NUCLEAR PROGRAM REVIEW

Task Force on Nuclear Safety
Tennessee Valley Authority
May 1979

TO : Leon E. Ring, General Manager

FROM : S. David Freeman, Chairman
Richard M. Freeman, Director

DATE : June 1, 1979

SUBJECT: TVA NUCLEAR PROGRAM REVIEW

We have reviewed the Task Force report entitled "TVA Nuclear Program Review." We approve its recommendations and direct that they be undertaken at once.

We believe that this report should be given widespread distribution both within and outside TVA. We encourage TVA employees to feel entirely free to discuss publicly the nuclear power and nuclear safety issues.

S. David Freeman

Richard M. Freeman

PREFACE

This draft report was prepared by the special task force appointed by the TVA Board to make recommendations relating to TVA's nuclear program in light of the Three Mile Island Nuclear Plant accident. The task force members are:

David G. Powell, Executive Assistant to the General Manager - Chairman

Ernest A. Belvin, Jr., Acting Director, Occupational Health and Safety

H. J. Green, Chief, Nuclear Generation Branch

Carlyle Michelson, Principal Engineer for Nuclear Systems Analysis

Dwight R. Patterson, Chief, Mechanical Engineering Branch

Sue E. Wallace, Chief, Planning and Analysis Branch, Division of Personnel

David G. Powell
David G. Powell

Carlyle Michelson
Carlyle Michelson

E. A. Belvin
Ernest A. Belvin, Jr.

Dwight R. Patterson
Dwight R. Patterson

H. J. Green
H. J. Green

Sue E. Wallace
Sue E. Wallace

INTRODUCTION

On March 29, 1979, at the direction of the TVA Board, the TVA General Manager directed the TVA staff to follow closely the Nuclear Regulatory Commission's investigation of the Three Mile Island Nuclear Plant accident, to review equipment, design, procedures, and staffing in TVA's nuclear plants, and to report its findings to the Board as soon as possible.

As a result, TVA's nuclear program has been under intensive review to determine the lessons we could learn from the Three Mile Island accident, the current status of the TVA safety program in light of those lessons, and changes which could be made to improve the program.

Several improvements are recommended in organization and management of the program. The most significant is the formation of an independent safety review staff outside the power, construction, and design organizations which has direct access to the TVA Board of Directors. Another very important change is to create a separate organization for nuclear generation within the Office of Power to concentrate on its unique problems, and to consolidate nuclear safety and nuclear engineering functions into a new nuclear engineering branch in the design organization.

Significant changes to the nuclear plant operator selection and training program are recommended. These changes will require more stringent intelligence tests in the recruiting of candidates, more intensive training over

several years, and an increase in the salaries of operators to a level that will recognize the professional status of the nuclear plant operator. Current operators and trainees will be required to meet the new standards.

Nuclear plant support will be improved by the recommendation that an emergency response team be dispatched to a plant experiencing an emergency to assist in managing operations and in communicating with other TVA experts.

Exposures of TVA employees to radiation in nuclear plants will be reduced with the recommendation that the current TVA limit of 5 Rem per year be lowered to 4 Rem per year.

Emergency planning will be improved with the recommendation that contingency planning for evacuating or sheltering people in the event of a nuclear accident be extended out to 10 miles.

Several design changes are recommended in light of the Three Mile Island accident which will improve the safety of TVA nuclear plants.

TABLE OF CONTENTS

	Page
Preface	i
Introduction	ii
I. Organization and Management of the Nuclear Power Program	1
A. Nuclear Safety Review Staff	2
B. Plant Operations and Staffing	4
C. Engineering Design Staffing	6
D. Differing Staff Opinions	7
II. Operator Selection, Training, and Staffing	9
Current Situation:	
A. Selection and Training	9
B. Staffing	11
Recommendations:	
A. Selection and Training	12
1. Selection	12
2. Training	13
B. Staffing	15
1. Emergency Response Team	15
2. Communications	15
III. Radiation Standards for Employees	17
IV. Nuclear Plant Design and Operation	19
A. Design Changes to Enhance Safety	25
1. Status Monitoring of Main Line Process Components	25
2. Primary System Venting	27
3. Primary System Water Level Monitoring	29
4. Advanced Core Monitoring for Normal Operation	31
5. Containment Isolation	32
6. Sampling and Radiation Monitoring Systems	35
7. Stuck-open Pressurizer Relief Valve	37

Page

B. Design Matters for Further Study - Small Break Loss of Coolant Accidents 39

C. Operational Feedback 41

V. Emergency Planning 44

A. Evacuation Contingency Plans 44

B. Communications Facilities 46

C. Emergency Offsite Environmental Monitoring 47

D. Public Reporting of Problems at Nuclear Plants 49

Appendix

Attachment

I. ORGANIZATION AND MANAGEMENT OF THE NUCLEAR POWER PROGRAM

Any nuclear power program must be safety-minded. In TVA, the Offices of Power and Engineering Design and Construction are charged with the primary responsibility for safety. The TVA Board, however, bears the ultimate responsibility for safety.

In order to provide the Board with an independent review on safety, an independent safety staff will be formed. Such a staff is needed because there is an inherent conflict between production costs and safety concerns, and the Board needs advice from experts whose sole concern is safety in order to be sure that safety gets the highest priority. This Nuclear Safety Review Staff will report to the Board through the Manager of Health and Safety, and act independently of the design, construction, and power production organizations.

In the Office of Power, management of nuclear plants will be separated from fossil and hydro generation management, which will give the nuclear program more direct access to top management and permit a greater emphasis on safety.

In the Division of Engineering Design, a new Nuclear Engineering Branch will be formed which will strengthen and give greater management emphasis to nuclear safety during design of TVA nuclear plants, by moving the function higher in the organization.

Finally, staff members with technical or professional views which differ with those adopted by management will be able to go directly to the independent Nuclear Safety Review Staff and the Board with their concerns.

A. Nuclear Safety Review Staff

Nature of the Issue:

Nuclear safety questions should be reviewed independently of the normal engineering and operating divisions of TVA, and this review must be incorporated into the decisionmaking process. Assurance must be provided that questions of nuclear safety receive paramount consideration over and above cost and schedule requirements or operational needs of the power system.

Recommendation:

To respond to these needs, a Nuclear Safety Review Staff will be established within the Office of Management Services. This staff will act independently of TVA organizations concerned with the design, construction, operation, and support of nuclear plants, and will have broad authority to monitor, review, and audit TVA's nuclear activities.

Its purpose will be to advise the TVA Board on nuclear safety policy, reporting through the Manager of Health and Safety and the General Manager, and to advise and assist in making decisions affecting the safety of TVA nuclear plants. The staff will make recommendations for changes to enhance the safety of TVA nuclear plants.

The Nuclear Safety Review Staff will act independently to conduct onsite inspections of all phases of TVA's nuclear program, and will be staffed adequately to perform this function. It may call upon other resources and areas of expertise within Health and Safety and other TVA organizations.

Specific functions of the Nuclear Safety Review Staff include:

1. Independent review of nuclear plant design.
2. Independent monitoring of nuclear plant construction.
3. Independent monitoring of nuclear plant operations.
4. Review of nuclear plant employee training.
5. Review of radiological emergency plans.
6. Review and audit of radiation protection.
7. Investigation and review of operating events or incidents at TVA plants, or other plants.
8. Receipt and investigation of employee concerns about safety issues not adequately addressed by line management.

The staff will advise the General Manager and Board (through the Manager of Health and Safety) of its opinion as to whether nuclear plant operations should be continued where there is an issue concerning the immediate health and safety of the public or employees.

The responsibilities of the staff do not reduce in any respect the responsibility of other TVA organizations in the ongoing licensing, design, construction, operation, and monitoring of nuclear plants for safe operation. The staff's purpose will be to review problems and questions, and to provide an independent check on nuclear safety policies and their implementation.

The staff will consist of senior TVA staff members expert in various aspects of nuclear plant design, construction, and operation. It may call upon consultants as necessary. Results of reviews and recommendations will be

reported to the Board through the Manager of Health and Safety. Periodic meetings with the TVA Board will be scheduled by the Manager of Health and Safety to advise on the adequacy of the overall nuclear safety program.

B. Plant Operations and Staffing

Nature of the Issue and Current Situation:

The Division of Power Production is responsible for operation of all TVA power generation facilities--nuclear, fossil, and hydro. The Nuclear Generation Branch is one branch within the division. The fundamental organization and management of that division have not changed since TVA instituted its nuclear power program. The nuclear program has unique needs which must be dealt with in a nontraditional way, so that nuclear safety receives additional emphasis.

Recommendations:

TVA will establish a new Division of Nuclear Generation within the Office of Power, to remove nuclear generation from fossil and hydro generation management and increase the nuclear program's access to top management.

This new division will provide several opportunities to increase the emphasis on safety through staffing and management controls, which provide the most direct means for TVA to ensure the safety of its nuclear plants. Qualification requirements and compensation of nuclear plant personnel will be adjusted to attract and maintain a highly qualified operating staff so that these will

be the most sought-after positions in the operating organization. A detailed discussion on operator selection and training is in Section II.

Additional management positions will be added for better coverage on all shifts at operating plants, and additional engineering and management personnel will be required to have training equivalent to that required for a senior reactor operator license in order to better understand the operating systems.

A uniform, computer-based nuclear plant document control system for all plant systems and components will be established which will provide all levels of plant supervision with immediate access to information necessary for work planning and management. This system will be implemented at Browns Ferry, Sequoyah, Watts Bar, and Bellefonte Nuclear Plants within one year.

A complete, computer-based nuclear plant management information system will be provided in each plant which will contain information such as equipment history records for essential safety components, maintenance requests for all components, and radiation exposure records for plant employees and areas. This will help provide an early warning system for potential safety problems.

A plant services section will be established in each nuclear plant to manage this system, perform planning and scheduling functions, and relieve plant section supervisors of routine administrative duties. This will enhance plant reliability, availability, and nuclear safety and provide the plant staff with an integrated, automated system for managing the plant business.

Several of these systems will be placed at Browns Ferry and Sequoyah immediately. The entire operational support system will be in place at all nuclear plants by spring 1980. A similar system will be designed for the Nuclear Generation central office to be compatible with the nuclear plants.

C. Engineering Design Staffing

Nature of the Issue and Current Status:

TVA's design nuclear safety engineering staff has a key role in identifying and resolving potential safety problems during the detail design of TVA's nuclear plants. This requires very experienced engineers in systems analysis and interaction. With the size of the TVA nuclear program, this function needs to be expanded and reorganized for greater management emphasis on nuclear safety.

Recommendation:

The Division of Engineering Design will strengthen its nuclear engineering safety activities by separating the appropriate nuclear engineering activities and forming a new Nuclear Engineering Branch. This branch will have responsibility for overall nuclear safety of TVA's nuclear plant design. Specific attention will be given to maintaining a highly competent design staff to review design and evaluate safety issues.

D. Differing Staff Opinions

Nature of the Issue:

Every professional and technical employee should be able to have his or her professional or technical opinion heard at a high-management level, when the employee considers the issue significant and the opinion differs from a management decision.

Current Situation:

TVA employees may make suggestions and may informally express differing opinions to management. However, there has been a need for clear expression by top management that differing views are, in fact, encouraged.

Recommendation:

TVA will establish internal procedures which will assure the expression of differing professional or technical opinions concerning substantive matters that may have potential impact on public health or safety.

TVA recognizes the value of differing views concerning substantive public health and safety matters. The agency's management believes that every responsible opinion is valuable and intends to assure that such views are heard and appropriately considered in all decisionmaking processes. TVA encourages perception and voluntary expression of safety concerns associated with the design, construction, and operation of TVA nuclear plants. This policy will be communicated to all employees to encourage their cooperation and

participation at all working levels. Appropriate incentives and protective measures will be included to assure participation without fear of recrimination or retribution.

An employee may bring a concern to the Nuclear Safety Review Staff if it is not resolved by management.

II. OPERATOR SELECTION, TRAINING, AND STAFFING

Nature of the Issue:

The availability of qualified and experienced operating personnel is one of the key factors in the safe operation of nuclear power plants. Selection, training procedures, and training facilities must be adequate to provide highly trained, competent operators. Operator performance during the Three Mile Island accident demonstrated a need to review closely TVA's operator selection and training.

Current Situation:

A. Selection and Training

The selection and training of TVA nuclear plant operators is a rigorous process, extending over several years. A minimum of two and one-half years of training is required from the time a student operator enters the training program until he or she can operate a reactor. A minimum of five years of training and experience is needed before an operator can hold the top shift engineer position. The typical TVA shift engineer has 8 to 10 years' training and experience.

Candidates for TVA's Nuclear Student Generating Plant Operator program are required to be high school graduates and take the General Aptitude Test Battery. Trainees spend 16 months in classroom training at TVA's Power

Production Training Center with formal course work in physics, mathematics, chemistry, electrical and instrument theory, and equipment design and operation.

Before advancement to the lowest rank of assistant unit operator, the student must devote six months to observation and hands-on experience in the nuclear plant. Before progressing to licensed reactor operator, the student must spend a minimum of eight additional months as an assistant unit operator and undergo training on sophisticated, computerized control room simulators at the Training Center.

TVA's Power Production Training Center includes simulators which replicate the Browns Ferry Nuclear Plant and the Sequoyah and Watts Bar Nuclear Plants. The simulators offer realistic training for both normal and emergency plant conditions. Additional simulators will be added for TVA's other nuclear plants.

A key feature of the simulator training is testing of trainees on more than 100 emergency events that might occur at an operating plant. This includes events such as open relief valves, loss of coolant accidents, and failure of various safety systems or components. Because of this in-depth training, the operator not only learns to respond to these events, but also develops a fundamental knowledge of the system behavior that assists in assessing a broad range of potential events.

During this progression, the operator not only must pass the Nuclear Regulatory Commission examination but also must successfully complete both oral and written TVA examinations. The TVA examination includes non-nuclear, balance-of-plant equipment operation as well as reactor operation.

The licensed reactor operator and senior reactor operator must spend two weeks a year at the Training Center undergoing requalification training. The majority of this training utilizes the nuclear plant simulators.

Operator trainees and operators undergo psychological testing at several stages in their careers. Applicants for the operator training program are screened for medically disqualifying factors. Testing is also done before the operator's first licensing examination and every two years thereafter.

B. Staffing

Minimum staffing by licensed operators on each shift at Browns Ferry Nuclear Plant is indicated by the following table:*

	Units in Operation			
Shift Position	One	Two	Three	Type of NRC License
Shift Engineer	1	1	1	Senior Reactor Operator
Assistant Shift Engineer	1	2	3	Senior Reactor Operator
Unit Operator (i.e., Control Room Operator)	2	3	4	Reactor Operator

* Several disciplines are represented in the support staff outside the control room on each shift.

The table shows that in addition to an NRC licensed reactor operator assi[illegible] to each unit and a licensed senior reactor operator in charge of the entire plant, TVA requires an NRC licensed senior reactor operator on each shift for each operating unit. This is not an NRC requirement.

This review of operator selection, training, and staffing shows that substantial improvements can be made.

There is no provision for getting a team of skilled professionals to assist in the control room at a plant in the event of an accident, although an emergency control center is established in Chattanooga to coordinate responses to an accident.

Recommendations:

TVA will revise its operator selection and training by imposing stringent intelligence testing, giving operators the equivalent of a college education through an intensive training program, providing good pay during training, and paying salaries to operators that will attract the best people into the progr[illegible]

A. Selection and Training

1. Selection

Intelligence will be stressed as one of the most important characteristics of superior reactor operators. Intelligence distinguishes those who have merely memorized a series of discrete manual operations from those who can

think through a problem and conceptualize solutions based on a fundamental understanding of possible contingencies.

A reliable intelligence test will be included in the selection screening program. The General Aptitude Test Battery currently used predicts only academic performance while in training. An intelligence test measures both academic aptitude and more fundamental ability. Intelligence test scores and instructor evaluations of behavior while operating reactor simulators during training are the best predictors of actual control room performance.

2. Training

The student operator training program will be increased to 26 months. This will permit a more in-depth approach to academic subjects and will permit each student to receive more hands-on experience in system operation before assuming the responsibility of a skilled operator.

The prolonged formal classroom training, the reactor simulator experience, and on-the-job training will provide the equivalent of a course of study leading to a technical degree at the college level. TVA will pursue a long-range goal of having the operator training program accredited as a program culminating in a recognized academic degree or certification. Accreditation is important to emphasize the rigorous course of study required to become an operator; recognize the status of power operations as a professional discipline, and enhance the ability to attract highly qualified and

motivated candidates for the program, suited to the significant responsibilities they are asked to assume.

A more rigorous training program will be established for those selected to advance to the Unit Operator (reactor operator) level. This will require more experience in plant operation with advanced training in electrical system operation; reactor theory; normal and emergency plant operating procedures; and the interrelationships of temperature, pressure, and saturation points in the steam cycle. The time-in-grade requirements for assistant unit operators will be increased by six months, from 8 months to 14 months, to accommodate these additional training and experience requirements.

Present requalification training for licensed reactor operators and reactor operator candidates will be expanded to include a unique simulator training device for each type of TVA reactor. This will permit broader training in responding to nuclear plant abnormalities and accidents. Additional classroom training will be required to cover new material being added to the training program. Retesting will be required.

All operators and students in the training program will be required to take the basic intelligence test once it starts being used in the selection process.

Operator salaries will be increased to reflect the more rigorous training and retesting, and to reflect the professional status of reactor operators.

Many of the above recommendations involve labor-management relations and will be handled accordingly.

B. Staffing

In addition to the personnel available at each plant, a proper response to an accident may also require getting additional staff to the plant and more effective communications between the plant and TVA experts in Chattanooga and Knoxville.

1. Emergency Response Team

TVA will establish a team of skilled professionals trained to provide additional help and expertise in the control room of plants undergoing an accident. These people will be particularly valuable in communicating with engineers in Knoxville regarding specific problems and needs at the plant.

A seven-passenger, two-pilot helicopter will be based in Chattanooga on 24-hour standby equipped with night and foul-weather flying equipment to quickly transport a team to the emergency site.

All nuclear plants will be equipped with helicopter-landing facilities.

A skeleton duty team will be on 24-hour call. Each member, including the pilot, will be equipped with radio paging devices. The skeleton team can be quickly located and dispatched to the scene within four hours by the Division of Nuclear Generation Emergency Director, while a more specialized team is assembled.

2. Communications

The Radiological Emergency Plan provides for establishing a Central Emergency Control Center in Chattanooga, at the outset of an emergency at one of the nuclear plants. An area in the Edney Building is currently used as the CECC.

TVA will install a new control center in the Chattanooga office complex for TVA offices to be completed in the early 1980's. This will include the latest communications equipment for both internal TVA and external communications, with redundant equipment for communicating with each nuclear plant.

An emergency communications center will also be established in the TVA office complex in Knoxville which will provide full access to all personnel and information in the Knoxville area. Upon notification of an accident, a support team from the Division of Engineering Design will be assembled to assist the plant and the emergency center in Chattanooga.

Operator selection, training, and plant staffing will be independently monitored and reviewed by the new Nuclear Safety Review Staff

III. RADIATION STANDARDS FOR EMPLOYEES

Nature of the Issue:

Exposure of employees to radiation while working in TVA nuclear plants is of vital concern to TVA. Prudent and safe operation of these facilities demands that all radiation exposures to employees be kept as low as reasonably achievable.

Current Situation:

TVA imposed a limitation in 1977 for its employees which is substantially more stringent than that required by the NRC. Under the current TVA limitation, no TVA employee is permitted to receive a dose in any one year greater than 5 Rem. By contrast, the NRC standard permits an employee under certain circumstances to receive up to 12 Rem annually. TVA makes a strong effort to prevent an employee from receiving the full 5 Rem, and no employee has ever reached the TVA standard of 5 Rem per year.

TVA has a formal program to keep radiation exposures to employees as low as reasonably achievable. This program includes:

1. Assurance that equipment and facilities are carefully designed to reduce exposures.
2. Use of good radiation protection standards in planning.

3. Use of proper equipment by qualified, well-trained personnel.

4. Use of a formal employee suggestion plan which encourages all employees to recommend ways of doing tasks to reduce radiation exposures.

The recent reorganization of TVA gives the Director of Occupational Health and Safety the responsibility for assuring that employees are protected from job hazards, including radiation exposure. The director establishes standards and conducts independent compliance audits to assure that management and employees remain sensitive to the need to minimize exposure. This new organization will significantly improve the effectiveness of measures to control and reduce employee exposures and concentrate attention on occupational safety issues.

Recommendation:

TVA will limit exposures of TVA employees to 4 Rem per year, a reduction of 20 percent from the current TVA limit, and below any standard being considered by NRC.

IV. NUCLEAR PLANT DESIGN AND OPERATION

The accident at Three Mile Island on March 28, 1979, began with a malfunction that might be expected during normal operation of a nuclear power plant--a loss of feedwater flow. But a series of other events including a stuck-open relief valve and subsequent operator actions quickly turned this rather common operating malfunction into a much more serious problem.

The accident raised a number of specific concerns about nuclear plant design and operating procedures that should be satisfied in order to assure that TVA's nuclear plants are designed and operated in the safest possible manner.

At Three Mile Island, auxiliary feedwater valves that should have been open were closed, a fact that adequate system status monitoring equipment would more clearly disclose. The plant operators, faced with an accident that had not been adequately described in their training, were forced to rely on instruments which did not give a true picture of what was happening inside the reactor.

The operators had no instruments to indicate the level of water inside the reactor vessel. There was no means for measuring the water level in the basement of the containment building. There was no way to sample

radioactivity levels inside containment. To further compound the problem, pumps were activated to remove radioactive water from the containment building to storage tanks in the auxiliary building, an action which ultimately led to the release of radioactivity to the environment.

The ability to communicate internally and with the public was inadequate following the release of radioactivity offsite. A better means of providing information to the public concerning status of the plant, information on radioactive releases, and other vital matters in a timely and efficient way is required.

Other questions arose. During recovery from an accident, how do you vent the reactor system so hydrogen can be released and the system refilled with cooling water? How can information displays be improved to permit the operator to deal with a wider range of accident conditions?

TVA had addressed many of these issues prior to Three Mile Island. TVA has already considered problems of:

1. the operator knowing water level inside the containment building (not the reactor itself),
2. capability to adequately dispose of hydrogen inside containment,
3. adequacy of the feedwater system, and
4. the availability of the pressurizer heater following an accident.

These problems have all been previously considered by TVA and resolved by design features some of which are unique to TVA plants. No further changes are needed to satisfy these concerns. The appendix details actions which TVA

taken on these items, and reflects that TVA has long been involved in nuclear power and has never hesitated to exercise independent judgment for safety in the design of our plants over and above the legal requirements.

In fact, TVA has been actively involved with nuclear power since the early 1950's, when a number of engineers were assigned to ongoing nuclear development and commercial programs at both U.S. and foreign installations. Coincidental with TVA's first nuclear power commitment, Browns Ferry Nuclear Plant in 1966, many of these engineers returned to TVA engineering and operation organizations to provide the nucleus for TVA's staff. This experience has assisted in the development of many features to improve nuclear plant safety. The appendix identifies a number of these.

Nevertheless, the Three Mile Island accident did reveal additional matters where TVA plant design could be further improved. Work by the TVA staff points out that because of fundamental design differences between boiling water reactors and pressurized water reactors, the Three Mile Island sequence of events cannot be duplicated at Browns Ferry.

Our first concern was the plant already in operation--Browns Ferry--which is a boiling water reactor (BWR), as contrasted to the Three Mile Island Plant which is a pressurized water reactor (PWR).*

Our next most immediate concerns were Sequoyah and Watts Bar, which are almost completed. Several features of the Sequoyah and Watts Bar plants which help preclude and mitigate an event similar to that at Three Mile Island are:

1. more water in the primary heat sink (the steam generators),
2. anticipatory signals to trip the reactor following secondary system malfunctions,
3. more redundancy by having four steam generators (Three Mile Island has two) for a primary heat sink,
4. additional anticipatory signals to the backup water supply (auxiliary feedwater system) for the steam generators,

---

* BWR reactor systems are direct cycle and do not have steam generators. For BWR's, such as TVA's Browns Ferry Nuclear Plant, loss of feedwater will trip and isolate the reactor vessel, and makeup water is provided by either of two high-pressure injection systems. In the unlikely event of both high-pressure injection systems failing, the reactor may be depressurized by venting steam through multiple relief valves to a large steam condensing pool (torus) in order that one of several diverse low-pressure injection systems may be placed into service. The reactor may be maintained indefinitely in this condition with no adverse effects.

In PWR plants, the steam generators serve as the primary reactor heat sinks. Therefore, loss of main feedwater and auxiliary feedwater deprives the reactor of its main heat removal path. Sequoyah and Watts Bar Nuclear Plants are pressurized water reactors, with a different vendor (Westinghouse) than Three Mile Island (Babcock and Wilcox). As in all TVA plants, the secondary systems were designed by TVA.

5. high reliability valves with redundant power sources for the auxiliary feedwater system, and
6. primary containment isolation upon initiation of high-pressure safety injection.

Procedures at Sequoyah and Watts Bar ensure:

1. proper alignment and availability of critical systems before reactor startup,
2. adequate operating instructions and training to ensure operator recognition of, and response to, abnormal conditions, such as loss of heat sink, primary system depressurization, and natural circulation cooling,
3. appropriate conditions to prevent accidentally pumping radioactive water out of primary containment, and
4. control of hydrogen inside containment.

In view of these features, we believe Browns Ferry Nuclear plant can continue to operate, and fuel can be loaded into Sequoyah Nuclear Plant and operation commenced on the basis of the current design of the plant.

TVA has felt it essential, however, to review all TVA nuclear plants even beyond the ongoing activities of NRC, the vendors, and TVA's continued licensing activities with NRC.

This section of the report discusses a number of design concerns, and TVA recommendations for action to improve safety.

The design issues considered are:

1. Status monitoring of main line process components
2. Primary system venting
3. Primary system water level monitoring
4. Advanced core monitoring for normal operation
5. Containment isolation
6. Sampling and radiation monitoring systems
7. Stuck open pressurizer relief valves.

For the reader's convenience, a simplified diagram of a typical pressurized water reactor is attached.

A. Design Changes to Enhance Safety

The following design changes have been under consideration by TVA for some time and will be implemented as indicated.

1. Status Monitoring of Main Line Process Components

Nature of the Issue:

Certain valves in the feedwater system for the Three Mile Island plant were closed for several minutes during the accident before the operator became aware of the condition and corrected it. This situation highlighted a need for better status monitoring and information display for the plant operators. TVA has been acutely aware of this need for several years.

The operator of a nuclear plant must be sure that safety equipment is ready for operation when it is required for emergencies. To assist the operator, equipment for monitoring the status of plant systems should be provided. This equipment should provide a display of information in the main control room which keeps the operator informed of the status of plant safety systems.

Current Situation:

The design of all TVA nuclear plants except Browns Ferry already includes digital computers that are used to monitor the process status information from plant safety systems. These computers use television monitor-type displays to provide system flow diagrams to show the status of main line safety system components. The use of computer technology makes it possible to provide a great deal of data on concise displays to the plant operator.

For example, the status monitoring system at Sequoyah monitors approximately 600 status points in each reactor unit. The operator is warned of an abnormal condition by safety system status lights, abnormal indications on the TV monitor diagrams, and by alarm messages on the computer printout.

The system automatically informs the plant operator of the time remaining to restore a safety system to service. The computer also determines if more than one plant safety system is affected by a single component being bypassed or inoperative.

Recommendation:

TVA will add more status monitoring points to monitor additional components on those safety systems that are required to operate immediately after an accident. This additional monitoring should provide further assurance that the flow paths for emergency core cooling will be available, if needed.

At TVA's operating nuclear power plant, Browns Ferry, TVA will consider those design improvements which are feasible to implement on an operating plant and that will enhance the operator's ability to quickly determine the status of each safety system.

Improvements at each plant will be accomplished on the following timetable:

Browns Ferry	-	proposed improvements will be completed at the next refueling outage after July 1, 1981
Sequoyah) Watts Bar)	-	the expansion will be completed at the first refueling outage
Bellefonte) Hartsville) Phipps Bend) Yellow Creek)	-	the expansion will be completed by issue of operating license

2. Primary System Venting

Nature of the Issue:

If a small break or leak occurs in the primary reactor coolant system which results in a net loss of coolant, gases will accumulate in a void at the top of the reactor vessel and other high points in the piping. The voids will be filled with steam and/or noncondensible gases (probably hydrogen). If the accumulation is sufficiently large, the water level in the reactor vessel can become so low that circulation of water is impaired. Venting of these gases from the reactor vessel, pressurizer, and high points in the piping may be important to assuring continued heat removal and aiding in refilling the primary system following certain types of accidents, such as a loss of coolant accident from a stuck-open relief valve or a very small pipe break.

Current Situation:

Steam and gas accumulations were not considered to be of concern before the Three Mile Island accident, but the question is being reinvestigated by the NRC and reactor suppliers. TVA does not now have primary system venting capability.

Recommendation:

TVA will provide the capability to vent the reactor pressure vessel, the pressurizer, and high points in the primary system piping of each pressurized water reactor plant as a precautionary measure and as an extra margin of safety, even if it does not become an NRC requirement. The detailed design will vary from plant to plant since each nuclear steam supply system vendors' primary system designs are different. However, the general venting capability will provide that all venting operations will be conducted by the operator from the control room, and the vent system will be designed in accordance with standard safety system design practices.

These improvements will be made as follows:

Sequoyah Unit 1 - by end of second refueling

Sequoyah Unit 2)
Watts Bar Units 1 and 2) - by end of first refueling

Bellefonte and Yellow Creek - before operation

3. Primary System Water Level Monitoring

Nature of the Issue:

It is essential to maintain sufficient water in the reactor vessel to keep the reactor core adequately covered during and after loss of coolant accidents, including accidents such as those caused by a small pipe break or stuck-open relief valve. It also is important that the reactor operator be aware if water level in the reactor vessel is decreasing.

Current Situation:

There are no indicators of reactor vessel water level available to the operator in the control room for pressurized water reactors. Before the Three Mile Island accident, the slow loss of water level had not generally been perceived as a problem.

Recommendation:

To meet this need for better information concerning the level of fluid in the reactor pressure vessel, TVA will proceed with the design and installation of level measurement arrangements for all of its Pressurized Water Reactor plants. Such arrangements will provide redundant instruments that will measure water level in the reactor vessel down to the bottom of the hot leg piping. This measurement will be adequate to detect formation and growth of a large steam and/or gas bubble in the reactor vessel. It will be sufficiently accurate to provide guidance for the plant operators during certain abnormal situations such as a very small pipe break or stuck-open

relief valve resulting in loss of coolant. Level indication is already provided for boiling water reactor plants, including Browns Ferry.

A reactor pressure vessel water level indicator will alleviate concerns about misleading pressurizer level indications which might develop during such abnormal situations.

Design of a level indication system will be completed for Sequoyah and Watts Bar plants by November 1979. If NRC approves the TVA design early in 1980, the installation will be completed as follows:

Sequoyah Unit 1 - by end of first refueling outage

All other pressurized water reactors - prior to initial operation

Until direct reactor vessel level indication is provided for Sequoyah Unit 1, safe operation is permissible because safety injection will be initiated by low pressurizer pressure signals regardless of pressurizer level. Applicable instructions will also require manual initiation at the same actuation setpoints.

Operating instructions and training will also ensure that the operators do not override automatic operations of the engineered safety features except under certain circumstances. When continued operation of the engineered safety features will result in unsafe plant conditions, operators may stop operation. When the plant is clearly in a stable controlled state and engineered safeguards are no longer required, they may be stopped. In addition, the detailed instructions and implementation will be carefully reviewed by NRC before reactor operation is permissible.

4. Advanced Core Monitoring for Normal Operation

Nature of the Issue and Current Situation:

A large amount of information in the process computer of the Browns Ferry Nuclear Plant must be assimilated and assessed by the operator during both normal operation and anticipated transients. This information is not readily available in a usable form. Because of fundamental design differences, this same problem does not exist in pressurized water reactor plants.

Recommendation:

An advanced core monitoring system will be added to assist the operator at Browns Ferry Nuclear Plant during both normal and abnormal operations. This system will assimilate information about the status of the reactor core. It will provide in a more useful format information on core power distribution, coolant flow distribution, thermal limits, water level, water temperature, pressure, and quality. This information will be displayed in a digested form on a video screen in the control room. This equipment is included in the design of the Hartsville and Phipps Bend Nuclear Plants. It will be added to all units at Browns Ferry within one year.

5. Containment Isolation

Nature of the Issue:

Nuclear plants are provided with a tight containment building which completely encloses the reactor and reactor equipment. Its purpose is to prevent escape to the environment of any radioactivity which might be released from the reactor system following an accident. This requires that all openings which might provide a way for radioactivity to escape are automatically closed (containment isolation) following an accident. This closure takes place as a result of accident conditions being detected by instruments. During the Three Mile Island accident, however, radioactivity did escape through the containment structure into the environment, indicating that a review of containment isolation should be made.

Current Situation:

TVA has reviewed the primary containment isolation system design features of its operating nuclear plant (Browns Ferry) and plants under construction. In essence, every piping system through the containment building wall is provided with two separate barriers (i.e., it is sealed with double-gasketed flanges or has two isolation valves in series in the line). Isolation valves in series are closed automatically in the event of certain abnormal conditions inside the containment. The valves in series are operated by separate independent power supplies for redundancy.

The valves and the containment as a whole are tested at high pressure before operation and periodically thereafter to verify leak tightness.

For all TVA plants, the containment automatically isolates on high pressure inside containment. The high pressure is caused by the release of steam and gases into the containment from the reactor.

At all plants except Bellefonte, the containment also isolates when an accident signal is received to operate emergency reactor core cooling systems.

At all plants except Browns Ferry, if the signal that initiated emergency core cooling returns to normal and control circuits are reset to normal by the plant operator, the containment remains isolated.

Recommendations:

At Bellefonte, changes will be made to ensure containment isolation when an accident signal is received to operate emergency core cooling systems.

At Browns Ferry, changes will be made to ensure the containment remains isolated if the signal that initiated emergency core cooling returns to normal and the control circuits are reset to normal by the plant operator. Until these changes are made, operating procedures will ensure containment isolation.

At all plants, TVA will add detectors which automatically close the lines which carry radioactive water from the containment building (which houses the reactor) to the auxiliary building, when high radiation is detected. These lines go to the floor drain sump and the reactor coolant drain. This feature will prevent accidentally pumping highly radioactive water outside containment, and thus preserve containment isolation.

The schedule for this work is as follows:

Browns Ferry Sequoyah 1	)	- first possible refueling outage upon receipt of hardware
Sequoyah 2 Watts Bar Bellefonte Hartsville Phipps Bend Yellow Creek	)	- prior to startup

6. Sampling and Radiation Monitoring Systems

Nature of the Issue:

Following an accident in which fuel damage occurs, the primary system water and water and air in the containment may be highly radioactive. The sampling and radiation monitoring system must provide information on radioactivity levels and other information necessary for the operator to understand the postaccident plant conditions.

The sampling system should provide the capability for obtaining post-accident samples of (1) reactor coolant, (2) water in the containment sump or residual heat removal system, and (3) containment atmosphere. These samples should be obtainable with acceptable radiation exposure to the operator.

Current Situation:

There are no NRC requirements to provide sampling capability following an accident. However, improved designs can provide sampling stations which are accessible during a degraded accident condition* without subjecting the operator to excessive exposure.

The radiation monitoring system should also be capable of monitoring the radiation levels inside containment with a degraded accident situation. This is not a current requirement, but it can be accomplished.

---

*Condition described in NRC Document No. TID 14844.

Recommendation:

1. TVA will place a radiation monitor(s) on the residual heat removal piping system. This will provide monitoring under degraded accident conditions when the residual heat removal system is pumping from the containment sump.

2. TVA will place a radiation monitor outside containment which is capable of monitoring the radiation levels inside the containment at degraded accident conditions. A monitor now exists which monitors less severe conditions.

3. TVA will make provisions for sampling water from the reactor cooling system and the residual heat removal system for the degraded accident condition.

4. TVA will install new lines with connections to the existing gaseous radiation sampling system for use in sampling the containment atmosphere for the degraded accident conditions.

   Sample lines will be routed to a shielded sampling station in an accessible area and provide for taking samples which could be removed offsite for analysis.

These items will be accomplished on the following schedule:

Browns Ferry Units 1-3 Sequoyah Unit 1	-	by end of first refueling outage after equipment becomes available
Sequoyah Unit 2 Watts Bar Units 1 and 2	-	by end of first refueling
Bellefonte Hartsville Phipps Bend Yellow Creek	-	before operation

7. Stuck-Open Pressurizer Relief Valve

Nature of the Issue:

The pressurizer relief valves at Three Mile Island stuck in the open position and remained open for a long time without the operator being aware of this fact. The failure of the operators to recognize that the valve was stuck in the open position and to close the block valve was a major contributing factor to the damage that resulted. Valves of the type used at Three Mile Island have a record of poor performance; that is, they sometimes leak and there have been instances other than Three Mile Island where these valves have stuck in the open position. This type of valve is so designed and constructed that it does not permit a highly reliable remote indication in the main control room to tell the operator if the valve is open or closed.

Current Status:

Valves provided for Sequoyah and Watts Bar are of a different type than those which failed open at Three Mile Island, and have a better performance record. They are equipped with a reliable indication in the main control room which will tell the operator whether the valve is open or closed. In addition, TVA has provided five other separate indications in the control room that the operator can use as further evidence that the valve is open or closed. The Sequoyah and Watts Bar abnormal operating instructions direct plant operators to utilize these indications to detect an open pressurizer relief valve. The operator is further instructed to close

block valve and thereby isolate any relief valve that is determined to have failed to reclose after the pressure which caused the valve to open has been sufficiently reduced.

Because of unique plant operating requirements at Bellefonte, the pressurizer relief valves provided by the reactor supplier will be similar to those provided for Three Mile Island.

Yellow Creek plant design does not include pressurizer relief valves, but the staff is evaluating the need for such valves.

Recommendation:

For Sequoyah and Watts Bar, TVA will emphasize the importance of timely closure of the block valve in series with the relief valve as the principal precautionary measure against a stuck-open relief valve. The presently provided indications for detecting an open pressurizer relief valve are sufficient for the operator to make a prompt decision.

Prior to operation of Bellefonte, TVA will provide similar indications and operating instructions for detecting an open pressurizer relief valve.

For Yellow Creek, similar indications will be provided if it is determined that relief valves are needed.

B. Design Concerns Requiring Further Study
Small Break Loss of Coolant Accidents

Nature of Issue:

Breaks of large piping which cause a large and rapid loss of water from the reactor primary system have been analyzed completely and carefully. Much of the nuclear plant safety equipment is designed specifically to protect the health and safety of the public from such accidents. Small piping breaks have also been analyzed but only recently has concern been expressed that this analysis had not been done adequately and that certain undesirable things could happen, such as formation of voids in the reactor system, improper level indication in some designs, and possible loss of natural circulation cooling. This is essentially what happened at Three Mile Island because of the stuck open pressurizer relief valve, which had the same effect as a small pipe break.

TVA recognized the potential problems with small pipe break accidents and expressed those concerns in a letter to Babcock and Wilcox in 1978 and has been attempting to resolve these concerns in subsequent discussions and exchanges of correspondence. The accident at Three Mile Island confirmed TVA's concerns.

Current Situation:

The nature and consequences of small break loss of coolant accidents is now fully recognized in the industry and Nuclear Regulatory Commission. Three Mile Island has resulted in a much better understanding of this

accident and how it can be detected and handled without unacceptable results. Nuclear Regulatory Commission bulletins and other information have been sent to owners and to reactor vendors which contain requirements on how to deal with such accidents as well as requiring written commitments and requests for information to ensure that each pressurized water reactor operator can safely operate its plants. These precautions permit the conclusion that pressurized water reactors can be operated with no undue risk to the health and safety of the public.

For the long term, there is a need for a more complete understanding of this kind of accident to determine if additional design and operating features will provide even greater assurance that no unacceptable consequences result from such accidents. Several features such as primary system venting and primary system level indication will provide greater assurance, but other features may be desirable.

Recommendations:

TVA will;

1. Require nuclear steam supply system vendors to provide further analysis of such accidents for TVA plants.
2. Encourage NRC to develop a better understanding of such accidents by analysis, and by research and development if necessary.
3. Devote personnel necessary to follow closely these additional NRC and industry efforts and assure that TVA's full concerns are resolved.

It appears that it will require six months to a year of intensive effort to develop this fuller understanding. In the event this program identifies

design changes, the changes will be implemented as the information becomes available. As the program matures, the results of th program will be factored into the existing operating procedures, then the TVA training simulators will be used to retain operators on small loss-of-coolant accident mitigation. In the meantime, current instructions and precautions are adequate to ensure that no unacceptable risk is involved in operating pressurized water reactors, particularly those of the Sequoyah and Watts Bar type.

C. Operational Feedback

Nature of the Issue:

Experience from operating nuclear plants is one of the most effective means for evaluating performance of plant design and operation for identifying opportunities for improvement. TVA and other nuclear plant operators routinely collect and maintain a large amoun.. of operating performance and maintenance data on all operating plants.

Each time an abnormal event occurs during operation of a nuclear plant, a Licensee Event Report (LER) is filed with the Nuclear Regulatory Commission. The LER describes the event, its causes, and its results. Through this process, the NRC has accummulated considerable information on major and minor occurrences at nuclear plants.

The NRC is responsible for assembling and verifying this information, reducing it to a usable form, and disseminating it to the utilities. This program to identify potential major events and recurring minor events

is hampered by the large amount of data to be collected, the inferior quality of reports, and lack of sufficient emphasis on the program.

More systematic and formal methods are needed to digest, interpret, and report the large volume of data available to assess its implication on nuclear plant safety and radiation exposure to plant personnel.

Current Situation:

TVA's Division of Power Production and Division of Engineering Design have formed a joint Task Force on Availability and Reliability Improvement which is charged with coordinating TVA efforts in this area and working with national organizations to develop a useful national data system. Also, TVA's Divisions of Engineering Design, Occupational Health and Safety, and Power Production currently have a program which includes evaluation of operating experience and coordinating efforts to keep radiation exposures as low as reasonably achievable.

TVA already devotes substantial effort to review of licensee event reports and other operating experience through its Nuclear Experience Reivew Panel in the Division of Power Production. Each branch within the division is assigned primary responsibility for review of specific sources of information.

The reviewers meet as a panel monthly to report on potential problems and each is reviewed at each subsequent meeting until the problem is satisfactorily resolved. From the items reviewed, the panel selects those which would be helpful in operator training, particularly those which may point

to operator error. A review of the items and the possible relationships to a TVA plant is included in the licensed operator's requalification program at each plant.

Recommendation:

TVA's design and operating organizations will develop for use in design and operation of TVA plants a data system which gives a better and more effective way to digest and report the large amount of information from TVA and other U.S. nuclear plants. The data system will give specific attention to nuclear safety and to radiation exposure to employees. The results will be made available to the NRC and other institutions and interested persons.

V. EMERGENCY PLANNING

Nature of the Issue:

Effective emergency planning to deal with nuclear plant accidents is an essential part of plant emergency procedures. Critical elements in emergency planning include provisions for evacuating or sheltering the public in the immediate area surrounding the plant, for communicating offsite, for emergency offsite monitoring of radioactivity, and for public reporting of problems at nuclear plants.

A. Evacuation Contingency Plans

Current Situation:

The basic TVA Radiological Emergency Plan was completed in 1973 and has been approved by NRC. TVA works closely with Alabama, Tennessee, and Mississippi in their emergency planning.

The state radiological emergency plan is a part of the TVA plan, and describes those actions to be taken by all state and local agencies to protect the health and safety of the public, including plans for evacuating and sheltering the public in the event of a nuclear accident requiring these actions.

NRC requires that each operating nuclear plant have a plan to evacuate people from the "low population zone," as defined in NRC regulations. This zone is typically about a 3-mile radius of the plant.

The TVA and state plans have been exercised on six occasions at the Browns Ferry Nuclear Plant. Five of these were drills, and a sixth occurred during the Browns Ferry fire in March 1975. One drill has been conducted at the Sequoyah Nuclear Plant and another is scheduled at Sequoyah prior to startup. During the last drill at Browns Ferry each home within a 7-mile radius of the plant was visited to determine how much time might be needed to evacuate persons living in the area. Following the drill, it was estimated that evacuation could have been accomplished within four hours. TVA and state and local agencies will continue to perform such drills to assure that if an emergency condition does arise, prompt response will be taken for the protection of the health and safety of the public.

Recommendations:

TVA will work with the states to expand the 3-mile radius to include a contingency plan describing the actions and resources necessary to evacuate or provide shelter for persons living within a 10-mile radius of the plant. TVA will assist Alabama, Mississippi, and Tennessee in developing these plans.

In addition, TVA through its Division of Occupational Health and Safety will provide a full-time employee to the State of Tennessee to assist in planning, development, and maintenance of radiological emergency plans. Through its program of technological assistance to public agencies, TVA's Office of Community Development will also provide technical and, as appropriate, financial assistance to local agencies. This assistance will

be used to develop or improve emergency warning systems, emergency operating centers, training of emergency personnel, and emergency and disaster response equipment. Such assistance will be useful both for response to nuclear emergencies and natural disasters.

B. Communications Facilities

Current Situation:

The communications systems in TVA nuclear plants are adequate for communications within TVA and with outside agencies. However, communication capability in the Site Environs Emergency Control location will be improved. This is the center where representatives of TVA and offsite agencies assemble and from which activities associated with offsite consequences are directed.

Recommendations:

The following communications circuits will be provided at the Site Environs Emergency Control Center at all TVA nuclear sites:

1. Two dedicated telephone lines connecting directly to the Muscle Shoals Emergency Control Center PBX, except for Browns Ferry Nuclear Plant which will use the existing radio system. Where radio systems now exist, redundancy will be provided.
2. A minimum of three TVA automatic telephone system dedicated lines for access to internal TVA communications circuits, including offsite microwave and powerline carrier circuits.
3. A minimum of three public telephone lines to assure communications with outside facilites. This service will be provided directly from the

public telephone system without being routed through the nuclear plant, thereby strengthening the redundancy of the Site Environs Emergency Control Center communications.

These services will be provided on the following schedule:

Browns Ferry Nuclear Plant)
Sequoyah Nuclear Plant) — Telephone service by 11/1/79
Watts Bar Nuclear Plant) Radio service by 2/1/80

Bellefonte Nuclear Plant by Fuel Loading

Hartsville "A" Nuclear Plant by Fuel Loading

Phipps Bend Nuclear Plant by Fuel Loading

Yellow Creek Nuclear Plant by Fuel Loading

C. Emergency Offsite Environmental Monitoring

Current Situation:

The ability to monitor the radioactive releases from a nuclear plant is vital to the public health and safety, during both normal operation and accident conditions. The Three Mile Island accident illustrates the uncertainty that can result with inadequate environmental monitoring. Environmental monitoring programs are established around all TVA nuclear plants and are carried out throughout the lifetime of the facility. In the event of a nuclear emergency, these predesignated sampling locations are fully utilized in evaluating the radiological consequences of the emergency in the environment.

The atmospheric monitoring network is divided into three subgroups. Monitors are located at the site boundary, at distances of 5 to 10 miles, and at remote locations about 20 miles from the plant. All monitors are equippped with particulate and charcoal filters. Rainwater and heavy particulates are also collected. Thermoluminescent dosimeters are located at numerous points to measure the gamma exposure rates.

TVA is the only operator of nuclear plants which provides a telemetry system in the environmental monitoring stations to transmit data on airborne beta-gamma levels into the plant control room. This information is vital in the early stages of an emergency in determining radioactivity levels. The telemetry system also permits voice communications with the control room directly from the telemetry stations.

Public water supplies within five miles downstream of the plant are sampled continuously and periodically analyzed. This provides an early warning system and permits the water supplies to be isolated from radioactive contamination. There are also wells onsite which are continuously sampled in the event of a liquid release which might reach the ground water supplies.

Additional monitoring is conducted by special monitoring teams dispatched to the affected area.

The radiological analysis of environmental samples is presently carried out in an environmental radioanalytical laboratory located in Muscle Shoals, Alabama. In order to increase the capability to analyze environmental samples, TVA is building a second laboratory near Vonore, Tennessee. This

facility will begin operation in January 1980; it is located much closer to nuclear plants which will operate in the eastern portion of the TVA system.

Recommendation:

The TVA offsite environmental monitoring program is one of the most significant in the country. The staff will continue to seek ways to improve the program.

D. Public Reporting of Problems at Nuclear Plants

Current Situation:

TVA's policy is to inform news media promptly, fully, and as soon as possible of any unusual events at nuclear plants considered to have potential significance to safety even though their significance in some cases may be minor. Any event that would be "news" is made public.

Nuclear Generation Division in the Office of Power is responsible for notifying the Director of Information when a problem occurs at an operating TVA nuclear plant. In the case of a plant under construction, the Division of Construction notifies the Information Office. The Director of Information informs the General Manager and the Board and prepares a news release, if needed.

Recommendations:

At a minimum, a public announcement will be issued whenever one of the following events occurs:

1. Nonscheduled unit shutdowns regardless of cause.
2. Shutdowns resulting from failure of or damage to safety-related equipment.
3. Failure of, or damage to, safety-related equipment.
4. Any unusual discharge of radioactive materials from the plant.
5. Within the plant, any unusual exposure of plant personnel.
6. Any severe personal injury or fatality, whether related to nuclear operations or not.
7. Any accident involving a carrier transporting spent fuel or radioactive waste materials from a TVA nuclear plant. The announcement will be coordinated with state radiological hygiene agencies as necessary.
8. Reporting effect--or no effect--from flood, earthquake, tornado, or other natural event in the plant vicinity that could produce public concern.
9. Any incident such as fire or explosion causing damage at the plant.
10. Any abnormal event involving environmental concern, such as significant chemical release.
11. Any significant curtailment of operations required to meet environmental requirements.

This list is not all-inclusive, and other abnormal events will also be announced.

In addition to the above, each plant will have a resident information officer.

Through attendance at the daily plant planning meetings the information officer will be kept abreast of plant activities. The information officer will serve both the plant superintendent and the Information Office, and will be responsible for coordinating information releases about plant activities, arranging for all visitors to the plant, and communicating with plant employees as well as the public concerning TVA programs and policies.

In addition, the resident information officer will be available during plant emergencies to disseminate information to the press and assist the plant superintendent in handling inquiries from the news media, the public, state and local agencies, and others.

Appendix

Completed TVA Actions in
Nuclear Plant Design to Improve Safety

This appendix summarizes actions TVA has completed in the past to improve nuclear plant safety. Section I below lists those that are related to problems revealed by the Three Mile Island accident.

Section II lists other actions which have improved safety in TVA nuclear plants.

I. ACTIONS RELATED TO THREE MILE ISLAND

Auxiliary Feedwater System

The Auxiliary Feedwater System (AFWS) is designed to supply sufficient water to the steam generators to allow the reactor to be cooled down if main feedwater is not available. Thus, the AFWS becomes important following any incident which results in loss of the main feedwater supply. At Three Mile Island, this system was not considered safety-related.

TVA considers the AFWS to be an essential part of those safety-related systems needed to protect the public health and safety, and has designed the systems accordingly.

For example, TVA required Babcock and Wilcox to provide a fully safety-grade control system for the AFWS of Bellefonte including a safety-grade, redundant essential air system to power valves in this system. Since that time, the NRC has requested other vendors to develop safety-grade systems for these functions.

Containment Water Level

Nuclear plants are designed on the basis that water can be released to containment in an accident without flooding essential safety equipment inside containment. It is important that the operator know what level of water exists in containment following an accident as an aid in assessing the magnitude of the accident and ensuring that safety equipment is not in danger of being flooded.

TVA recognizes the importance of monitoring water level inside containment and has provided on all TVA plants redundant, safety-grade, containment water level indicators in the main control room. The instruments have a range of indication in excess of the maximum design basis water level inside containment.

Pressurizer Heaters

The pressurizer heaters provide a water temperature in the pressurizer that creates a steam pressure to prevent boiling elsewhere in the primary system. This pressure control prevents steam bubble formation in the reactor vessel, steam generators, and primary system piping. It is important that these heaters are available to maintain pressure in the primary system and ensure circulation for cool down through the steam generators. TVA considers the pressurizer heaters to be an essential part of the safety-related systems and has designed its systems accordingly.

Hydrogen Inside Containment

Certain nuclear plant accidents may cause hydrogen gas to be produced inside the reactor and also to be produced in the containment building.

Hydrogen generated inside the reactor can be released to the containment building as a result of the accident or it can be deliberately vented by the operator to containment following an accident. A sufficient quantity of hydrogen mixed with the air inside the containment would become an explosive mixture. Nuclear plants are designed to prevent hydrogen explosions and most plants are designed with hydrogen recombiners which burn the hydrogen before the concentration reaches explosive mixtures. Some designs provide for recombiners that are portable and which are connected to the containment after an accident to draw air from the containment, recombine the hydrogen with oxygen in the air, and return the hydrogen-free air to containment. These designs have been acceptable to the NRC. However, such designs are questionable because considerable time and effort are required to connect the system after an accident when radiation levels may be high. Also, care must be taken that this operation does not allow radioactivity to escape from containment building.

TVA has recognized the problems with portable recombiners located outside containment. Browns Ferry Nuclear Plant has an inert atmosphere inside containment that prevents the possibility of a hydrogen explosion. At all other plants, TVA has two separate recombiners permanently installed inside the containment. These are always ready for operation following an accident that could release hydrogen. For TVA plants, this problem has been resolved and there are no changes required.

Status Monitoring Systems

Operators of nuclear plants must be sure that safety equipment is ready for operation when it is required for emergencies. To assist the operator,

status monitoring systems are installed to display information in the main control room in such a way that the operator is better informed of the status of plant safety systems. Such systems can vary in the amount and manner in which information is displayed.

When the Regulatory Commission first required status monitoring of safety systems in our Watts Bar plant, TVA voluntarily decided to include this same design feature on the earlier Sequoyah plant. Realizing this was a feature that provided additional assurance that the plant would perform safely in the event of an emergency, TVA pursued a very comprehensive design approach. This approach included using a digital computer to collect and process the status information. In addition, the computer transmits the data to video units that have especially designed presentations to allow the operator to visualize the status of the safety systems.

Papers have been presented and discussed at technical conferences and TVA staff have discussed this design approach with engineers from various utilities and architect-engineering firms. TVA is recognized as a pioneer in using this comprehensive design.

Further improvements as a result of the Three Mile Island Accident will be made. See Section IV.A. of the report.

II. OTHER ACTIONS

Auxiliary Control Room

There exists a remote possibility that some event can occur in the main control room which requires the operators to abandon the control room and to safely shut the plant down from another location. Starting with Browns Ferry, TVA imposed very stringent requirements on the reactor vendors for design of an auxiliary or backup control room. All subsequent TVA plants have been designed to permit safely shutting the plant down from a remote location. TVA requirements, for the most part, have now become NRC requirements.

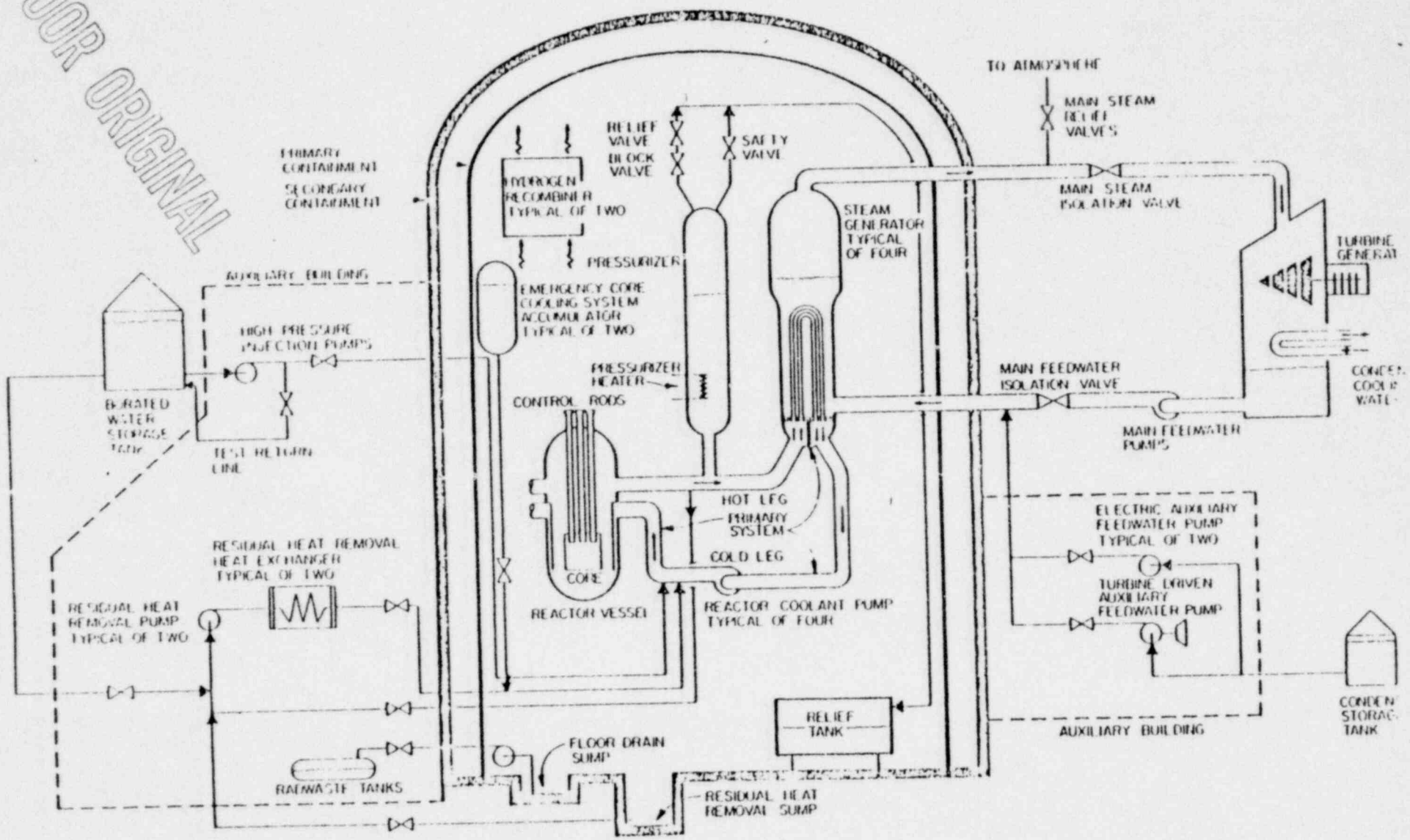
Advanced Control Rooms

Nuclear plant control rooms contain a very great amount of information that must be assimilated and interpreted by the operators in the course of performing manipulations during normal and abnormal plant operation. TVA has worked with suppliers to develop advanced control room designs for Hartsville, Phipps Bends, and Yellow Creek plants. These designs use computer systems to process and analyze plant information and then display it to the operator in more easily interpretable form on video screens. Controls are designed and arranged for easy access and operation. TVA is recognized as a leader in this area and has presented at several professional meetings papers describing TVA control room designs.

Solid State Control Systems

About the year 1973, solid state controls were developed which were more reliable than the conventional relay systems in performing the increasingly

SIMPLIFIED REPRESENTATION OF A TYPICAL PRESSURIZED WATER REACTOR PLANT



complex control actions required for nuclear plant design. TVA adopted this new technology and a solid state control system was developed for the Bellefonte Nuclear Plant which would perform control and interlock actions. This type system has since been adopted by other power plant owners and is now widely accepted as a significant improvement in nuclear plant control. It is used at all TVA nuclear plants after Bellefonte.

Application of Generator Breakers

NRC requires that two physically independent sources of electric power be available to all nuclear plants from off-site. One of these sources must be available to supply the plant equipment within a few seconds if the plant suddenly shuts down and no longer generates its own power. Each of the independent sources must be available in time to prevent any unsafe conditions in the plant. Generator breakers are fast and reliable. TVA has used these generator breakers to quickly cut off the plant turbine generator from the outside lines if it trips. This ensures that there is no interruption of power to the plant equipment which permits normal shutdown with no unusual or emergency actions required.

Turbine Missiles

Steam turbine-generators have, on very rare occasions, failed by disintegration, causing large pieces of the machine to fly off as missiles. Nuclear plants must be designed such that plant safety will not be jeopardized from turbine missiles.

All TVA turbine generators are oriented to minimize the probability of missiles hitting vital parts of the plant. TVA was one of the industry

leaders in use of site arrangement to reduce the turbine missile hazard. TVA was also one of the industry leaders in the use of probability analysis to indicate that the turbine missile hazard is an acceptable risk in a properly arranged plant.

Tornado Generated Missile Protection

Nuclear plants must be designed to withstand a tornado hitting the plant. This includes flying debris and missiles carried along by the tornado which might strike vital parts of the plant including buried pipes and cables. There were no criteria in existence for determining how far missles, such as steel pipe and telephone poles, would penetrate the earth.

To correct for this lack of information, TVA conducted tests by dropping missiles from helicopters onto concrete slabs, crushed stone, and earth. High speed photography was used to record data and penetrations were measured. The results were used by TVA to design underground pipes and electrical ducts which will not be damaged by tornado missiles.

Containment Purge Line Isolation

It is permissible in some plants for operators to enter containment during plant operation. Before entering, it is necessary to circulate purge air through these parts of containment where access is permitted. This means that fairly large air ducts are open during plant operation. If a pipe rupture occurs during this time, the valves which automatically close off the purge air lines after an accident must be designed for the large forces and possible debris leaving through the opening. TVA apparently recognized this as a safety problem before it was recognized by NRC and designed its plant accordingly. NRC now requires designs to accommodate these conditions.

Use of Reflective Insulation

Hot piping inside containment must be insulated to minimize loss of heat. Fibrous insulation was widely used because it is cheap and efficient. However, during pipe ruptures inside containment, fibrous insulation can be blown off and may clog strainers, pumps, or otherwise impair operation of safety systems. TVA was one of the first to recognize this potential problem. All piping insulation inside containment is metal reflective insulation. NRC now requires that nuclear plant designs consider the potential hazards caused by use of fibrous insulation inside containment.

Stainless Steel Cracking

Boiling water reactors use stainless steel piping for the reactor primary system. There has been considerable cracking of stainless steel piping in operating boiling water reactors. Early during the design of Browns Ferry, evidence indicated that certain kinds of stainless steel material (furnace sensitized) might be suspect. At considerable expense, TVA decided to eliminate all furnace sensitized stainless steel from its reactor designs.

Very recently there has been some further evidence that an improved material is available which provides better assurance that cracking will not occur during the life of the plant. Consequently, we have decided to change all stainless steel piping at Hartsville and Phipps Bend to the improved material. This latter decision is not a safety decision, but the decision was weighed heavily by the fact that it has high probability of reducing repair and maintenance and of considerably reducing personnel exposure to radiation.

Containment Spray Additives

Containment spray systems are used to cool containment after an accident by spraying water inside the building. Chemicals are added to the spray water which collect radioactive iodine and, thus, reduce the potential for iodine to escape following an accident. The chemical used at some plants is corrosive. TVA took the lead in working with the vendors in developing a new chemical which is less corrosive but is still effective in absorbing iodine.

Inspection of Bedrock Under Structures

Foundation design is an important aspect of nuclear plant safety. The condition of foundations at all nuclear plant sites is determined by core drilling and removing the cores for examination. However, this does not provide conclusive evidence for determination of open or clay-filled cavities below the surface of rock foundation for safety-related structures. TVA pioneered in the use of small television cameras for inspecting the walls of drill holes and in providing a photographic record of such inspections.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	:	Docket No. 50-320
	:	
METROPOLITAN EDISON COMPANY	:	
et al.	:	
Three Mile Island Nuclear Station	:	Determination regarding Extra-
Unit 2	:	ordinary Nuclear Occurrence

SUBMISSION OF INFORMATION,
MOTION FOR LEAVE TO INTERVENE,
AND REQUEST FOR HEARING

1. The persons submitting information herein (Informants) are as follows:

Gerald S. Fantasky and Vincenta L. Fantasky
James A. Good and Bonita R. Good
James E. Gormley
Dynamics Products Corporation
Modagraphics Corporation
John Glise, Inc.
The Red Baron of America, Inc.
James D. Derr, Inc.
Robert T. Dunn and Annette Dunn
Katherine Shirilla
Michael Lyons and Judith Lyons
Terrill Schukraft
Constance Krebs
Kenneth E. Stoner, Jr., and Linda Stoner
Giant Food Stores, Inc.
White Shield, Inc.
Komet Co., Inc.
First Edition Book Stores, Inc.
Wolowitz, Inc., d/b/a "Young Image Shop"
Free Car Wash, Inc., d/b/a "Gas and Wash"
Cumberland Skadium, Inc., d/b/a "Cumberland Skadium"
Harry Cramer, Inc., d/b/a "Harry Cramer Oldsmobile"
Aero Corporation, d/b/a "Budget Rent A Car"
Michelle Smajda and Terry Smith
Earl J. Markle and Dorothy Markle
William Gorman and Beverly Gorman
Russell C. Earhart and Grayce Earhart
Herbert M. Packer, Jr.
John W. Griffith and Jean B. Griffith
LeRoy I. Sykes

Monte H. E. Parfitt and Rose Marie Parfitt
Walter J. Lachewitz, Jr.
American Vanguard Systems, Inc., t/a Millhouse Restaurant
Samuel W. Fleck and Louise E. Fleck
David A. Barbarette
Leonard J. Bourinski and Joyce E. Bourinski
Joan E. Bretz
Gary F. Ditto
William E. Dunham and Patricia Dunham
Espenshade Meats
Gilbert Freidman
Mountainview Thoroughbred Racing Assn., Inc.
Penn Photo, Ltd.
Pennsylvania National Turf Club, Inc.
The Sport Nit, Inc.
C. Robert Larsen and Marie K. Larsen
Peter Davis and Carol A. Davis
William Shields and Susan Shields
Barry Buck and Toni Buck

All of the foregoing reside, resided, were or are located on March 28, 1979 within 25 miles of Three Mile Island Nuclear Station Unit 2 (TMI), and on March 28, 1979 several reside, resided or were or are located in the immediate vicinity of said Unit. All are persons within the meaning of 10 CFR §140.3(g). The foregoing constitute all of the Plaintiffs in the consolidated class action naming the Licensee of TMI and others as defendants filed in the United States District Court for the Middle District of Pennsylvania, No. 79-432. Said class action relates to the nuclear incident which took place on or about and after March 28, 1979.

2. On July 8, 1979, the Nuclear Regulatory Commission (Commission) initiated the making of a determination as to whether the above nuclear incident constitutes an extraordinary nuclear occurrence (ENO) and invited interested persons to submit any information in their possession relevant to this determination. Notice of this action was published in the Federal Register Vol. 44, No. 142, on July 23, 1979, and appeared in media announcements.

The notice published in the Federal Register stated, inter alia, that further provisions for public participation will be announced at a later date. To the best of Informants' knowledge and belief, such provisions have not been announced. In addition, Informants believe that at least one application has been made to the Commission by other persons to make an ENO determination.

3. Informants are interested persons because either they and their properties were exposed to radiation or to radioactive materials from the nuclear incident, because they lost the use and value of their properties, or they found it necessary to take protective action such as evacuation to reduce or avoid exposure to radiation or to radioactive materials. Informants are interested persons because they are named Plaintiffs in the above mentioned class action on behalf of all individuals and entities within a 25-mile radius of TMI. Important substantive and procedural rights in the class action may be affected by the determination as to whether or not there is an ENO, which rights are found in portions of the Atomic Energy Act. See, 42 USC §2210(n).

4. Informants presently possess the following information relative to the criteria set forth in 10 CFR §140.84(a) and (b):

During the incident, in place monitors within the plant went off scale for three days and otherwise gave erroneous measurements, exceeding their capacity for measuring releases of radioactivity and radioactive materials. This and other facts led the Lessons Learned Task Force to report that: "...sampling of plant gaseous effluents, with laboratory analysis of samples subsequent to release, is the only valid technique for monitoring accidental releases of radioiodines and particulates." NUREG-0578 p. A-38.

Published calculations to date have relied on a limited number of dosimiter readings, have not given sufficient weight to the maximum dosimiter readings observed, the margin of error in such measuring devices or the conflict of interest of the Commission's contractor, Radiation Management Corporation. Said corporation is part owned and financed by General Public Utilities, the parent company of the Licensee of TMI.

Published calculations do not give weight to any estimated, observed, possible or calculated stack, vent and other releases applied to the meteorological dispersal formula for TMI, e.g., release of 13,000,000 curies of Xe133 and readings of 3,000 mr/hr above vent stack observed on March 29.

5. In addition, it is believed that the Commission is in error in its statement at Vol. 44, No. 142, Federal Register, page 43130 that:

> "Based on the information available to the NRC Staff at this time, it appears that neither part of Criterion I is satisfied. Both personal, exposures and property contamination are presently considered to be far below the levels specified in the tables set out above. In the period March 28-April 7, the approximated upper limit on whole body dose to a person in a populated area offsite has been calculated to be 100 millirems. For the most part, property contamination levels measured approximated 'minimum detectable activity' levels."

The Commission may further be in error by not giving sufficient weight to its words in 10 CFR §140.84(a), to wit: "...could have been or might have been exposed" to the doses stated thereafter. Published articles indicate that the actual releases and doses received may never be known.

6. Informants presently possess the following information relative to the criteria set forth in 10 CFR §140.85:

While the consolidated class action filed by Informants, in accordance with the Federal Rules of Civil Procedure, does not state the amount of damages claimed, several of the actions which have been consolidated originally pleaded damages in excess of 560 million dollars. It is possible that all damages could exceed such amount. Such damages include those outlined in 10 CFR §140.85.

Payments of approximately 1.2 million dollars have heretofore been voluntarily paid to evacuees. This does not include loss of wages or any expenses of evacuees in families which did not have pregnant women or pre-school children. The latter expenses are of great magnitude. The insurers of the Licensee and others have indicated a willingness to pay loss of wages and are negotiating with Plaintiffs' liaison counsel in the class action for further sums to be paid in settlement of other portions of the claim.

A notice of class action will soon be sent to all members of the classes and subclasses which are estimated to be approximately two million people for the purpose of indicating their willingness to participate in the suit and to indicate their damages. Response to this notice will be extremely valuable in indicating damages suffered by victims of the incident.

7. In addition, it is believed that the Commission is in error in its statement at Vol. 44, No. 142, Federal Register, page 43131 that:

> "Based on the information available to the NRC staff at this time, the only category of Criterion II damages possibly satisfied by the Three Mile Island accident is defined by (4), namely financial loss resulting from protective actions such as evacuation, appropriate to reduce or avoid exposure to radiation or radioactive material."

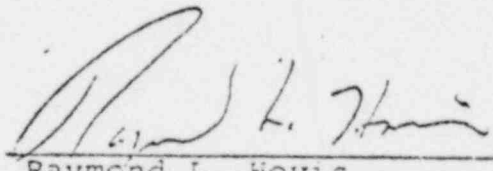
The Commission will be in error if it does not interpret damages suffered by Informants and others to include loss of use of affected property and possibly total cost necessary to put affected property back into use. See, 10 CFR §140.85(b)(1) and (2).

8. In view of the fact that Informants and those who they represent will be affected by the within proceeding, Informants desire to participate as parties and hereby petition for leave to intervene pursuant to 10 CFR §2.714, as well as any other procedures determined by the Commission for participation in this determination.

9. Informants wish to intervene as it relates to the submission and consideration of doses of and exposures to radioactivity and radioactive materials, submission and consideration of damages to persons and property, as well as interpretation and affect of law and of the Commission's Regulations.

10. Because of the importance of this determination, Informants also request that a hearing be held in the vicinity of TMI for the purpose of allowing Informants and other interested parties to participate. The Commission is also requested to extend its 90-day deadline (10 CFR §140.83) so that it can make an actual determination and not a determination by default.

David Berger
1622 Locust Street
Philadelphia, Pennsylvania 19103
Attorney for Informants



Raymond L. Hovis
35 South Duke Street
York, Pennsylvania 17401
Attorney for Informants

Dated this 28th day of August, 1979.

Service is to be made on the above attorneys at each of the above addresses.

COMMONWEALTH OF PENNSYLVANIA:
: SS
COUNTY OF YORK :

Before me, a Notary Public in and for said Commonwealth and County, personally appeared JAMES A. GOOD who is a petitioner herein, who being duly sworn according to law, deposes and says that he is authorized to make this affidavit on behalf of petitioners, who are also acting as informants, and that the facts set forth in the foregoing document are true and correct to the best of his knowledge, information and belief.

James A. Good

SWORN and subscribed to
before me this 24th day
of August, 1979.

Notary Public

MY COMMISSION EXPIRES
OCTOBER 24, 1981
YORK, YORK CO., PA.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	:	Docket No. 50-320
METROPOLITAN EDISON COMPANY et al. Three Mile Island Nuclear Station Unit 2	: :	 Determination regarding Extra-ordinary Nuclear Occurrence

NOTICE OF APPEARANCE

The undersigned does hereby appear on behalf of the following informants and petitioners in the above captioned proceeding:

Gerald S. Fantasky and Vincenta L. Fantasky
James A. Good and Bonita R. Good
James E. Gormley
Dynamic Products Corporation
Modagraphics Corporation
John Glise, Inc.
The Red Baron of America, Inc.
James D. Derr, Inc.
Robert T. Dunn and Annette Dunn
Katherine Shirilla
Michael Lyons and Judith Lyons
Terrill Schukraft
Constance Krebs
Kenneth E. Stoner, Jr., and Linda Stoner
Giant Food Stores, Inc.
White Shield, Inc.
Komet Co., Inc.
First Edition Book Stores, Inc.
Wolowitz, Inc., d/b/a "Young Image Shop"
Free Car Wash, Inc., d/b/a "Gas and Wash"
Cumberland Skadium, Inc., d/b/a "Cumberland Skadium"
Harry Cramer, Inc., d/b/a "Harry Cramer Oldsmobile"
Aero Corporation, d/b/a "Budget Rent A Car"
Michell Smajda and Terry Smith
Earl J. Markle and Dorothy Markle
William Gorman and Beverly Gorman
Russell C. Earhart and Grayce Earhart
Herbert M. Packer, Jr.
John W. Griffith and Jean B. Griffith
LeRoy I. Sykes
Monte H. E. Parfitt and Rose Marie Parfitt
Walter J. Lachewitz, Jr.
American Vanguard Systems, Inc., t/a Millhouse Restaurant

Samuel W. Fleck and Louise E. Fleck
David A. Barbarette
Leonard J. Bourinski and Joyce E. Bourinski
Joan E. Bretz
Gary F. Ditto
William E. Dunham and Patricia Dunham
Espenshade Meats
Gilbert Freidman
Mountainview Thoroughbred Racing Assn., Inc.
Penn Photo, Ltd.
Pennsylvania National Turf Club, Inc.
The Sport Nit, Inc.
C. Robert Larsen and Marie K. Larsen
Peter Davis and Carol A. Davis
William Shields and Susan Shields
Barry Buck and Toni Buck

The addresses of the foregoing are various and for purposes of this notice may be deemed the same as the undersigned.

The undersigned is an attorney-at-law admitted to practice and in good standing in the following Courts: United States Supreme Court; United States Courts of Appeals for the First, Third and Ninth Circuits; United States District Courts for the Middle and Eastern Districts of Pennsylvania; The Supr Court of Pennsylvania; and other Courts in the Commonwealth of Pennsylvania.

David Berger
1622 Locust Street
Philadelphia, Pennsylvania 19103

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	:	Docket No. 50-320
METROPOLITAN EDISON COMPANY et al.	:	
Three Mile Island Nuclear Station Unite 2	:	Determination regarding Extra-ordinary Nuclear Occurrence

NOTICE OF APPEARANCE

The undersigned does hereby appear on behalf of the following informants and petitioners in the above captioned proceeding.

Gerald S. Fantasky and Vincenta L. Fantasky
James A. Good and Bonita R. Good
James E. Gormley
Dynamics Products Corporation
Modagraphics Corporation
John Glise, Inc.
The Red Baron of America, Inc.
James D. Derr, Inc.
Robert T. Dunn and Annette Dunn
Katherine Shirilla
Michael Lyons and Judith Lyons
Terrill Schukraft
Constance Krebs
Kenneth E. Stoner, Jr., and Linda Stoner
Giant Food Stores, Inc.
White Shield, Inc.
Komet Co., Inc.
First Edition Book Stores, Inc.
Wolowitz, Inc., d/b/a "Young Image Shop"
Free Car Wash, Inc., d/b/a "Gas and Wash"
Cumberland Skadium, Inc., d/b/a "Cumberland Skadium"
Harry Cramer, Inc., d/b/a 'Harry Cramer Oldsmobile"
Aero Corporation, d/b/a "Budget Rent A Car"
Michelle Smajda and Terry Smith
Earl J. Markle and Dorothy Markle
William Gorman and Beverly Gorman
Russell C. Earhart and Grayce Earhart
Herbert M. Packer, Jr.
John W. Griffith and Jear B. Griffith
LeRoy I. Sykes

Monte H. E. Parfitt and Rose Marie Parfitt
Walter J. Lachewitz, Jr.
American Vanguard Systems, Inc., t/a Millhouse Restaurant
Samuel W. Fleck and Louise E. Fleck
David A. Barbarette
Leonard J. Bourinski and Joyce E. Bourinski
Joan E. Bretz
Gary F. Ditto
William E. Dunham and Patricia Dunham
Espenshade Meats
Gilbert Freidman
Mountainview Thoroughbred Racing Assn., Inc.
Penn Photo, Ltd.
Pennsylvania National Turf Club, Inc.
The Sport Nit, Inc.
C. Robert Larsen and Marie K. Larsen
Peter Davis and Carol A. Davis
William Shields and Susan Shields
Barry Buck and Toni Buck

The addresses of the foregoing are various and for purposes of this notice may be deemed the same as the undersigned.

The undersigned is an attorney-at-law admitted to practice and in good standing in the following Courts: United States Supreme Court, United States Court of Appeals for the District of Columbia Circuit, United States District Court for the Middle District of Pennsylvania, Supreme Court of Pennsylvania, and other courts in the Commonwealth of Pennsylvania. In addition, the undersigned has practiced before the Nuclear Regulatory Commission since 1973 at both the Atomic Safety and Licensing Board and Appeals Board levels.

Raymond L. Hovis
35 South Duke Street
York, Pennsylvania 17401
(717) 843-8871

16:2 LO... T STREET
PHILADELPHIA, PA. 19103

PHILADELPHIA PA AUG 30 79 U.S. POSTAGE .41

PHILADELPHIA PA AUG 30 79 U.S. POSTAGE .13

FIRST CLASS MAIL

Executive Legal Director
OELD
U.S. Nuclear Regulatory Commission
Washington, DC 20555