REVISIONS TO ANSI/ANS 3.1 1978 -
RESULTING FROM TMI-2

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ABSTRACT

The Three Mile Island incident has been the most traumatic event ever to occur in the history of the U.S. Nuclear Power Program. This sobering event brought about a new wave of public concern as well as an avalanche of backfit requirements unprecedented in our history. The numerous studies by governmental agencies and blue ribbon committees has resulted in over 200 recommendations to improve nuclear operations. Many of these recommendations have merit and will offset many of the deficiencies found in the investigation of the TMI-2 incident. Some recommendations however will have little or no impact on improving safety of nuclear operations but have been imposed by emotional analysis not technical analysis.

The personnel errors which occurred at TMI-2 brought forth several areas of weaknesses in personal selection, qualification and training that impacted ANS-3. As a result, the ANS-3 Committee started working on a revision to ANSI/ANS 3.1-1978 Standard in May 1979. In July 1979 the first set of official recommendations was issued in NUREG 0518. Due to the "interim" nature of these regulations some interpretation of the intent of these recommendations had to be made and a basis developed to justify changes to the standard. For example, the Shift Technical Advisor (STA) recommendation has been included in the standard revision as a temporary position until such time as the regular members of the shift supervisory organization receive upgraded training such that they can perform this function and the new control room manning requirements are finalized and implemented at all nuclear plants. The recommendation that each shift supervisor have a college degree was another issue of considerable debate and an alternative position was reached and set forth in an addition to Section 4.1 which the committee believes fulfills the intent of the recommendation. This addition recognizes that on a rare occasion an individual
with exceptional skills comes up through the ranks and has demonstrated his ability to be a competent department head or plant manager.

Additional organization positions were added in this revision and numerous changes were made throughout the standard including a complete rewrite of training requirements, Section 5.

The Three Mile Island incident coupled with the general lack of understanding by the public set off an uncontrolled chain reaction in the NRC, state and local governments, as well as the news media that thrilled the "Anti-Nukes" and shocked the entire world. This sobering incident brought into focus several deficiencies in the NRC's and the utilities management of nuclear industry operations such as the overemphasis placed on the design basis accident, inadequate human factors considerations in plant design, and the need for better training on fundamentals of nuclear plant operation.

The utility industry was quick to take the initiative and responded beyond one's expectations to this incident with both personnel and material support. New programs to improve safety of operations were also developed including the establishment of the Institute of Nuclear Power Operations (INPO). Standards that were affected by TMI-2 such as ANSI/ANS 3.1-1978 were immediately brought forth by the ANS-3 Committee for review and revision. Coincident with this time period,
Reg. Guide 1.8 revision 2 was out for comments and as a result of TMI-2, the comment period was extended. Specific comments were requested for staffing, training, qualifications and requalification of operating, technical support and supervisory personnel. This brought in a deluge of comments from utilities, contractors, consultants, etc. that had to be considered by the ANS-3 Committee. The effort started in May 1979. In parallel with this effort the NRC staff and its many "Lessons Learned" study groups developed literally hundreds of recommendations to improve nuclear plant operations. These recommendations are summarized in an NRC document familiar to most people here entitled NUREG 0737 "Clarification of TMI Action Plan Requirements". Those recommendations impacting on ANSI/ANS 3.1 are too numerous to discuss here, however two of the more critical issues included: (1) the addition of a Shift Technical Advisor (STA) to each shift and (2) the college degree requirement for shift supervisors.

The new "STA" position for the operating organization was a significant issue and was discussed by the ANS-3 Committee at great length. The members with operating experience believed that use of an "STA" did not make a major contribution to operating safety since this person was not licensed and not a part of the line organization. However, his technical knowledge might be of some value to the shift supervisor in an accident or transient situation. The consensus position reached was that this position should be established on a
temporary basis. The need for the STA could be eliminated when the NRC required shift supervisory organization was implemented. This organization must be implemented by July 1, 1982 and includes both a Senior Reactor Operator position and a Senior Licensed Shift Supervisor in the control room. Dual unit common control rooms will also be allowed to have a minimum of two SRO's on shift.

The second significant issue was the NRC's recommendation for all shift supervisors to hold college degrees. The ANS-3 Committee disagreed strongly with this recommendation. This is a fine goal, but in reality there are several concerns that need to be addressed such as:

1. The number of college degreed people available and the resulting recruiting competition.

2. Cutting off the career path of existing outstanding non-college graduate operating supervisors with long years of nuclear experience and demonstrated capabilities as technical and personnel managers.

3. College graduates are not automatically good managers of people.

4. The need to create incentives to obtain competent college graduates who are willing to dedicate several years to shift work since shift work places them out of the normal stream of activities and they feel that they may be bypassed by their peers for promotion.
The associate degree was considered as an alternative to the college degree; however, the equivalent to this type of degree is essentially gained by participation in the existing SRO required training programs set forth in ANSI/ANS 3.1. The decision of ANS-3 was to provide an addition to Section 4.1 for consideration of exceptional non-college degreed personnel for any position in this standard based on an evaluation of several positive factors such as years of supervisory experience, college level training received, etc. that could qualify an individual for a specific position. This review of course must be well documented and approved by the appropriate organization manager.

Consideration was also given to the organizational structure for nuclear power plants since considerable pressure exists throughout the NRC and some industry personnel for a "standard organization". The ANS-3 Committee's consensus opinion remains as stated in the scope of the standard since we believe that our charter requires us to provide acceptable means to achieve a requirement without stifling innovation and provides for some flexibility that is needed to meet the differences between various organizations' policies, procedures, legal requirements and differences in plants and physical facilities.

Now that I have discussed two of the more critical issues, I will revert to a more systematic summary of the revisions made to this standard.
The definitions section was reorganized and the terms arranged in alphabetical order. The nuclear power plant experience definitions were regrouped and revised as follows: credit given for non-nuclear power plant experience was reduced by 50%; however, the total credit given was increased to three years. As an example, six years of Nuclear Navy experience is equivalent to three years of nuclear power plant operating experience.

The experience allowed for simulator training programs was reduced to a one for one basis with a maximum of three months and all other forms of on-the-job training are now included as one item with a maximum one for one credit allowance of two years. These changes will increase the demand for ex-Nuclear Navy personnel and in some cases non-Nuclear Navy personnel will need additional time to gain the nuclear plant experience and training required by this standard. These changes placed credit for this type of training on a more comparable as well as justifiable basis.

The qualifications for all managerial and technical plant positions were revised, after lengthy discussions on the pros and cons of increasing the required nuclear experience. These revisions consisted of requiring more specific types of experience such as: being an active participant in the plant organization during startups, refueling outages, etc. We recognize, of course, that we cannot write a complete practical position charter for each job due to
utility's differences in responsibilities assigned to a specific position, job titles used, and an individual utility's policy on participation in construction and pre-operational testing activities. If one examines the qualifications carefully he will find that the overall time to become qualified for most positions has remained essentially the same but the nuclear experience requirements have been changed to include more specific experience. The exceptions to this are the qualifications for the engineer in charge 4.6.1, staff specialists 4.7.2 and SRO licensed personnel. The engineer in charge must now have six years of professional level experience instead of three years, plus a degree. Staff specialists must now have five years of professional level experience instead of three years, plus a degree. Personnel required to obtain the SRO license may need to be hired six months earlier to meet the new requirements if they have not previously held a license. These increases in experience level were based on the growing need for off site technical support personnel that have in-depth knowledge of plant design and operations. Each new plant we build has more systems, more instruments, more computer controls, more procedures and as a result requires more time to learn and more highly skilled people.

Section 3.1 was revised by adding two new paragraphs: one which recommends job overlap for replacement personnel and the other which requires an assessment of the collective
qualifications of the plant staff to assure that the plant staff has in-depth experience beyond just the minimum requirements of the standard. Industry experience indicates that addition of the last paragraph should not present a problem and it emphasizes the fact that management must not try to get by with minimums at a time when our industry is striving to improve its operating record and prevent future TMI type incidents.

In Section 3.2.4 Operators - Technicians - Maintenance Personnel, two additional paragraphs were added to clarify the ANS-3 position that apprentices may perform work without direct supervision if they have demonstrated their ability to perform certain tasks satisfactorily.

Section 4.1 was revised to provide clarification for meeting the nuclear power plant qualification requirements due to the increased length of time prior to fuel loading that personnel must be brought on site to receive training and participate in the preoperational and startup test program. This clarification calls for consideration that credit be given toward nuclear power plant experience depending on the credibility of the work assignments and provides a mechanism to assist in meeting the experience requirements. The addition to this section for the use of exceptional non-degreed personnel to fill management positions was discussed previously as a major change to the standard. It should be emphasized however that personnel of this caliber are rare
and a careful evaluation should be made of any such candidate since use of this exception must standup to future NRC review.

The qualifications for the Plant Manager have been revised, and the allowance for an alternate to hold an NRC license and/or college degree has been removed. The Plant Manager now must have a Bachelor's Degree in Engineering or related science and hold or have held an SRO license on a similar type of reactor or as a minimum been certified at an appropriate simulator. The Plant Manager must also be assigned on site at least six months prior to the start of the preoperational test program. The experience requirements are also more specific and call for previous participation in nuclear power plant operations at power levels above 20%, routine refueling outages, initial plant startup testing or post refueling outage startup testing. These specific requirements were also added to most managerial positions. College degrees are now required for the Maintenance Manager, Quality Assurance and the newly added position of Training Manager.

These added requirements were based on the fact that our plants continue to grow more sophisticated in every aspect and college level training provides the mechanism to understand the technical basis for design, materials properties, welding techniques, as well as the programs which must be structured to train our personnel properly in a reasonable amount of time.
The new Training Manager position was added to meet a real deficiency in the standard regardless of TMI and this person must hold an SRO license unless another person on the Training Manager's staff, that has been assigned the responsibility for licensed training, holds an SRO license.

The Supervisors’ Section 4.3 has been completely redone and requires careful review. The new required position of Senior Operator was added and the educational requirements have been increased such that when all shift supervisors and Senior Operators meet the requirements, the NRC required Shift Technical Advisor can be eliminated.

The ANS-3 Committee also concluded that the responsibilities of the licensed shift personnel are so vital to nuclear safety that an additional section on certification was added requiring an in-depth review of the training, health and competence of Shift Supervisors, Senior Operators and licensed operators by corporate management. In order to reduce the burden of detailed investigative work for the corporate manager, this section allows the appointment of a review board to examine the records of potential candidates for these positions.

Qualifications for additional positions have been added to Section 4.4 of this revision including preoperational and startup testing personnel, Training Coordinator, Training Instructor, Shift Technical Advisor, and personnel who review and approve preoperational and startup tests.
The need for these positions existed before TMI due to the magnitude of the impact of these activities on the safety as well as the reliability of nuclear operations. All qualifications set forth in Section 4.4 now contain more specific requirements and a new special provision has been added for Sections 4.4.1, 4.4.2, 4.3.3 and 4.4.4 which allows the use of temporary replacement personnel for these positions with reduced qualifications. This temporary replacement period is specified in Section 3.1 as being limited to three months on a justifiable basis and was added to the standard to compensate for situations in which the incumbent in the job becomes unavailable for whatever reason and the fact that it takes time to hire or otherwise obtain a qualified replacement.

In addition to the specific requirements added to the positions described in this standard, non-licensed personnel are required to have demonstrated knowledge of systems important to safety and system interactions such that they recognize the affect their work assignments might have on the plant equipment and thus prevent personnel errors such as valving out Tech Spec required equipment, etc.

The qualifications for the individual responsible for chemistry and radiochemistry have been increased to two years but also includes a credit allowance of six months for satisfactory completion of a vendor certified program in addition to the generic detailed changes made for all positions.
The Training Section (5.) has been substantially revised and includes development of job task analysis as a basis for training programs which is completely in agreement with the objectives of our industry's INPO organization. In addition to this the training requirements for all positions specified in Section 4. contains more specific requirements in an effort to address the deficiencies in training programs resulting from the various TMI-2 incident studies.

These added details include eligibility requirements for potential license candidates, examination criteria, detailed subjects for classroom training, on-the-job training, operating practices and simulator training. Training in management skills was also added for licensed supervisors in order to improve their overall ability to manage and motivate people and to analyze and assess plant operating activities more accurately.

The examination criteria have also been revised and higher standards of acceptance are specified in order to have consistency between the initial qualification acceptance grade and the acceptable requalification grade.

Why? This upgrading is essential if we are to improve the overall quality of our operations and make our operations truly professional. We can no longer be satisfied with meeting minimal requirements if our industry is to survive in the future.
Impact on industry - an assessment of the impact this standard revision will have on industry was made by reviewing the manning of Commonwealth Edison's future Carroll County Station, now scheduled for service in 1992.

The major impact has been on the change in the number of people required in the operating organization and the additional lead time prior to fuel loading to meet such requirements as the six months of RO experience before one can take an SRO exam. At Commonwealth Edison the operating organization performs all the original site instrument calibrations, motor bumping, system flushing, and initial bus and breaker energizing in addition to the preoperational test program.

The continued emphasis on more training and retraining programs has resulted in adding a sixth shift position. This is not however totally the result of the increased retraining requirements of this standard. It is partially due to the fact that more fringe benefits have been added for employees over the years such as added vacation and holidays. It is now to the point where we need an entire shift to cover for these periods in combination with the increased retraining. Personnel now have 12-1/4 paid holidays per year and up to six weeks vacation. In order to implement the program four shift supervisors, nine operating personnel and three more training instructors must be added. The affect of the new qualification requirements would impact primarily on the operating organization since the massive amount of paper work (flushing proce-
dures, preop procedures, plant procedures) that must be done prior to loading fuel in a new station in conjunction with construction support would require most of the personnel to be on site in time to qualify for practically all positions except the manager type positions taking into account that personnel requiring special training would be sent off site to acquire such training during this period. The operating supervisory personnel that need the Senior license must be trained and licensed as reactor operators and sent off to acquire the six months experience at an operating plant unless one is fortunate enough to obtain licensed reactor operators that meet the requirements from another nuclear plant.

In the worse case assuming all supervisors needed to obtain both an RO and SRO license, the Commonwealth Edison Company two unit Carroll County Plant would need six department heads and 18 supervisors on the payroll six months earlier than pre-TMI to fulfill this requirement. This cost along with the cost of the sixth shift mentioned earlier would add about 2.4 million dollars to the total operating department payroll for initial manning up to fuel load, assuming the sixth shift is hired three years before fuel load. The cost of adding the sixth shift to an existing two unit plant will be about 1.9 million dollars per year (16 men at 40K dollars/yr. including fringe benefits). This comparison only applies to comparable dual unit plants with a common control room. Every utility has its own unique management
system for performing construction, startup and operating activities and this makes cost comparisons difficult.

This standard revision was made during a period of crisis in our industry and every effort was made by the Committee to be realistic and practical when evaluating recommendations for change. The initial balloting on this proposed revision was such that many minor changes had to be incorporated into the revision to gain an acceptable majority of positive votes. Final review of the balloting results in the Fall of 1980 and the number of revisions made to the standard indicated that a new ballot should be taken. This balloting was performed in January 1981 and resulted in 6 approvals, 5 approved with comments, 9 not approved, 4 not voting and 4 not returned out of a total of 28 possible votes. Resolution of the unapproved ballots will be undertaken at an ANS-3 meeting scheduled in March 1981.