, findings and continuing debates over nuclear power and radiation, which rose to the forefront of national attention 10 years ago this March 28 with the accident at Three Mile Island, the USA's worst nuclear accident. (Cover story, 1A)

Tomorrow: An industry report card.

Q & A

A QUICK LOOK AT NUCLEAR POWER AND HEALTH

Radiation's impact on health is still unclear

Questions persist about the health effects resulting from the Three Mile Island accident. The mainstream of science says the radiation released during accident has not yet caused any increase in cancer — however few will absolutely rule out that any single cancer may result.

How much radiation did the accident release?

Plant radiation monitors failed during the accident. But experts have calculated average doses to be about 10 millirems for the general population, up to 140 millirems for plant workers.

Is 10 millirems enough to cause illness?

It's unlikely — 10 millirems is about one-fourth the radiation in a standard chest X-ray. But there are numerous variables — such as individual tendency to cancer, how the radiation was absorbed, whether they were pregnant at the time, over what period of time they absorbed the radiation.

What if levels were higher, as some argue?

It could boost the number of cancer cases, though Pennsylvania Health Department epidemiologist George Tokuhata insists "these doses are accurate."

What would be the first sign that radiation had caused some cancer in the community?

An increase in leukemia cases would have shown up within the first five to 10 years, most experts say.

Has there been any evidence of increased cancer?

Professional studies have found cancer rates in the TMI area consistent with the U.S. average — about one in five — and no increase in leukemias. However, studies undertaken by area residents document cancer clusters — higher than normal rates of disease in a small area.

What do the experts say about those studies?

Some say the research was shoddy. They also point out that most tumor cancers don't develop for at least 15 or 20 years after radiation exposure.

So, higher cancer rates are unlikely?

Absolutely not. Several prominent scientists say they fully expect to see elevated cancer rates in the TMI region.

How can they make that assumption?

They claim the levels of radiation were much higher than publicized, they also assume low-level radiation is more dangerous than previously thought. "It's not enough to say this much or that much radiation came out. The wind could carry a deadly plume into one neighborhood and leave another one very close untouched," says Dr. Elizabeth Cherry, University of Pittsburgh School of Medicine.

When will the study be conducted?

Experts don't know for sure. Health at a National Cancer Institute study — the first ever to examine cancer rates near nuclear plants — are to be completed this summer. The study was begun after NCI found a leukemia cluster near the Pilgrim plant in Massachusetts.

How will the study be conducted?

Cancer types and rates based on county death certificates are reviewed in areas with operating nuclear plants — and compared to similar communities with no plants.

How does radiation cause cancer?

Experts believe cancer occurs in stages of development. Radiation may contribute to the first, or initiating stage by causing a mutation of a chromosome or deletion of a chromosome. It also may activate a cancer-causing gene known as the oncogene. And it may deactivate a cancer-suppressing gene known as the anti-oncogene.

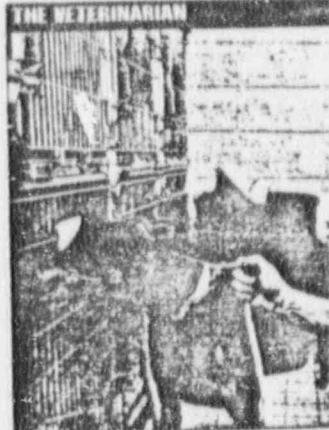
Is all radiation dangerous?

In calculating risk, any level of radiation above zero is assumed to carry some risk. But some experts argue that there is a threshold and everything below the threshold is safe — or perhaps beneficial. But, it's generally agreed that all radiation may carry a risk and the younger the age, the more severe the higher the risk.

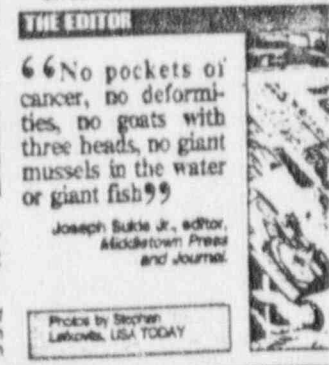


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Photos by Stephen Latkowski, USA TODAY



"I don't refer to Three Mile Island as an accident. I refer to this as the stupidity of the operators and owners. This didn't have to happen."
Elizabeth Cherry, with husband Manuel, have sued plant operators for health problems. Still-operating Three Mile Island 1 in background.



"I'm not too fussy about utility agencies don't think the nuclear in"

Uncertainty breeds stress

By Rae Lykes and Brad Burnsted USA TODAY

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When they had another agent, they were concerned about the value of their property. They were questioning why they wanted to raise their lives around here. "And for some, as the cleanup process continues the 1980-1985, so do the stress-related illnesses. Among key findings last week were stress studies by some residents."

... 11, 1988. ...
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 ... deal ...
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INTRUSION: Jesse Jackson, left, keeps a frenetic pace, will deny power tested in April 4 Chicago mayoral race, some say he shouldn't run for president in '92, but he says, "I'm committed to a party that represents fairness." 4A.

AIR TERRORISTS: FAA is doing a poor job of alerting airlines of threats, say congressional investigators. 3A.

TAXES: Many people are filing state returns earlier, trouble spots for refunds, state-by-state look. 5A. States eye fuel taxes. 2A.

... handling soaring murder rate, 10-day curfew for youths. 3A.

John Tower eyes bank, lecture 200 per speech. 4A.

Cartoon are killed, 12 injured in a ... 3A.

ITE: Auto insurance in USA must come down but "we can't settling premiums by vote." 10A.

... insurance firms in "rigors of improved auto-safety measures" Carbyrick of Public Citizen. 10A.

... Spring home-buying season ... 18. "Creative" mortgages. In a tough market. 3B.

... Long pilots strike update. 1B.

... in 7 weeks for Tom Kite. KC ... 10A. ... shows "incredible potential." 1D.

... usually grows fruits, vegetables, ... over poison to food. 10A.

... writes take a stab at comedy. 2D.

... time is so long, 20 yrs. young. 4D.

... highlights Park fall festivities. 6D.

... Dueling box of Cary Grant.

... 2A.

USA TODAY

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2A Basketball	1-7C
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Life

2B Classified	4-8D
2B Crossword	7D
2B Horoscope	8D
7B Television	2D

FOR THE GOLD
 abroad Section E

TODAY, a Division of Gannett Co., Inc.

LOTS

... the nation

w enforcement
 ... percent female



... Source: Department of Justice

By Ely M. ... USA TODAY



DEBORAH BAKER: Her son, Bradley, was born with Down's syndrome. She won \$1.1 million out of court. "I can touch one person, that will be good..." Think, talk, voice your concerns.

SPECIAL REPORT

TODAY

- ▶ TMI accident at a glance, 2A
- ▶ Q&A on radiation impact, 5A
- ▶ USA TODAY Poll reveals fear of living near plant, 5A
- ▶ Emotional stress takes its toll, 5A
- ▶ Danger of low-level radiation, 5A

TUESDAY

- ▶ An industry report card



DR. GEORGE TOKUHATA: "We certainly do not expect a significant rise in cancer," says researcher at Pennsylvania's health department.

Battles rage; El Salvador turnout low

By Juan J. White
 USA TODAY

Heavy fighting marred El Salvador's presidential election Sunday — bringing more trouble to the struggling U.S.-backed democracy.

At least 32 people were killed as leftist rebels made good on vows to disrupt balloting. Castes throughout the country kept voter turnout light in smaller towns, but there were long lines in the capital.

Challenger Alfredo Cristiani of the right-wing ARENA party claimed victory in his bid to succeed President Jose Napoleón Duarte. Returns aren't official, but he's certain he won more than 50 percent needed to avoid an April runoff.

A Cristiani win would mean ...

... owners admitted no blame ... more than 2,000 other ... of cancer, birth defects and other maladies await court judgment.

Ten years after TMI's near-disaster, nuclear experts and local residents still debate its effect on health — and debate

COVER STORY

'Accident is nowhere near over'

TMI fallout: 2,200 suits over health problems, a hopeful industry

By Patrick O'Driscoll,
 Rae Tyson and Brad Burnsted
 USA TODAY

MIDDLETOWN, Pa. — Deborah Baker's question hangs in the air, like the familiar cloud of cooling-tower steam rising from her neighborhood nuclear power plant — Three Mile Island.

"How much radiation is not enough — or too much?" she asks.

... decade after a partial meltdown destroyed the plant's No. 2 nuclear reactor and terrified the nation.

... son, Bradley, was born with Down's syndrome nine months after the March 28, 1979, accident. The Baker family learned from "TMI" — as locals call it — that ...

... birth ...

... owners admitted no blame ... more than 2,000 other ... of cancer, birth defects and other maladies await court judgment.

Ten years after TMI's near-disaster, nuclear experts and local residents still debate its effect on health — and debate

Interest on rise; near 'th

By Dennis Claiborn
 USA TODAY

... fears may have it a new ... under interest rates.

Expect rising mortgage rates for the peak spring home-buying season — and rates in general to keep heading up.

A higher-than-expected wholesale price report — a 1 percent increase in February — sent rates soaring Friday. Now, markets are braced for a lead report on February consumer prices, due Tuesday.

"The bond market is going to continue to get clobbered," says Lawrence Chimerine of the WEA Group consulting firm. He predicts 30-year Treasury bond yields will rise as high as 10 percent by summer.

Friday, T-bond yields jumped to 9.28 percent from 8.11 percent Thursday — the biggest one-day jump since last August. Investors, shocked by the inflation report, want higher returns to compensate for locking up their money.

Investor worries about inflation are likely to mean:

- ▶ Mortgage rates will keep rising. The average 30-year fixed-rate mortgage was 10.86 percent Friday vs. 10.86 percent a week earlier.
- ▶ Savers will gale. Bank rates on one-year CDs topped 9 percent just two weeks ago — vs. 8.5 percent Jan. 1.

Joel Naroff, economist at First Fidelity Bancorp in Philadelphia, expects a one-quarter to one-half point rate rise by summer. "If you're looking for the top, we're not there yet."

Big question: How high will the Federal Reserve have to push rates to slow the economy and thus slow inflation?

Despite Friday's report, the Fed may fear acting too fast. It doesn't want to spark a recession. Friday, the Fed pumped money into the banking system to restrain short-term rates, despite the inflation news.

Cutting edge

By Craig Wilson
 USA TODAY

For 100 years the Swiss Army knife was red, the color of the Swiss flag.

Three years ago it debuted in black, gray, green and white — not red, but still acceptable for a knife. Now it comes in pink and yellow.

The buyers: "Mostly a younger customer who likes to coordinate things color-wise," says Kathy DeBame, Swiss Army Brands Ltd. saleswoman, Conn.

... ones went ...

... as a "buy one of these" for your sweetheart.

The pastel knives are available only in the 113

TMI at a glance . . .

The accident

What happened:
 ▶ At about 4 a.m. March 28, 1979, a relief valve at TMI-2 became stuck, releasing reactor cooling water as steam.
 ▶ Plant operators mistakenly shut cooling water to reactor.
 ▶ Overheated core begins partial meltdown, producing a potentially explosive hydrogen bubble in reactor.
 ▶ 144,000 people evacuated.
 ▶ Bubble dissipates after six days.

Medical impact

Extreme stress widely documented; no firm proof of increased cancer, leukemia or deaths.

Economic impact

Up to \$1 billion, including real estate values in areas closest to plant, which failed to keep pace with appreciation.

Lawsuit status

At least 2,111 plaintiffs; approximately 300 settled, \$25 million pact; highest settlement reportedly \$1.1 million, other cases pending.

The plant now

Cleanup \$1 billion to be spent removing radioactive hardware; completion due mid-1990s.

Plant status: Shut, radioactive core to be sealed.

The area

Three Mile Island: 2.5 miles long, in the Susquehanna River, 10 miles south of Harrisburg.
 Population: 158,000 within 10 miles of plant.
 Industry: Small businesses, rural farms, TMI-1 a prime employer with 900 people working at the plant.



By Joseph Hutchinson, USA TODAY

NEWS

BEHIND THE SCENES WITH PEO

Soviet is testi

Joseph Stalin would have a
 7th Yeltsin, the defiant reformer
 setting the Soviet example.
 Leonid Brezhnev would have
 pointed him to
 some obscure
 post far from
 Moscow.

But it's a sign
 of the times that
 the current Soviet
 leader, Mikhail
 Gorbachev, tolerates his
 former friend and
 ally, who's able
 to rally thousands
 in Moscow to
 publicly attack
 the ruling
 Communist Party
 — as he did
 on Sunday.

"Yeltsin is a
 YELTSIN: A
 'maverick,' said
 Soviet estate
 American Uni-
 versity's Louise
 Shelley, a Soviet
 faux expert. "There's no one
 like him and he's shown extra-
 ordinary resilience."

Yeltsin, 56, is perhaps the
 dramatic manifestation of the
 pillars underpinning Gorbachev's
 movement — glasnost (openness
 and perestroika (restructuring).
 With Gorbachev as his chief
 Yeltsin rose quickly to the ruling
 lifeline to December 1985, then
 pushed by the more conservative
 members — fell just 48 days
 years later. His crime: bet on



COVER STORY

Nuclear revival is likely

Continued from 1A

nearly everything else surrounding
 nuclear power: plant safety, worker
 training, radioactive waste.

Despite all the heated talk, there
 may be a breath of potential new life
 for the dormant nuclear power in-
 dustry, which hasn't ordered a new
 reactor since 1978.

Growing worry about global
 warming — the so-called "green-
 house effect," due to too much car-
 bon dioxide in the atmosphere —
 could spur the construction of CO₂-
 free nuclear plants instead of CO₂-
 generating coal-power plants.

Even staunch anti-nuke groups
 such as the Environmental Defense
 Fund admit there may be a revival
 — or at least a re-examination. "It is
 an option that will be on the table,"
 says EDF's Paul Oppenheimer.
 A new TODAY poll shows
 most people are

concerned about living near a nuclear plant. But
 50 percent favor 31 percent favor
 against — on whether to go nuclear
 to help curb the greenhouse effect.

"I've had people in government
 say, 'If you're so concerned, why not
 move?' I say to them, 'Where to?'
 says Joyce Corradi, who runs a child-
 care center here. "There's no place
 that's more than 200 miles from a nu-
 clear plant."

Such worries don't surprise the
 Nuclear Regulatory Commission,
 which oversees the U.S.
 licensed, commercial reactors.

"The public climate, if you will,
 was beginning to improve up to three
 years ago," says NRC's Joe Fou-
 chard. "What happened? Chernobyl.
 You can understand public unease
 ... but TMI doesn't even compare."

Today, regulators say, most nu-
 clear reactors are far safer and better
 run, and a disaster like Chernobyl —
 30 dead, thousands exposed to lethal
 radiation — would be highly unlikely

the time of the accident, says it's ir-
 responsible to dismiss possible links be-
 tween TMI and cancer.

"We know that some 90 percent of
 cancers are environmentally in-
 duced. We just don't know if there is
 a connection here," says MacLeod,
 who argues that a comprehensive
 health study of those who lived with-
 in five miles of TMI is long overdue.

Judges and juries may have the
 last word — if they can ever untie
 complex legal knots. "This is like mo-
 lesters in a wind chill of minus-4,"
 says plaintiff lawyer Dusan Bratic.

Colon cancer victim James Webb,
 56, a Leonardtown, Md., helicopter
 pilot who flew TV crews over TMI
 during the accident, has a simple
 strategy: "You can find all kinds of
 doctors that say radiation doesn't
 cause my kind of cancer. But you
 ain't going to find no doctor who's
 going to get on the stand and raise
 his hand and say, 'Radiation
 did not cause...'"

"I don't know if the NRC's team lead-
 er during the accident should have
 says the industry's previous view
 "that severe accidents couldn't hap-
 pen" is gone — replaced by "a tremen-
 dous upgrading at all levels."

Whether that can offset the years
 and multibillion-dollar cost of build-
 ing new nuclear plants is debatable.
 But recent reactions to the global
 warming problem may afford nuclear
 power another look.

▶ A "greenhouse" bill recently in-
 troduced by Sen. Tim Wirth, D-Colo.,
 would fund research to improve re-
 actor safety, he says after reactors
 would help overcome public concerns
 — what he calls "nuclear measles."

▶ President Bush is expected to
 push for more nuclear plants.
 "We've been reading about some of
 the needs to diversify our energy
 base (and) I have long been in favor
 of the safe use of nuclear power,"
 says Environmental Protection
 Agency chief William Reilly. "It isn't
 just a case of nuclear power."

Donna Rice

That buck-toothed blonde with
 glasses and her hair pulled straight
 back really was Donna Rice, shoo-
 ing off her disguise to a weaker
 journalism conference.

The former model says she "lo-
 everything I had worked for all
 my life" because of her relationship
 with ex-Sen. Gary Hart.

"Imagine the kind of person you
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 ple thinking of you as that kind of per-
 son," she says.

Rice was speaking at the Institute
 on the Ethics of Journalism at Wash-
 ington and Lee University. She says



South of Harrisburg
 Population: 168,000 within 10 miles of plant.
 Industry: Small businesses, rural farms, TMI-1 a prime employer with 800 people working at the plant.

COVER STORY

Nuclear revival is likely

Continued from 1A

nearly every day surrounding nuclear power plant safety, worker training, radioactive waste.

Despite all the heated talk, there may be a breath of potential new life for the dormant nuclear power industry, which hasn't ordered a new reactor since 1978.

Growing worry about global warming — the so-called "greenhouse effect," due to too much carbon dioxide in the atmosphere — could spur the construction of CO₂-free nuclear plants instead of CO₂-generating coal-power plants.

Even staunch anti-nuke groups such as the Environmental Defense Fund admit there may be a revival — or at least a re-examination. "It is an option that will be on the table," says EDF's Michael Oppenheimer.

A new USA TODAY poll shows most people are still unsettled about nuclear power — 82 percent are "very" or "somewhat" concerned about living near a nuclear plant. But we're split 43 percent for, 51 against — on whether to go nuclear to help curb the greenhouse effect.

"I've had people in government say, 'If you're so concerned, why not move?' I say to them, 'Where to?'" says Joyce Corradi, who runs a childcare center here. "There's no place that's more than 200 miles from a nuclear plant."

Such worries don't surprise the Nuclear Regulatory Commission, which oversees the USA's 106 licensed, commercial reactors.

"The public climate, if you will, was beginning to improve up to three years ago," says NRC's Joe Foucheard. "What happened? Chernobyl. You can understand public uneasiness... but TMI doesn't even compare."

Today, regulators say, most nuclear reactors are far safer and better run, and a disaster like Chernobyl — 30 dead, thousands exposed to lethal radiation — would be highly unlikely now in the wake of TMI.

"I'm sorry we had to pay the price, but it's worth it. A lot of good things came out of this," says Michael Koss, operational director at TMI No. 1, the undamaged reactor still in use.

But those who sued General Public Utilities Corp., which now operates TMI, couldn't disagree more.

They say the accident spewed unknown, harmful amounts of radiation over humans and livestock.

"The accident is nowhere near being over," says Elizabeth Chavez, one of several mothers who canvassed neighborhoods in the years after TMI and found alarming numbers of cancers.

Her brother fell violently ill the day of the accident and died of cancer in 1983. Her husband fights prostate cancer. She has a thyroid condition she blames on TMI. And like 100 others, she recalls an odd, metallic taste in the air that day — a familiar sign of radiation exposure.

In Pennsylvania's coke disease researcher, Dr. George Tokuhata, a 1988 study of cancer rates, pregnancy outcomes and children's health showed no unusual medical problems among TMI-area residents. "We didn't see any evidence of increased cancer. In fact, the (rate of) leukemia was lower than usual."

Asked about the studies undertaken by residents, Tokuhata adds firmly, "Those studies don't hold water."

"It's difficult to equate emotions with scientific evidence," adds GPE spokeswoman Carol Clewton, who says only a tiny amount of radiation was released.

But University of Pittsburgh public health professor Robert M. Cook, state health commissioner at

the time of the accident, says it's irresponsible to dismiss possible links between TMI and cancer.

"We know that some 90 percent of cancers are environmentally induced. We just don't know if there is a connection here," says MacLean, who argues that a comprehensive health study of those who lived within five miles of TMI is in progress.

Judges and juries may have the last word — if they can enter into complex legal knots. "This is like no-lesser in a wild card of mine," says plaintiff lawyer Cassin Strub.

Color cancer victim James Webb, 56, a Lehigh Valley, Pa., helicopter pilot who saw TV crews over TMI during the accident, has a simple strategy: "You can find all kinds of doctors that say radiation doesn't cause any kind of cancer. But you ain't going to find no doctor who's going to get on the stand and raise his hand and say, 'Radiation absolutely did not cause it.'"

Harold Denton, NRC's team leader during the accident's chaotic days, says the industry's previous view "that severe accidents couldn't happen" is gone — replaced by a "tremendous upgrading at all levels."

Whether that can offset the years and multibillion-dollar cost of building new nuclear plants is debatable. But "recent reactions to the global warming problem may afford nuclear power another look."

A "greenhouse" bill recently introduced by Sen. Tim Wirth, D-Colo., would fund research to improve reactor safety. He says safer reactors would help overcome public concern — what he calls "nuclear angst."

President Bush is expected to push for more nuclear plants. "We've been reacting about some of the needs to diversify our energy base (and) I have long been in favor of the safe use of nuclear power."

Adds Environmental Protection Agency chief William Katt: "It isn't just a case of nuclear yes or no."

The nuclear industry is expected to seize its chance to revive its sagging fortunes. "Groups that have opposed nuclear energy have to reconsider their opposition in light of the environmental problem," says Edward Davis, president of the American Nuclear Energy Council.

Some remain staunchly opposed. "Nuclear power just doesn't cut it," says Rep. Claudio Schneider, R-K.L., sponsor of a gross house bill in the House. "We'd rather conserve energy and add solar and wind power."

"Our argument is very simple. You don't trade one environmental calamity for another," adds Michael Marotta of the Nuclear Information and Resource Service.

While the arguing goes on, TMI nears the end of a \$1 billion cleanup effort. Working with exotic, long-handled tools from a platform 40 feet above the reactor's water pool, workers cut up radioactive debris and ship them to a mobile dump site. In an Avon, Pa., facility, they'll be packed in casks for shipment to a nuclear waste repository.

Elizabeth Chavez and others who believe the utility's claim that the hot-off process is safe — and remain skeptical about nuclear power.

"They plan to keep that plant open as a monument to the world that, yes, nuclear power is safe," says Chavez, who'll join an anniversary vigil at TMI next week. "But God forbid they have another accident. People will kill to get out of here."

Deborah Butler cautions people here and elsewhere not to believe any one side — government, industry, or anti-nukes — without weighing all the facts. "Don't sit back, you got to care."

... be, it perhaps the most dramatic manifestation of the twin pillars underpinning Gorbachev's movement — glasnost (openness) and perestroika (restructuring).

With Gorbachev as his mentor, Yeltsin rose quickly to the ruling Politburo in December 1985, then — pushed by the more conservative members — fell just as fast two years later. His crime: belief that

... If he's not, then it's a sign that democratization is not proceeding (but) has been slowed."

Asked why it's so important for him to win, Yeltsin told Time magazine: "If you're trussed up in the street and robbed of your jacket, it would also be important to you that your robber was identified and captured."

— James J. Walle

Donna Rice: I lost it all

That buck-toothed blonde with glasses and her hair pulled straight back really was Donna Rice, showing off her disguise to a weekend journalism conference.

The former model says she "lost everything I had worked for all of my life" because of her relationship with ex-Sen. Gary Hart.

"Imagine the kind of person you never dislike and think of people thinking of you as that kind of person," she says.

Rice was speaking at the Institute on the Ethics of Journalism at Washington and Lee University. She says

she shuns attention. "I have a disguise," she says. "I have buck teeth that I put on. They cost me 80 bucks. You guys want to see?"

With that she put on glasses, inserted the teeth and changed her appearance. "I hope time will eventually take care of all of this."

In the meantime, Rice says, she has thought about but ruled out legal action against the media that have made her an unwilling celebrity.

"Even though I was not participating in the media blitz, I was prevented from leading my life... I was basically a fugitive for months."

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TMI Anniversary

Movie fantasy turned reality

MIDDLETOWN, Pa. (AP) — Life nearly imitated art a decade ago in a nuclear technology that supposedly couldn't fail.

In nearby Harrisburg, a theater showed "China Syndrome," a movie in which a nuclear accident threatened to wipe out an area "the size of Pennsylvania."

At 4 a.m. on March 28, 1979, movie fantasy turned horribly real at the Three Mile Island power plant as a series of human and mechanical failures nearly triggered a nuclear disaster along the Susquehanna River.

By 8 a.m., after cooling water was lost and temperatures soared above 5,000 degrees, the top half of a reactor's 130-ton radioactive core collapsed and melted. Contaminated coolant water escaped into a nearby building, releasing radioactive gases.

Frightened by reports of uncontrolled radiation releases and a potentially explosive hydrogen bubble in the damaged reactor, as many as 200,000 people living within 30 miles of the plant fled the region. Women and young children within five miles were advised by Gov. Dick Thornburgh to leave.

The accident was contained, but it intensified fears about the potential dangers of nuclear power, killed plans for new U.S. plants, and left a once-complacent nuclear power industry defensive about its abilities.

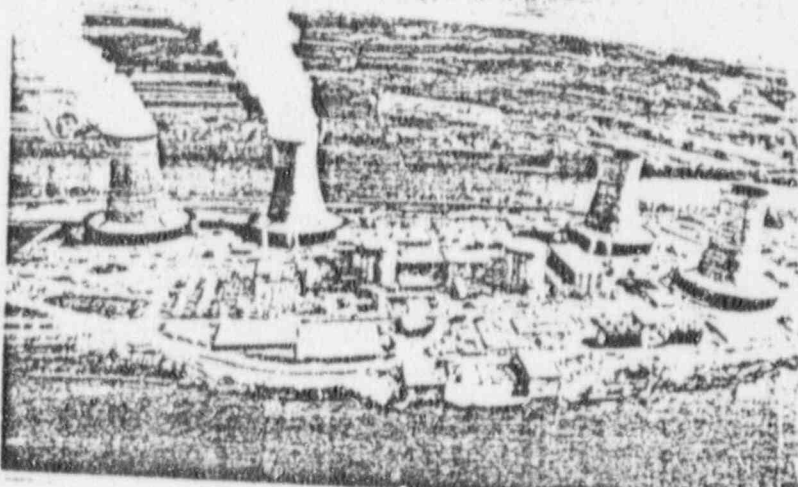
Robert Long, director of planning and nuclear safety at Three Mile Island, recalled that before 1979 people in the industry were confident a serious accident was all but impossible.

"All of us felt it was just really remote," he said. "There are still people in the industry who think, 'It couldn't happen to us.' We're constantly trying to remind people it could happen to anybody."

The health effects continue to be debated. The utility says radiation doses outside the plant during the accident were less than background radiation, and in patients and animals.

General Public Utilities Corp., the New Jersey-based owner of the plant, suffered greatly. It lost a nearly \$1 billion investment in the just-opened Unit 2, was vilified for mangling the region's psyche and teetered on the edge of bankruptcy until a cleanup financing plan was put in place in 1985 and its other reactor at Three Mile Island returned to service later the same year.

After overcoming both financial and technical pitfalls, the nearly \$1 billion cleanup should be completed late next year. Seventy-one percent of the core has been shipped to federal research laboratories in Idaho, and General Public Utilities is being



Ten years after the nuclear disaster at the Three Mile Island Nuclear Power Plant in Middletown, Pa., the Unit One reactor continues to function (seen at left), while the Unit Two reactor remains unoperational (at right).

hailed by the industry as a model utility.

"We're trying to recognize people do make mistakes, but we're going to do what we can to learn from those mistakes," said Michael Roche, director of Unit 2.

For most of those who live near Three Mile Island, this week's anniversary will be just another day. But local activists will hold a vigil outside the plant, talk with reporters and recall those eerie days of 1979.

Two citizen groups, Three Mile Island Alert and Susquehanna Valley Alliance, have doggedly monitored plant activities and called attention to shortcomings in cleanup and operations. They also tried to block the 1985 restart of the Unit 1 reactor.

"This is a utility that has lied, cheated and was convicted of a felony," said Eric Epstein, a spokesman for Three Mile Island Alert. "In our opinion, it lacks the requisite competence and character to operate a nuclear plant."

He referred to a guilty plea in 1984 for the use of false leak test results at Unit 1's cooling system before the accident, to accusations the company made false statements to the federal Nuclear Regulatory Commission and to a cheating scandal involving operating personnel who falsified test results in 1981.

"Underlying it, there is still quite a bit of feeling... the utility is going to do what it wants to do regardless of what anybody else does," he said.

One of the surprises of the accident was that the China Syndrome — a chain of events in which molten fuel burns through a reactor and containment building and spews radioactive steam into the air — can be stopped once started.

Although 50 percent of the uranium fuel melted and 30 tons of molten material flowed within minutes to the bottom of the steel reactor vessel, the remaining water cooled it and held it in place.

"As a result of TMI-1, there has been a rethinking of severe accident consequences and it's still going on

today," said Mr. Roche, the Unit 2 director.

Harold Denton, the agency's director of government and public affairs, said that without the addition of cooling water three to four hours into the accident, "it would have penetrated the reactor vessel and that would have been a really severe accident."

Mr. Denton, whose calm, knowledgeable style calmed many of the region's fears during the accident, was regarded as something of a hero.

Over the years, the owner of Three Mile Island has mounted extensive public relations campaigns, telling people it has learned the accident's lessons and has demonstrated since 1985 it can safely operate the Unit 1 reactor while continuing the

cleanup.

The company says it has retained operators, given them better designed controls and helped develop state-of-the-art cleanup techniques. Operators now have monitors that, in place during the accident, would have alerted them within 10 minutes that the core had lost cooling water, Mr. Long said.

One remaining issue is General Public Utilities' plan for long-term monitoring of Unit 2. About 29 pounds of nuclear fuel will remain in hard-to-reach places, but the company says there will be no chance of any chain reaction or other dangerous condition occurring.

Another issue is what to do with 2.5 million gallons of once-contaminated water left from the accident and its aftermath.

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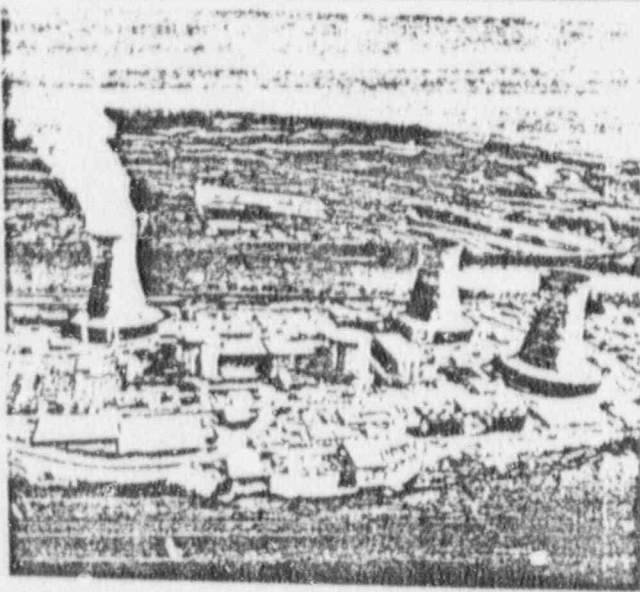
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TMI Anniversary



Associated Press

lear disaster at the Three Mile Island Nuclear Power Plant in Middletown, or continues to function (seen at left), while the Unit Two reactor remains

a model today," said Mr. Roche, the Unit 2 director.

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cleanup.

The company says it has retrained operators, given them better design controls and helped develop some of the art cleanup techniques. Operators now have monitors that, if in place during the accident, would have alerted them within two minutes that the core had lost cooling water, Mr. Long said.

One remaining issue is General Public Utilities' plan for long-term monitoring of Unit 2. About 200 pounds of nuclear fuel will remain in hard-to-reach places, but the company says there will be no chance of any chain reaction or other dangerous condition occurring.

Another issue is what to do with 2.3 million gallons of once-contaminated water left from the accident and its aftermath.

Confusion order of day, officials lied, hid truth

EDITOR'S NOTE — National writer Robert Dvorchak, the AP's correspondent in Harrisburg, Pa., a decade ago, was one of the first reporters to arrive on the scene of the Three Mile Island emergency.

By ROBERT DVORCHAK
AP National Writer

MIDDLETOWN, Pa. — Four days into the accident at Three Mile Island, the stream of conflicting statements was in full torrent.

The company, which had lost its credibility, said the crisis was over.

Minutes later, the Nuclear Regulatory Commission warned that a hydrogen bubble in the reactor was potentially explosive and blocked efforts to cool the uranium core.

The NRC in Washington feared the bubble could reach a flammable stage within five days.

NRC officials at the scene said detection was impossible for at least nine to 12 days.

Scores of reporters, who carried radiation detection badges with their pads and pens, rushed the office of Gov. Dick Thornburgh. "They were no longer interested in the story. They feared for their own safety," recalled former gubernatorial spokesman Paul Critchlow.

Reporters by trade are detached observers. But during the United States' worst commercial nuclear accident, they were as personally involved as the people who weathered the crisis.

The vanguard of a 400-reporter invasion was based in the state capital of Harrisburg 10 miles away, where a new governor was in his first day of office and the Legislature was debating the sorry condition of the state's roads.

Three Mile Island overwhelmed everyone. And reporters found out fast that it was a nightmare of confounding technology, contradictions,

(Continued on Page B-10)

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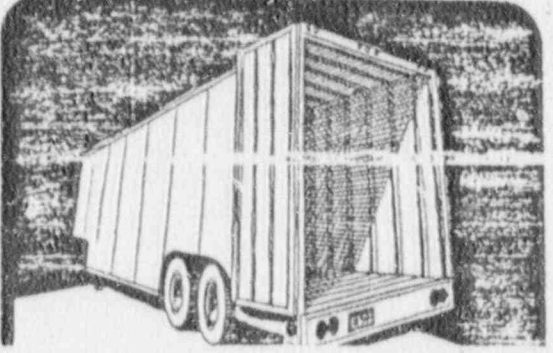
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TMI Anniversary

Confusion order of day; officials lied, hid truth

(Continued from Page B-4)

feverish emotions and limited access to sources.

It took seven days to get a clear story from all involved, when the NRC confirmed the hydrogen bubble was gone and gave a plain account of what happened. Everything before seemed disjointed.

The near-calamity lacked such visuals as fire, funnel clouds, floodwaters or wreckage. The most popular image was the looming presence of the huge, bourgeois-shaped cooling towers.

Reporters had to learn quickly about the extremely complex workings of a nuclear-powered generating system.

At 4 a.m. on March 28, a Wednesday, Three Mile Island worked like a giant tea kettle making steam for electricity in its bell-fired reactor. Then a ball valve caused two pumps to shut off, which halted a steam turbine and stopped the chain reaction within the reactor.

One hundred tons of uranium stored with decay heat, and a relief valve opened to reduce pressure as the emergency cooling system flooded the reactor with water. But the valve stuck and stayed open for two hours, draining vital coolant water and leaking radiation into the air.

Operators looking at a faulty gauge mistakenly shut off the emergency

cooling system. The core was uncovered and the top half melted. A bubble of hydrogen formed.

Even at the time, no one had a clue what was going on.

Nothing in operator manuals mentioned a bubble. It was as if operators were given history books to take an algebra test. A computer monitoring core temperatures split out warning marks, the high-tech equivalent of scratching your head. Nuclear industry, which touted itself as cleaner than coal and cheaper than oil, had bragged such an accident was impossible. And the company's operator then, Metropolitan Edison Co., played down the situation.

Employees from Metropolitan Edison called from its headquarters in Reading, miles away. "There were no recordings of any radiation off site," spokesman William Scranton III

told reporters at 11 a.m. that "everything is under control." Unknown to him or others, the plant was venting radioactive steam at the time.

An angry Mr. Scranton returned at 6 p.m. to say: "Metropolitan Edison has been giving you and us conflicting information."

Asked why reporters were not told about the venting, Metropolitan Edison vice president Jack Herbel

said, "They didn't ask."

But the company wasn't alone in rosy statements. A Nuclear Regulatory Commission staffer said the accident "wasn't close to a catastrophe."

The next day, Metropolitan Edison President Walter Creitz said the plant was safely shut down. In reality, it was leaking radioactivity and staying stubbornly hot.

All trust disintegrated with a new burst of radiation Friday, which prompted the public to flee a nuclear reactor for the first time.

At 10 p.m., dishes in the sink and clothes in the washer after Mr.

Thornburgh advised pregnant women and young children within five miles of the plant to leave. An unauthorized "Jill Defense alert" walked early to Harrisburg.

"We are operating almost totally in the blind," NRC Chairman Joseph Hendrie said that morning. "It's like a couple of blind men staggering around making decisions."

The neighbor seeking answers honed to ask a reporter about the newsmag's wife and two children. Told they had gone to visit relatives, the neighbor hung up without a good-bye. Then her car was heard speeding away.

A reporter could cover a Metropolitan Edison news conference at American Legion Post 594, head down the street to hear the NRC and then drive back to Harrisburg to get the state version.

At one of these entry sessions, with reporters asking questions while standing or folding chairs, Mr. Herbel said: "I don't know why we need to tell you each and everything we do."

Desperate for facts, Mr. Thornburgh sought White House help. It sent as its spokesman Harold London of the NRC, whose soothing Southern drawl and grasp of reactors

helped calm things down.

The White House also put a gag order on Metropolitan Edison so only one story would come out. President Carter visited on Sunday, to reassure a jumpy populace while technicians worked to remove the bubble.

Metropolitan Edison said the bubble was gone the next day. A company official repeated this over the phone to four reporters before they felt comfortable with the information.

The NRC confirmed Tuesday that the bubble was gone and six days later declared the crisis over.

Costly experience for utility which has since turned around

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At 4:30 p.m. on March 26, a Wednesday, Three Mile Island worked like a giant tea kettle making steam for electricity from its well-fired reactor. Then a balky valve caused two pumps to shut off, which halted a steam turbine and stopped the chain reaction within the reactor.

Over 1,000 tons of uranium stizzled with focus heat, and a relief valve opened to reduce pressure as the emergency cooling system flooded the reactor with water. But the valve stuck and stayed open for two hours, draining vital coolant water and leaking radiation into the air.

Operators looking at a faulty gauge mistakenly shut off the emergency

cooling system. "There have been no recordings of any significant levels of radiation, and none are expected off site," says James Blaine Fabian said.

Lt. Gov. William Scranton III reassured reporters at an 11 a.m. briefing that "everything is under control." Unknown to him or reporters, the plant was venting radioactive steam at the time.

An angry Mr. Scranton returned at 4:30 p.m. to say: "Metropolitan Edison has been giving you and us conflicting information."

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Costly experience for utility which has since turned around

PARSIPPANY, N.J. (AP) — Operators of the Three Mile Island power plant in Pennsylvania avoided a nuclear disaster, but the accident was a financial catastrophe for its owner, General Public Utilities Corp.

Yet a decade later, a plaque hangs in the company's lobby, recognizing it as the 1986 Electric Utility of the Year by the trade publication Electric Light & Power.

"It's been an amazing turnaround," said Mark Luftig, a utility analyst at the investment firm Salomon Brothers Inc.

General Public Utilities lost \$172 million on revenue of \$1.49 billion the year of the accident. After paying a dividend of \$1.20 a share for 1979, the company halted dividends for the next eight years, costing stockholders an estimated \$800 million. Its stock price plunged from \$18 a share to a low of \$1.37 1/2.

The company initially had to spend \$24 million a month to buy replacement power from other utilities. It also abandoned a power plant in the early stages of construction after spending a third of the expected \$1.3 billion cost.

But the utility, which provides electricity to 4.2 million people in New Jersey and Pennsylvania, cut costs with a leaner operating structure, and it finally won permission to restart an undamaged nuclear reactor at Three Mile Island in 1985.

The company also was able to work out a cost-sharing plan for the \$1 billion cleanup of the damaged reactor in which it is paying about a tenth of the cost. Insurance, its customers, federal and state governments and the nuclear industry pay the rest.

By last year, General P. U. Utilities had boosted its after-tax profit to \$283.8 million on \$2.83 billion in revenue and its stock price topped \$34 a share.

Issues still facing the company are the more than 1,100 personal injury suits pending from the accident and the need to start preparing for the cost of decommissioning the Three Mile Island complex.

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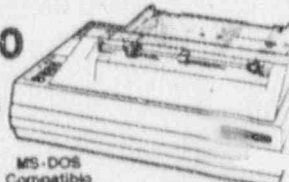
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Barry violated the city's financial disclosure act and should be fined for failing to report a hidden real estate partnership with developer Jeffrey N. Cohen, according to sources.

Marianne Coleman Niles, who heads the city's campaign finance office, has determined that a promissory note the mayor signed in 1985 when he bought an interest in a Nantucket, Mass., building constituted an interest-free loan from the real estate partnership, the sources said.

\$49,000 over 10 years for a 10 percent interest in the building.

In a meeting yesterday with the mayor's legal counsel, Herbert O. Reid Sr., Niles asked that the mayor pay a fine and amend his financial disclosure forms, the sources said.

The amount of the fine discussed yesterday could not be determined, but the mayor could face a maximum penalty of \$1,500. The mayor did not report the partnership on

CRIMINAL SOURCE, SOURCES SAID.

According to sources, Reid did not tell Niles whether the mayor would agree to the sanctions and emphasized that Barry did not intend to violate any law. Reid argued that the promissory note, a common element of real estate partnerships, was not a loan but simply an agreement by Barry to pay his \$49,000 interest in installments, according to sources.

Barry meets with business group critical of city's leadership. Page C1

Reid declined to comment on the meeting, saying the discussion was confidential.

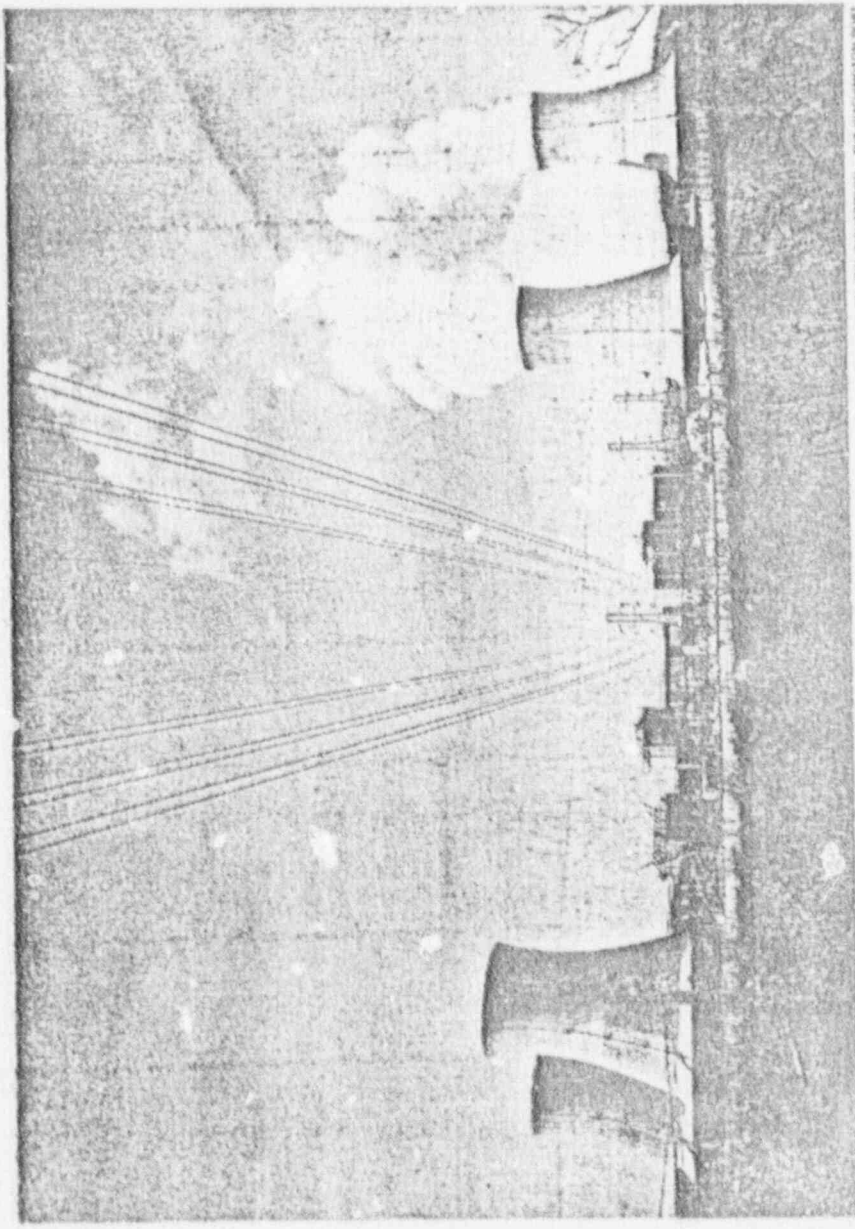
John C. White, the mayor's spokesman, said "We are not in receipt of any report" from Niles' office.

"Until we receive a report of their findings, we have no comment," White said. The mayor also

See DISCLOSURE, A10, Col. 2

See GRAY, A11, Col. 4

Bush staff workers sue to rubdown drug-testing. Page 2



Power lines extend from Three Mile Island, where damaged Unit 2, left, may sit in "monitored storage" for 90 years. BY JOE ROUBINSON—THE WASHINGTON POST

A Decade After Accident, Legacy at TMI Is Mistrust

By Cass Peterson
Washington Post Staff Writer

GOLDSBORO, Pa.—Bill Whittock was among the first to suspect there was a problem. Alone in his house on the west side of the Susquehanna River, he was awakened in the predawn hours by a roar that sounded "like a big jet airplane."

Whittock looked out the window, toward the river and the light-angled towers of the Three Mile Island Nuclear Power Plant.

"I saw this big plume of steam going up in the air," he said. "It blew for about 10 minutes, then it stopped, and then it roared again. Then it stopped and everything got quiet."

It was shortly after 4 a.m. Wednesday, March 28, 1979. Unknown to Whittock, the new-

er of Three Mile Island's two nuclear units had suffered the worst accident in the history of the U.S. civilian nuclear industry.

A malfunctioning pump, a steam valve and a series of operator errors had combined to drain water from the core of the reactor, exposing its intensely hot and highly radioactive fuel rods. In a rush vernacular, the reactor had suffered a "LOCA"—a loss-of-cooling accident—so perilous that it is the "worst-case scenario" in the safe manuals.

It was the start of three decades that shook the nuclear industry and of weeks of fear and frustration for residents of this scenic river valley, many of whom fled their homes without knowing exactly what danger they were escaping.

The nuclear industry continues to

See TMI, A8, Col. 1

Predecessor,

Room Testimony Ruling | Smokers' Rights in Md.

INSIDE

Mexicans Await 'Brady Plan'

O. Doherty See It Falling Short

A Decade After Accident, Legacy at Three Mile Island Is Mistrust

TMI, From A1

... that their fears were unwarranted. The containment features of the reactor worked, holding in what utility officials estimate was 18 billion curies of radioactivity—more than 100 times the amount believed to have been released in the 1986 nuclear accident at the Chernobyl reactor in the Soviet Union. Unlike that accident, which took 31 lives, no one died as an immediate result of the TMI accident. But something else did die in central Pennsylvania: trust.

There has been a great loss of confidence in this community as far as people in authority having the answers," said Joyce Corradi, who became an activist against the plant because an activist against the plant after the accident. "I'm not sure how I know what to believe."

... at 2 reactor, crippled beyond repair and nearing the end of a \$1 billion cleanup in a tourist attraction today. Its sister reactor, was prefabricated in 1985 after

opponents lost a bid to the Supreme Court to keep it closed.

But resentments still smolder among some residents who found themselves playing unwanted roles in a week-long nightmare.

At the heart of their concerns is whether the accident, and the occasional releases of radioactivity in its aftermath, will have long-term health effects. Every officially sanctioned health study has concluded the risk is minimal.

Still, residents here remember that the experts had said an accident like the one at TMI could not happen, and initially described it as a minor malfunction. Instead, virtually every new piece of information about the accident in the last decade has indicated that damage within the reactor was far more severe than expected.

"I think there is still an element of people who are frightened by nuclear power," said Ann D. Trank of Middletown, a civic leader and mother of six who served as a mem-

ber of the President's Commission on the Accident at Three Mile Island. "I don't think people have changed their minds that much."

The crisis in confidence began almost as soon as the accident did. On Wednesday, March 28, hours after the core had collapsed into rubble, Lt. Gov. William W. Scranton repeated at a news briefing to say that Metropolitan Edison, the plant's owner, had assured the state that "everything is under control."

By afternoon, Scranton had altered his statement. The situation, he said, was "more complex than the company first led us to believe."

By Friday, the stage had been set for full-scale panic. Officials were still issuing reassuring statements about the status of the reactor, but schools had been closed, day-care centers were being urged to stay indoors, and farmers were being warned to keep their animals under cover and on stored feed.

Then, two things happened: First, on the advice of Nuclear Regulatory Commission (NRC) Chairman Joseph Hendrie, Gov. Dick Thornburgh recommended that pregnant women and small children leave the area. Second, concern surfaced about a gaseous "bubble" in the reactor that appeared to pose the hazard of an explosion.

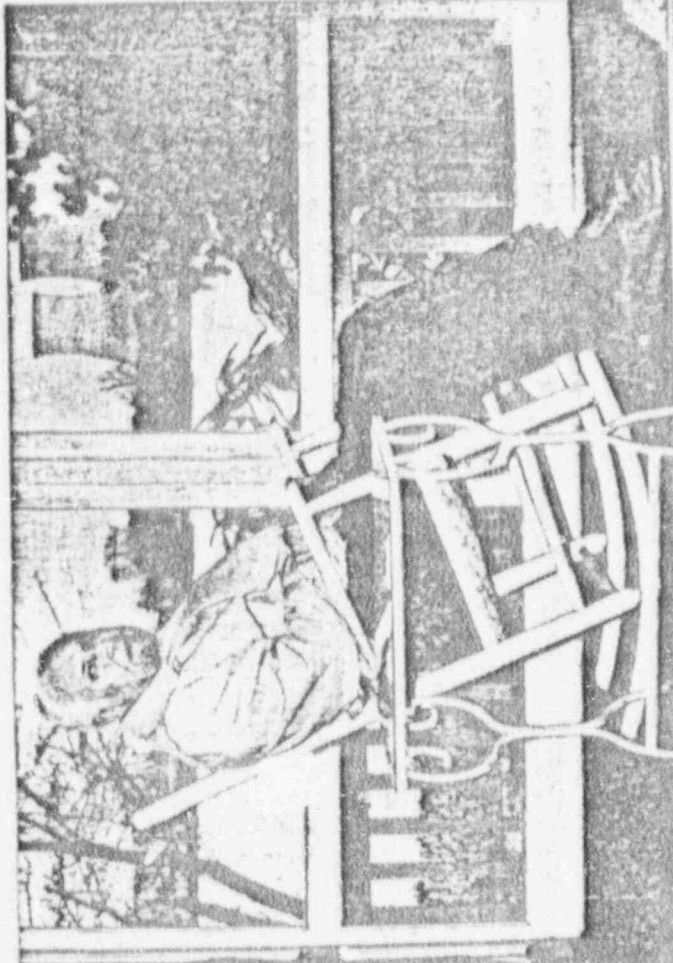
Corradi, who runs a day-care center and was at home with several preschoolers, captures the situation with fine understatement: "I had the feeling that they didn't have a handle on what was going on."

Corradi and her family fled to her mother's home, 40 miles away. Shortly after arriving there, she said, her 9-year-old son vomited "vile green slime."

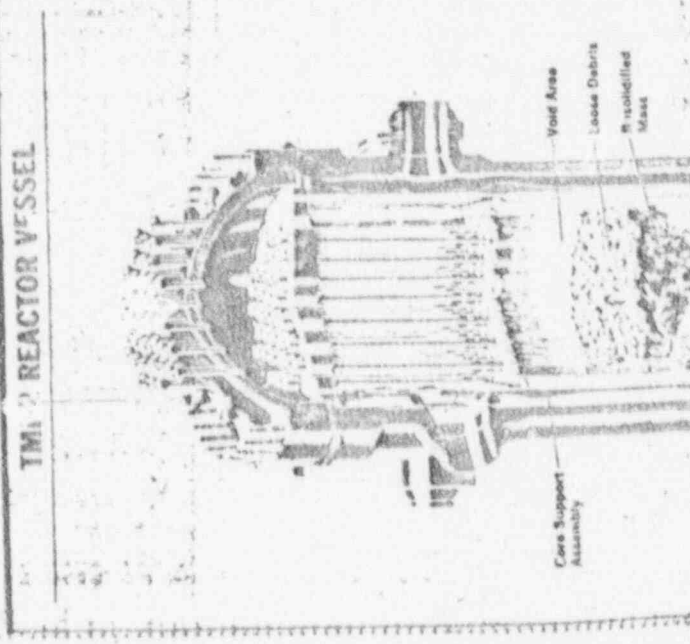
U.S. doctors told her it was nothing—perhaps stress, maybe something the boy ate. A Japanese doctor who came to Middletown with several colleagues later told her the incident was "a classic symptom of radiation sickness."

Ten years later, Corradi's son is in college and apparently healthy. The Corradis were not among those who filed more than 2,000 physical injury lawsuits against Met Ed. Corradi still isn't sure which of the conflicting medical opinions she believes.

But the incident, like other vague and unexplained symptoms suffered



Three Mile Island neighbor Bill Whitlock was awakened 10 years ago by a roar from the plant "like a jet airplane."



The Continuing Cleanup \$1 Billion and Counting

MIDDLETOWN, Pa.—The last layer of debris still rests on the bottom of the steel reactor vessel at Three Mile Island Unit 2. An underwater camera panning slowly through the muck at the vessel floor shows shattered fuel rods and e-4 bits of metal.

The images flicker across television monitors like old nightmares. Here a broken fuel tube, its ceramic-coated uranium pellets spilled into the dark sludge below, there a blob of some undefinable substance, contorted by temperatures that soared over 5,000 degrees Fahrenheit.

A decade after an accident lurked at the heart of a \$700 million nuclear reactor into 150 tons of radioactive rubble, cleanup operations are continuing at TMI-2. Bit by painstaking bit, round-the-clock crews here have removed more than two-thirds of the debris, packed it into shielded canisters and loaded it into special casks for shipment to the federal nuclear reservation at Idaho Falls.

Shortly after the accident, some nuclear experts estimated that the cleanup would cost around \$40 million and that the plant ultimately would be repaired and put back in service.

By illusions about future operations at TMI-2 were dashed as technicians knelt their first look at internal damage, several years after the accident. Where officials expected to find a damaged core, there was a void. The part of the core left uncovered by cooling water had simply melted and resolidified several feet down like a pool of candle wax. By some estimates, the core was 30 minutes away from melting through the eight-inch-thick steel reactor vessel when cooling water was finally restored.

The cleanup, nearly two years from completion, so far has cost about \$1 billion.

The cost reflects the intricacy of the operation. Workers standing atop the reactor vessel maneuver specially designed tools at the end of 40-foot poles through the cloudy water covering the core. Despite their heavy protective clothing, workers cannot peer directly into the

vessel or linger long at the edge of the narrow openings that admit their tools.

The task also has required exotic technology, such as the plasma arc torch now being used to cut apart five two-inch-thick stainless steel grids in the lower part of the vessel. Workers must remove the grids to get at core material that slumped to the bottom of the reactor.

The costs associated with the TMI accident don't stop there. Like dozens of other nuclear installations, TMI-1 has been forced to upgrade its operations, equipment and training programs to reduce the likelihood of a similar catastrophe.

Before the accident, there were 350 workers involved in operating both reactor units on the island. Today, 800 employees are involved in operating TMI-1 alone. General Public Utilities-Nuclear spokeswoman Carol Clawson said control-room operators spend one-fourth of their time in training, much of it in simulated control rooms grappling with a variety of potential malfunctions.

The control room has been changed as well, down to the detail of painting instrument panels a different color to enhance the visibility of warning lights.

Across the back wall of the control room is a solid panel of lights attached to systems that monitor crucial pumps, valves and other equipment. The panel allows operators to check the status of the entire reactor at a glance.

During the TMI accident, at least one crucial gauge was not visible to operators. About 20 steps away from the main operator's seat, facing away from the control room, was a gauge that would have warned operators that a pressure relief valve had stuck open and was draining water from the core.

Clawson, standing in the control room where the drama started a decade ago, pointed out the gauge. "If they'd looked at it," she said, "they would have known right away what the problem was."

—Cass Peterson

doors in three control rooms. TMI-1 MacLeod was always to be placed, and the state epidemiology director concluded in 1981 that the accident would cause "no significant physical health effects."

Federal agencies have reached similar conclusions, generally basing their conclusions on estimates of radiation released in the early hours of the accident. Many citizens remain unconvinced. The results of a Columbia University study, the first comprehensive look at cancer incidence in the area, are expected later this year. Few expect the findings to clear the air.

"I hold my breath every time my son goes for a physical," Corradi said. "I hold my breath when I think of him having children."

The concern stems from uncertainty over how much radioactivity was released during the accident, and each revelation from the innards of the damaged reactor has raised new questions.

Met Ed estimated initially that less than one percent of the fuel rods were damaged as internal temperatures rose above 2,000 degrees Fahrenheit. When technicians penetrated the core with remote cameras, they found far more extensive damage. By the time they had worked their way to the bottom of the rubble-strewn reactor vessel, the estimate stood at 50 percent fuel melt, at temperatures that exceeded 5,000 degrees.

Because vent monitors malfunctioned during the accident, there is no documentation of actual releases. Technical experts had to estimate releases by analyzing data collected after the accident.

Temperatures inside the reactor could have affected how much of the radioactive material was volatilized, and thus was able to escape the vessel through vents, Corradi says. Estimates of radiation releases should be recalculated, taking into account the accident's severity.

"We had an accident. It was severe," she said. "We were not told the truth, and you cannot sweep these things under the carpet."

Other residents consider the issue an old wound that should be left alone to heal.

"If there's something to be found out, I think it'll be very long-term," said Middletown resident Dennis Stover. "They don't know how much was released or how much wasn't. What happened in that 72-hour period? Who knows? Which way was the wind blowing?"

Stover, who says the news media "grossly distorted" stories about the accident, was working in a clothing

store living in an old-fashioned Main Street. "I would say they're apathetic, but TMI is there, and so what?"

"You have to have confidence in the person who's telling you." In the last decade, the nuclear in-

THREE MILE ISLAND: A CHRONOLOGY

March 28, 1979: Three Mile Island Unit 2, on line for just three months and operating at full power, automatically shuts down when a pump bringing cooling water to the reactor core stops functioning. Unknown to operators, valves for backup pumps have been closed. A pressure relief valve in the reactor opens as designed, but fails to close when pressure returns to normal. Water needed to cool the reactor core continues to gush through the open valve and eventually the core is uncovered.

The accident lasts about five hours, as operators repeatedly misread control signals and shut off new cooling water. By the third hour, parts of the core have begun to melt from their own heat.

March 29: Although the accident is over, the drama is not. Metropolitan Edison, TMI's operator, says that less than one percent of the fuel has been damaged in the accident. But "bubbles" of gas have formed in the reactor's coolant system and traces of radioactive iodine have been detected in nearby communities. Gov. Dick Thornburgh directs local residents to stay indoors, with windows closed.

March 30: On the advice of Nuclear Regulatory Commission Chairman Joseph Hendrie, Thornburgh advises evacuation for an estimated 3,500 pregnant women and children living within five miles of the plant. Nearly 200,000 people flee their homes, some for several weeks.

April 9: NRC officials declare that the "crisis is over." Thornburgh lifts orders closing nearby schools and says it is safe for pregnant women and young children to return.

May: The reactor is declared in "cold shutdown."

Oct. 23: The NRC fines Metropolitan Edison, TMI's operator, \$155,000.

Oct. 30: The President's Commission on the Accident at Three Mile Island ("the Kemeny Commission") releases its report, pointing to poor training as a key factor in the accident and recommending dozens of changes in the operation and regulation of nuclear plants.

July 1980: More than 40,000 curies of radioactive gases are vented from the reactor building in preparation for cleanup crews.

May 1982: The first television inspection of the reactor vessel shows that damage is worse than expected. Dozens of fuel rods have shattered and melted, forming a molten mass below a void in the center of the vessel.

Nov. 7, 1983: Metropolitan Edison is indicted for falsifying leak rate data at TMI-2 and for destroying documents before the accident.

Feb. 29, 1984: Metropolitan Edison pleads guilty to one count and no contest to six counts of the 17-count indictment.

May 29, 1985: NRC votes 4 to 1 to restart TMI-1, the reactor's undamaged sister, which was down for refueling at the time of the accident. The plant is restarted in October.

September 1985: Still probing the damage inside the reactor, workers find a mound of rubble at the bottom of the vessel. The discovery leads to new estimates of the accident's severity. Core temperatures reached 5,000 degrees Fahrenheit, as much as 50 percent of the fuel melted.

October 1985: The slow process of "defueling" the reactor begins. Workers start removing the fuel mass and packaging it for shipment to the federal nuclear reservation near Idaho Falls.

July 1986: General Public Utilities Nuclear (Metropolitan Edison's new subsidiary for nuclear plants) proposes to dispose of 2.3 million gallons of mildly radioactive water from the accident by evaporating it. The request is pending.

December 1986: General Public Utilities-Nuclear announces it intends to put TMI-2 in monitored storage at the end of the cleanup.



ings in monitored storage to 900 years, and by seeking NRC approval to get rid of million gallons of mildly radioactive water from the accident by evaporating it.

Many residents had thought cleanup meant dismantling the reactor. "The basement is still highly radioactive that at human level is impossible," said Eric Epstein, TMI Alert, a citizens organization formed more than two years before the accident. "We're just not comfortable with leaving a high-level/low-level radioactive waste dump in the middle of the Susquehanna River."

The evaporation plan also drawn fire because the complex pre-treatment process cannot move tritium, which binds to water and will be evaporated into the air with the water.

"We're going to get a dose of it," said Whitlock, a retired civil engineer. "They just keep giving these doses. I'm old enough probably won't bother me, but I worry about young people, get these low doses all the time."

Carol Clawson, GPU vice president for communications, said water is so slightly contaminated that it could be discharged directly into the Susquehanna under NRC regulations—a plan that was dropped because of concerns the public would be upset.

"People here feel strongly about this," she said. "People here will not be out protesting something else if it weren't for the accident. They really feel strongly."

Yet as strongly as they feel about the accident, the misinformation and the trauma, many residents here go out of their way to express support—or at least ambivalence—about nuclear power. Most cite other concerns: acid rain, which has been blamed for damaging some of the state's finest trout streams; global warming.

Bill Whitlock says that he would not have bought his spacious riverside home more than 20 years ago if he had known a nuclear plant would become his neighbor and GPU has done little to restore his trust.

"I don't believe too much of what they say," he said.

But on the subject of TMI's continued operation, Whitlock says they close the plant down now, "it's in terrible shape for electricity. You have to look at it objectively."

"We're still concerned, but we're resigned," he said. "My father-in-law says that you get used to hang if you hang often enough."

GENERAL PUBLIC UTILITIES-NUCLEAR DIVISION—THE BARRINGTON PLANT

The Continuing Cleanup: \$1 Billion and Counting

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The control room has been changed as well, down to the details of instrument panels and color to enhance the visibility of warning lights.

Across the back wall of the control room is a solid panel of lights attached to systems that monitor crucial pumps, valves and other equipment. The panel allows operators to check the status of the entire reactor at a glance.

During the TMI accident, at least one crucial gauge was not visible to operators. About 20 steps away from the main operator's seat, facing away from the control room, was a gauge that would have warned operators that a pressure relief valve had stuck open and was draining water from the core.

Clawson, standing in the control room where the drama started a decade ago, pointed out the gauge. "If they'd looked at it," she said, "they would have known right away what the problem was."

—Cass Peterson

But like the initial word on the accident itself, subsequent reports on health effects have been in conflict.

A year after the accident, Pennsylvania Health Secretary Gordon MacLeod found an abnormal number of thyroid problems in newborns in three counties surrounding TMI. MacLeod was abruptly replaced, and the state epidemiology director concluded in 1981 that the accident would cause "no significant physical health effects."

Federal agencies have reached similar conclusions, generally basing their conclusions on estimates of radiation released in the early hours of the accident. Many citizens remain unconvinced. The results of a Columbia University study, the first comprehensive look at cancer incidence in the area, are expected later this year. Few expect the findings to clear the air.

"I hold my breath every time my son goes for a physical," Corradi said. "I hold my breath when I think of him having children."

The concern stems from uncertainty over how much radioactivity was released during the accident, and each revelation from the innards of the damaged reactor has raised new questions.

Met Ed estimated initially that less than one percent of the fuel rods were damaged as internal temperatures rose above 2,000 degrees Fahrenheit. When technicians penetrated the core with remote cameras, they found far more extensive damage. By the time they had worked their way to the bottom of the rubble-strewn reactor vessel, the estimate stood at 50 percent fuel melt, at temperatures that exceeded 5,000 degrees.

Because venting and malfunctioned during the accident, there is documentation of actual releases. Technical experts had to estimate releases by analyzing data collected after the accident.

Temperatures inside the reactor could have affected how much of the radioactive material was volatilized, and thus was able to escape the vessel through vents. Corradi says estimates of radiation releases should be recalculated, taking into account the accident's severity.

"We had an accident. It was severe," she said. "We were not told the truth, and you cannot sweep these things under the carpet."

Other residents consider the issue an old wound that should be left alone to heal.

"If there's something to be found out, I think it'll be very long-term," said Middletown resident Dennis Stover. "They don't know how much was released or how much wasn't. What happened in that 72-hour period? Who knows? Which way was the wind blowing?"

Stover, who says the news media "grossly distorted" stories about the accident, was working in a clothing

"As quick as they're [homes] on the market, they're sold," he said.

Civic leader Trunk agrees that life has returned to normal in Middletown, a serene community of 10,000 with a turn-of-the-century charm and prosperous-looking stores lining an old-fashioned Main Street. "I won't say they're apathetic, but TMI is there, and so what?"

major reason was that an engineer who teaches State campus in Harrisburg home a radiation levels near their homes.

"He didn't find anything," said Trunk. "You have to have a person who's telling the truth. In the last decade,

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March 28, 1979: Three Mile Island Unit 2, on line for just three months and operating at full power, automatically shuts down when a pump bringing cooling water to the reactor core stops functioning. Unknown to operators, valves for backup pumps have been closed. A pressure relief valve in the reactor opens as designed, but fails to close when pressure returns to normal. Water needed to cool the reactor continues to gush through the open valve and eventually the core is uncovered.

The accident lasts about five hours, as operators repeatedly misread control signals and shut off new cooling water. By the third hour, parts of the core have begun to melt from their own heat.

March 29: Although the accident is over, the drama is not. Met Ed's operator, says that less than one percent of the core has been damaged in the accident. But "bubbles" of gas have formed in the reactor's coolant system and traces of radioactive iodine have been detected in nearby communities. Gov. Dick Thornburgh directs residents to stay indoors, with windows closed.

March 30: On the advice of Nuclear Regulatory Commission C Joseph Mendre, Thornburgh advises evacuation for an estimated 15,000 people living within five miles of the plant. 200,000 people flee their homes, some for several weeks.

April 5: NRC officials declare that the "crisis is over." Thornburgh orders closing nearby schools and says it is safe for pregnant women and young children to return.

May: The reactor is declared in "cold shutdown."

Oct. 25: The NRC fines Metropolitan Edison, TMI's operator, \$

Oct. 30: The President's Commission on the Accident at Three Mile Island (the Kemeny Commission) releases its report, pointing to poor operation and regulation of nuclear plants.

July 1980: More than 40,000 curies of radioactive gases are vented from the reactor building in preparation for cleanup crews.

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September 1985: Still probing the damage inside the reactor, a mound of rubble at the bottom of the vessel. The discovery is estimates of the accident's severity. Core temperatures reached 5,000 degrees Fahrenheit, as much as 50 percent of the fuel melted.

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July 1986: General Public Utilities-Nuclear (Metropolitan Edison subsidiary for nuclear plants) proposes to dispose of 2.3 million gallons of radioactive water from the accident by evaporating it. The plan is pending.

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said, 'We're staying,'" she said.
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most of them related to how it
to wrap up the TMI-2 cleanup. The
company angered residents by an-
nouncing that it intended to leave
the reactor vessel and other build-
ings in "monitored storage" for up
to 90 years, and by seeking the
NRC's approval to get rid of 2.3
million gallons of mildly radioactive
water from the accident by evap-
orating it.

Many residents had thought that
cleanup meant dismantling the re-
actor. "The basement is still so
highly radioactive that human entry
is impossible," said Eric Epstein of
TMI Alert, a citizens organization
formed more than two years before
the accident. "We're just not com-
fortable with leaving a high-
level/low-level radioactive waste
dump in the middle of the Susque-
hanna River."

The evaporation plan also has
drawn fire because the company's
pre-treatment process cannot re-
move tritium, which binds to water
and will be evaporated into the air
with the water.

"We're gonna get a dose of that,"
said Whittlock, a retired civil en-
gineer. "They just keep giving us
these doses. I'm old enough, it
probably won't bother me, but I
worry about young people, getting
these low doses all the time."

Carol Clawson, GPU vice pre-
sident for communications, said the
water is so slightly contaminated
that it could be discharged directly
into the Susquehanna under NRC
regulations—a plan that the utility
dropped because of concerns that
the public would be upset.

"People here feel strongly about
this," she said. "People here would
not be out protesting something
else if it weren't for the nuclear
plant. They really feel strongly."

Yet as strongly as they feel about
the accident, the misinformation
and the trauma, many residents
here go out of their way to express
support—or at least ambivalence—
about nuclear power. Most cite oth-
er concerns: acid rain, which has
been blamed for damaging some of
the state's finest trout streams, or
global warming.

Bill Whittlock says that he would
not have bought his spacious river-
side home more than 20 years ago
if he had known a nuclear power
plant would become his neighbor,
and GPU has done little to recipi-
tate his trust.

"I don't believe too much of what
they say," he said.

But on the subject of TMI's con-
tinued operation, Whittlock says: "If
they close the plant down now, we'll
be in terrible shape for electricity.
You have to look at it objectively."

"We're still concerned, but we're
resigned," he said. "My father used
to say that you get used to hanging
if you hang often enough."

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March 30: On the advice of Nuclear Regulatory Commission Chairman Joseph Hendrie, Thornburgh advises evacuation for an estimated 3,500 pregnant women and children living within five miles of the plant. Nearly 200,000 people flee their homes, some for several weeks.

April 9: NRC officials declare that the "crisis is over." Thornburgh lifts order closing nearby schools and says it is safe for pregnant women and young children to return.

May: The reactor is declared in "cold shutdown."

Oct. 25: The NRC fine, Metropolitan Edison, TMI's operator, \$155,000.

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