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COMPTROLLER GENERAL OF THE UNITED STATES

WASHINGTON, D.C. 20548



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May 27, 1980

✓ The Honorable Gary W. Hart, Chairman  
The Honorable Alan K. Simpson  
Ranking Minority Member  
Subcommittee on Nuclear Regulation  
Committee on Environment and  
Public Works  
United States Senate

SEN06406



Subject: <sup>MRC</sup> [Do Nuclear Regulatory Commission Plans Adequately Address Regulatory Deficiencies Highlighted By The Three Mile Island Accident?] (EMD-80-76)

On the morning of March 28, 1979, the Nation's worst commercial nuclear powerplant accident occurred at Three Mile Island in Pennsylvania. Starting with a minor malfunction in the nonnuclear part of the plant, a series of events occurred that severely damaged the nuclear core. Radioactive particles escaped from the damaged core and were pumped to an adjoining building where some radioactive gases were released to the environment. Although these releases were later determined to be small, the seriousness of the accident raised nationwide concern about the safety of nuclear power.

Within a matter of weeks, a number of groups began examining what happened and why. The President of the United States established a group to comprehensively study the accident, the Nuclear Regulatory Commission began a number of internal studies and created a special inquiry to independently review and report on the accident, the nuclear industry established the Nuclear Safety Analysis Center which performed an investigation, and the Congress held a number of hearings and established a special group to investigate the accident and examine its implications on the commercial future of nuclear power.

Inundated with numerous recommendations from these studies, the Commission drafted a plan to improve the regulation and operation of nuclear facilities. This plan, referred to as the Three Mile Island Action Plan, includes 51 major tasks that the Commission believes are necessary to respond to the many Three Mile Island investigations and

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studies. These tasks are subdivided into about 177 specific actions, most of which have been prioritized and given a schedule for completion.

On February 1, 1980, you requested that we evaluate the Action Plan and the adequacy of the Commission's process for prioritizing and implementing the planned actions. To do this, we selected 10 major tasks for detailed review as agreed with your office. These tasks represent a cross-section of the 51 tasks included in the Plan and include 49 actions already taken or proposed by the Commission (See Enclosure I for a listing of the 10 tasks.)

During the period of our review, the Plan was still in draft form and changed several times. The Commission was still adjusting the priorities of the tasks and the resources needed to carry them out. Completion of the Plan and approval by the Commissioners was not expected until May 1980. Although it was difficult to evaluate the specifics of the Plan under these circumstances, we have several observations about the process used by the Commission to create the Plan:

- The Commission has taken adequate steps to insure that all Three Mile Island recommendations were considered during the development of the Action Plan.
- The Commission's method of prioritizing the Action Plan tasks seems adequate and recognizes the need for quick action on safety-related problems.
- The Commission's actual or proposed efforts, to date, are adequately described in the Action Plan task descriptions.
- The Commission's estimated resources and time frames do not leave much margin for error.
- The Commission is relying heavily on the nuclear industry for the development of most corrective actions.

Because the successful and timely implementation of the Action Plan depends on many variables, we believe that

means should be developed to keep track of the Commission's progress. The President has created a special group to oversee the Commission's actions over the next 2 years and we endorse this concept. We believe, however, that the Commission should also periodically report its progress to the Congress.

THE COMMISSION TOOK ADEQUATE CARE  
TO IDENTIFY AND CONSIDER THREE  
MILE ISLAND-RELATED RECOMMENDATIONS

The Commission took several actions to insure that all Three Mile Island-related recommendations were considered in developing the Action Plan. First, it created a special steering committee to develop a plan that recognized all the recommendations. This committee included individuals who had studied Three Mile Island events and were familiar with the issues and the findings of the various accident investigations.

Second, the Commission listed, at the end of each task described in the Action Plan, the Three Mile Island recommendations that either applied to or were used in developing the task. This shows the Commission's desire that the Action Plan adequately address the Three Mile Island recommendations. This does not mean, however, that the Commission intends to fully carry out every recommendation. The Commission staff did not believe that all recommendations can or should be fully implemented. Some recommendations are not completely applicable to the Commission, some are contradictory, and some may prove impractical or unnecessary as further analysis is performed. According to the Commission staff, however, each listed recommendation was considered in the development of the task and will be explored as the task is implemented.

Finally, the Action Plan identified--by major investigation--where all Three Mile Island-related recommendations are addressed in the Plan. For those recommendations that are not addressed, the Commission has given reasons for their exclusion. These exceptions will be approved by the Commissioners through their review and approval of the entire Action Plan.

The last action was motivated by our evaluation of an earlier Action Plan draft. By comparing the recommendations listed in the draft Action Plan to the major Three Mile

Island investigation reports, we identified a number of recommendations that the Commission had excluded. After bringing this to the Commission staff's attention, the staff renewed efforts to insure that all recommendations were considered and accounted for during the further development and implementation of the plan.

THE COMMISSION'S PRIORITY RANKING SYSTEM SEEMS ADEQUATE

The Commission's system for prioritizing the 177 actions, although not based on detailed analysis or criteria, seems adequate for its intended purpose. The priority system was similar to the one used by the Commission to rank generic safety issues. It was approved for use in the Action Plan by the Commissioners on December 21, 1979, and was subsequently found acceptable by the Advisory Committee on Reactor Safeguards and the Atomic Industrial Forum. It included the following six priority ranking factors.

|   | <u>Points</u> |
|---|---------------|
| 1. Safety Significance of the Proposed Action                           |               |
| High.....   | 100           |
| Medium.....   | 50            |
| Low.....  | 0             |
| 2. Type of Improvement  |               |
| Improves the human element.....   | 20            |
| Fixes the hardware.....   | 10            |
| 3. Project is ongoing, the resources would be<br>wasted if stopped..... | 20            |
| Project has not yet been initiated.....                                 | 10            |
| 4. Nuclear Regulatory Commission Resource<br>Requirement                |               |
| Small (less than 2 staff-years).....                                    | 20            |
| Medium (between 2 and 10 staff-years)....                               | 10            |
| Large (more than 10 staff-years).....                                   | 0             |

5. Industry Resource Requirement: Total per nuclear unit over 40-year life--1 staff-year = \$50,000
- Small (less than 1 staff-year)..... 20
  - Large (more than 1 staff-year)..... 0
6. Timing of Improvement (i.e., how quickly will the expected benefit begin to be realized after initiation of task)
- Short-term (within 1 year)..... 30
  - Near-term (within 2 years)..... 20
  - Long-term (within 3 years)..... 10
  - Extended beyond 3 years..... 0

The steps used to prioritize the Action Plan items include the following:

- Task managers, using their best judgment, ranked the action in terms of high, medium, or low safety significance.
- A technical group within the Action Plan steering committee, assigned priorities to each action using the six ranking factors and input from the task managers and the Commission operating offices.
- A meeting was held between the technical group and the task managers to discuss the priority of the actions and revisions made by the technical group.
- If there was disagreement between the technical group and the task manager, the differences were explained to the full steering committee with a majority vote deciding the priority ranking.

This system resulted in 55 actions being assigned a priority one, 46 items a priority two, and 29 items a priority three. In addition, 47 items were not assigned a priority because they were either normal, ongoing Commission functions or were items for which appropriate action had not yet been determined.

Generally, this system assigned a higher priority to those actions which not only are important to safety but also could be implemented quickly with the least Commission and

industry resources. This, the Commission staff reasoned, would permit available resources to be used for as many actions as possible instead of being concentrated on a few costly and time-consuming items. Also, because the Commission thought that the human element in powerplant operations had been seriously neglected in the past, a higher priority was given to those actions as opposed to the ones that would improve hardware.

Although this process was based on the engineering judgment of the Commission's technical staff instead of a more precise risk-based analysis, we believe that it was adequate for its intended purpose. The Commission was not trying to rank these actions according to their relative safety importance. Instead, it was attempting to divide the large number of actions into safety categories as a way of assigning staff resources and dealing with as many of them as possible. At the completion of this process, the Commission selected 100 of the actions (out of about 177 in total) for some type of execution in the remainder of this fiscal year and the next. This included all priority one items, most priority two's, and some priority three's. Therefore, even though the priority ranking process was not as refined as it could have been, it is likely that the more important safety items are being addressed.

THE ACTION PLAN ADEQUATELY  
DESCRIBES COMMISSION ACTIONS

In our review of the 10 Action Plan tasks, we attempted to determine if the Commission was actually carrying out the tasks described in the Plan. Considering the draft status of the Plan, we found that it adequately described actions that the Commission either had already taken or had intended to take.

Included in the 177 actions are 67 which have already been approved by the Commissioners, with implementation either completed or firm dates scheduled for completion. These actions resulted primarily from special internal Commission studies done in the aftermath of Three Mile Island and were well described in the Action Plan.

The remainder of the Action Plan includes 110 actions that will be completed sometime in the future depending on their priority and the availability of Commission resources. Some have already been started, others are waiting on the

completion and approval of the Action Plan, and others have been delayed pending separate consideration and action by the Commissioners. For these types of actions, we found that the Action Plan descriptions were less firm, but that individuals had been assigned to work on and be responsible for completing them in the time frame identified in the Plan. The Commission intends to initiate work on 33 of these actions during fiscal years 1980 and 1981. The remainder are deferred until fiscal year 1982 or later.

Most of these 110 actions reflect Three Mile Island-related recommendations which the Commission staff believes should be addressed. Many of them, however, require additional study before the staff can determine what action to take or even if the action is necessary considering its cost and relative importance to safety.

For instance, one such action is the "Nuclear Data Link" (Task III. A.3.4.). The Three Mile Island investigations found that the Commission headquarters personnel did not have adequate information to understand what was happening during the accident. Besides recommending that direct telephone lines be installed between operating plants and Commission headquarters, these investigations suggested that a system be installed to transmit plant operating data directly to the Commission's Incident Response Center in Bethesda, Maryland.

In response, the Commission inserted a task in the Action Plan to further study the cost and feasibility of this recommendation. A contract was awarded to a Department of Energy national laboratory to undertake the task and to recommend a course of action. Following the completion of this contract, the Commission will decide whether the recommendation should be implemented, discarded, or studied further. According to a Commission official, early indications are that the cost of the first proposal evaluated may be prohibitive and that less costly alternatives will have to be explored.

ACTION PLAN SCHEDULES AND  
RESOURCES--ARE THEY ADEQUATE?

The Commission went through several phases to estimate time frames and to identify the resources needed to implement each Action Plan item. We found that the Commission's overall process in this area was reasonable and should

provide a good basis for planning the disposition of the Action Plan tasks. Whether the tasks can be completed on time with the estimated resources, however, can only be determined as the Plan is implemented.

The Action Plan includes estimated time frames and resources needed for most of the Action Plan items. These estimates, for the most part, were prepared by the five major Commission offices depending upon the priority assigned to the Action, the perceived role of the Office in completing the task, and the resources available. Because the Commission budget cycle has already been completed for fiscal years 1980 and 1981, it was necessary for each Office to reassign both people and money from programmed activities to the Action Plan tasks.

In doing this, each office identified the resources that could be spared without seriously affecting its overall regulatory and licensing mission. These resources were spread over as many of the applicable actions as the offices reasonably thought they had time to implement. The Action Plan steering committee and the Commission's Office of the Controller reviewed the justification for the resources assigned to each action, were instrumental in adjusting them as necessary, and generally determined that they were adequate to carry out the task. Although we have no basis to disagree, we believe that the resources assigned to the actions do not leave much margin for error. They appeared to be the minimum that the Commission could assign and still be able to do the task.

This was confirmed by several Commission officials who characterized the resources in the plan as austere. One official, in particular, noted that the Plan--as well as other Commission activities--did not leave much room for maneuvering. If another major accident were to occur, if unforeseen licensing problems were to develop, or if supplemental and regular appropriation bills are not passed as requested, this official said that personnel assignments and office priorities will have to be reassessed, including those in the Action Plan. He did not think it inappropriate, however, for a planning document to fully account for all staff time and resources or attempt to get as much out of those resources as possible.

We agree with this position and believe that the Commission has gone through a reasonable process for estimating schedules and assigning resources to the Action Plan tasks.



Whether the schedules and resources for the individual actions are adequate, however, can only be determined as the Plan is implemented.

THE COMMISSION HAS INCREASED  
RELIANCE ON THE INDUSTRY

The only way that the Commission can implement the large number of Action Plan items during the remainder of this year and the next is to rely heavily on the nuclear industry to study the items and to develop and implement the corrective actions. For the most part, the Commission has only scheduled minimal time, as described in the previous section, to develop general criteria and to review the implementation efforts of the industry.

As a result, the successful completion of the Action Plan depends primarily on how seriously the industry addresses the action items and their attitude toward doing a quality job. This could, however, vary significantly throughout the utility and nuclear industry. For instance, one of the Action Plan items required utility companies--with plants close to receiving an operating license--to perform a partial control room design review. This was done because several Three Mile Island investigations considered present-day control rooms inadequate for operators to understand and control a reactor during accident conditions.

The Commission, however, did not develop criteria or guidelines for these utilities to follow, leaving each one to decide what and how much to do. <sup>1/</sup> As a result, of the two reports received and examined by the Commission thus far, the utility with a relatively good control room design did what the Commission believes is a good review, while the one with a relatively poor design did a bad review. Because of this problem, the Commission has decided to redo the control room reviews for each of these utilities, using a contractor specially qualified in assessing the relationships between man and machine.

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<sup>1/</sup>According to Commission officials, control room design and review criteria will be developed later this summer. At that time all utilities with plants in operation or under construction will be required to perform a complete control room design review.

CONCLUSIONS AND RECOMMENDATIONS

Through the Action Plan, the Commission is implementing a massive program to upgrade safety at nuclear powerplants. The planned actions seem appropriate for this purpose, but because the program is in its infancy, success or failure cannot be determined at this time.

We believe that the Commission is stretching its resources very thin and placing major dependency on industry and other organizations. Also, budget rescissions, another major accident, or future Commission mandated responsibilities could have a major impact on successful completion of the program. We therefore believe that some oversight mechanism should be established to provide the Congress and the public with periodic information on the status of each action and how well the Commission is implementing its plan.

In this respect, President Carter, on March 18, 1980, created a "Nuclear Safety Oversight Committee" to oversee the Commission's activities and assess the progress being made to implement the recommendations of the President's Commission on the Accident at Three Mile Island. Consisting of five members from outside the Federal Government, this committee will have its own technical staff and appropriations and, according to an administration official, is expected to be in existence for 2 years.

We endorse this concept and believe that such independent oversight of the Commission is needed to insure compliance with important Three Mile Island recommendations and to guarantee that progress is made toward improving reactor safety. To assess the Commission's progress in implementing the Action Plan, however, we also believe that the Commission should report periodically to the Congress on the status of the Plan. This report should specifically describe the progress and resources spent on each action item as compared to the original Plan.

In addition, because the Commission has depended greatly on the nuclear industry to review and implement Three Mile Island recommendations, we believe that the new "Nuclear Safety Oversight Committee" should pay particular attention to how well the industry responds. If the response, in the Committee's opinion, is not adequate, the Commission should

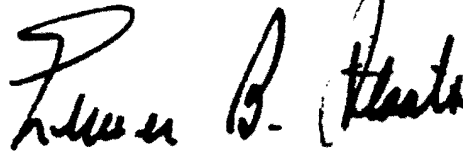
be required to reevaluate its role in seeing that the Action Plan tasks are properly implemented.

RECOMMENDATION TO THE COMMISSION

We recommend that the Commission periodically report to Congress on its progress in implementing the Action Plan, specifically providing the status of each action compared to the original Plan. If the Commission does not agree with the recommendation, congressional oversight committees should consider formally requesting periodic reports pursuant to our recommendation.

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As requested by your office, we did not obtain official Commission comments. In addition, we will restrict the distribution of the report until July 30, 1980, when your subcommittee's report on Three Mile Island is expected to be published. At this time, we will send copies of this report to the Commission and other interested parties.



Comptroller General  
of the United States

THREE MILE ISLAND ACTION PLAN TASKS WE REVIEWED

To test the accuracy of the Three Mile Island Action Plan, we reviewed the following 10 tasks. They represent a cross-section of the 51 tasks in the Action Plan and include 49 specific actions already taken or proposed by the Nuclear Regulatory Commission.

1. Improve the training and qualifications of nuclear powerplant operating personnel (Task I.A.2.).
2. Insure that the results of equipment failures, operating errors, or other powerplant problems are properly reported, analyzed, and distributed to the people that need to take corrective action (Task I.E.).
3. Improve control room designs so plant operators will be better able to understand and respond to emergencies. (Task I.D.).
4. Require utilities to install additional powerplant features that will control an accident or limit the radiological releases during the accident (Task II.B.).
5. Require that certain plant instruments be capable of monitoring and surviving accident conditions (Task II.F.).
6. Improve the capability of utilities to respond to radiological emergencies (Task III.A.I.).
7. Improve the Commission's emergency preparations and ability to respond to accidents (Task III.A.3.).
8. Improve public protection following an accident by upgrading radiation monitoring equipment and methods of collecting and analyzing radiation data (Task II.D.2.).
9. Strengthen the Commission's authority to penalize utilities that do not conform to regulatory requirements (Task IV.A.).
10. Establish a Commission policy on safety (i.e., what level of nuclear regulation is enough) (Task V.1.).