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Appendix R Presentation
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When Mark Salley called to ask if I would be willing to explain the rationale for the individual requirements of Appendix R to 10 CFR 50, he mentioned that many of you folks had not been born at the time of the TVA Browns Ferry Fire. I thought he was exaggerating, until using all of the higher mathematics I still remember, including my fingers, I figured out that people born on the day of the fire would now be one-quarter through their 34th year. I realized that he was not exaggerating and decided that a bit of historical review might help to set the scene for my remarks.

I was at Scout camp in August 1945 when the atomic bombs that ended WWII were dropped on Japan. I was thirteen years old. Both of my older brothers (one in the infantry in Europe and the other in the Navy amphibious forces in the South Pacific) were being prepared for the invasion of Japan. That the Atomic Energy Commission was the successor of the Corps of Engineers Manhattan Engineering District that built the bombs was still about all I knew of the AEC when I started my career in nuclear energy at the AEC Savannah River Operations Office in June of 1962.

Savannah River, one of three AEC production sites, was constructed in the early 1950s. (The other two, Hanford located in the high desert of central Washington along the Columbia River and Oak Ridge located in the hills of East Tennessee, were built during the war.) These three sites produced the plutonium, weapons grade enriched uranium, and tritium used to construct our nuclear weapons arsenal. The nuclear weapons program, the responsibility of the AEC General Manager, was the largest and most important part of the AEC mission.

That part of the AEC mission for the promotion and regulation of nuclear materials for civilian use was the responsibility of the Director of the Office of Compliance. There was little technical communication between these two parts of the AEC and I became the first fire protection engineer in Compliance when I transferred to AEC Headquarters Fuel Cycle Licensing in August 1973. The Office of Compliance became the independent Nuclear Regulatory Commission in January 1975. (Remember that the fire at Browns Ferry that started all this occurred on March 22, 1975.)

Early in 1976 I was detailed from Fuel Cycle Licensing to NRR to assist with the development of Branch Technical Position 9.5-1, *Guidelines for Fire Protection for Nuclear Power Plants.* As I recall, Draft D was given to me for review. A couple of hours later I had crossed out about 85 percent of the text. This led to an interesting and ultimately positive conversation of the purpose of the proposed BTP. I was told that, *of course you dummy*, the purpose was to develop guidelines for required fire protection upgrades, not only for the Browns Ferry plant, but also for all the other NPPs in the country – both operating and under construction. But I asked how they hoped to develop meaningful fire protection upgrade guidelines for these plants given the absence of detailed fire protection requirements for new plants. Practically speaking, the many technical requirements for NPPs had been developed without any consideration for fire protection needs.

As a result of that conversation, the emphasis changed and BTP 9.5-1 became the base line of fire protection requirements for NEW NPPs, published in May 1976. It is important here to call attention to the first footnote in this BTP because it spells out explicitly a fundamental concept of NRC regarding its several published technical requirements. It reads as follows:

"*Designs or methods different from the guidelines set out in this document may be acceptable if they provide fire protection comparable to that recommended in the guidelines. Suitable bases and justification must be provided for alternate approaches to establish acceptable implementation of General Design Criterion 3.*"

Only after BTP 9.5-1 was completed did we begin to consider deviations from those basic requirements that could be acceptable for plants already operating or in various stages of design and construction. Those efforts became Appendix A to BTP 9.5-1, *Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976* published in August 1976. Thus, BTP 9.5-1 and its Appendix A provided the guidance used by the staff to evaluate a plant's fire protection depending on when a particular NPP was docketed. (To the best of my knowledge, BTP 9.5-1 is the document used by the NRC staff to review fire protection features for any new nuclear power plants.)

Early in 1978 I transferred to the Office of Standards Development. I clearly remember keeping in close touch with the FPE staffs in NRR because I was working on documentation to support their fire protection licensing efforts. By the summer of 1979 most licensees had committed to most of the technical requirements of Appendix A to BTP 9.5-1. However, there were still a significant number of plants with open issues. How to get those issues closed was increasingly a subject of conversation between the Commissioners, particularly Commissioner Peter Bradford, and NRR. Everyone agreed that only two options were open to the staff: Write a rule that would apply to all of the plants with open issues, or; Issue orders to each plant individually. Everyone also agreed that whichever option was chosen the industry would sue in federal court. The decision was immediately obvious. Choose a rulemaking and defend the decision in court once. For to issue orders would mean going to court about 30 times.

On August 9, 1979, NRR sent a letter to Guy Arlotto, my Division Director, requesting a Rulemaking for a Five Man Fire Brigade. While I had never been involved in writing a Rule, the process did not seem particularly complicated, but I understood from conversations with others in the office that it could be tedious. For instance, I learned that regardless of the length, and simplicity or complexity of the technical issues involved, the *minimum time* required from initiation to publishing an effective rule was four years. In discussing this particular request, I pointed out that: (1) I knew NRR had a total of 17 open issues, and; (2) the five man fire brigade was the least significant of the 17. Also, it didn't seem prudent to invest four years of my time to write a rule to resolve just that one relatively minor problem when for essentially the same time commitment we could help NRR resolve all of their outstanding issues. Our reply to NRR reflected these concerns.

At a subsequent meeting between Bob Minogue, Director of Standards Development, and Ed Case, Deputy Director of NRR, Bob Ferguson, a Section Leader in NRR, and I were given direct responsibility to produce the new rule. Bob section was responsible for reviewing fire protection for those plants that already had an operating

license. While Bob and his crew provided the technical details of the open issues and options proposed by the staff as acceptable alternatives to resolve them, I was responsible for actually writing the rule.

I'll come back to this a bit later, but remember what I said above being advised that the *minimum* time for producing a rule was four years? Section 50.48 and Appendix R to 10 CFR 50 was published in the Federal Register on Wednesday, November 19,1980 with an effective date of February 19, 1981. Fifteen months and ten days had elapsed from the date of the letter requesting initiation of rulemaking and publishing the final rule in the Federal Register. Amazing what can happen when a Commissioner is personally interested and calls the NRR Deputy Director daily for a status update!

Two more related vignettes before I get into some of the details of Appendix R. The ACRS subcommittee responsible for oversight of fire protection issues had asked for a briefing on Appendix R. The industry response was to be given by the corporate FPE for one of the northeast utilities. Over the years we had developed a good working relationship, respecting and trusting each other. Out in the hall before the meeting started I learned that his heart was not in the task before him. He confided that he, and many of his industry colleagues, really welcomed Appendix R because it would became the means of implementing certain fire protection features that management felt was either not needed or was too expensive. He immediately added that if I quoted him in public he would be forced to deny he said it. I believe there is a lesson here for those of you on the front lines of regulation and enforcement. Listen *very carefully* to your industrial counterparts but continue to exercise your best technical judgment and share it with your management and those same industrial counterparts.

The related vignette illustrated why he was a reluctant advocate came immediately following his testimony. David Okrant, one of the ACRS members spent the entire time of both the NRC and industry comments with his back to the speakers, reclining comfortably in his high-backed chair. Many in the room thought he was asleep. When the Chairman asked if there were any questions, Mr. Okrant whipped around with a speed I could scarcely believe. He admitted that many of the industry comments about the shortcomings of Appendix R *seemed* valid. But, he asked, what the industry proposed in its place. When the speaker opined he did not understand exactly what Mr. Okrant was asking he received a scathing rebuttal. It was clear, Mr. Okrant said, that fire protection in the countries NPPs was deficient and needed immediate improvement. The staff had presented its best effort at codifying those needed improvements. IF those efforts were as deficient as the industry had just alleged, what did they propose instead? Without serious industry alternatives presented *right then*, he for one was not particularly inclined to be sympathetic to their arguments. I really felt sorry for my friend.

That's enough about HOW and WHY Appendix R was developed. Now let's get to the interesting stuff about what was in our heads and WHY we wrote what we wrote.

Preparing for this presentation is the first time in several years that I have looked at the rule in its entirety: two thoughts jumped out at me. First, nothing hear was new. Second, all the items seem so basic I had to wonder why a rule was necessary. Both are legitimate and understandable observations. With the exception of the new definition in Section I, everything else is included in BTP 9.5-1 and its Appendix A. But remember,

every item here is included to permit closure of one open issue between the staff and at least one NPP licensee or applicant.

I. **Introduction and Scope** – The phrases "important to safety," or "safety-related," will be used throughout this Appendix R as applying to all safety functions. The phrase "safe shutdown" will be used throughout this Appendix R as applying to both hot and cold shutdown functions.

II. General Requirements

A. Fire Protection Program – Every plant must have one.

B. Fire Hazards Analysis – Every plant must perform one by qualified fire protection and reactor systems engineers.

C. Fire Prevention Features – Lists many of the features described in detail in Section III

D. Alternative or Dedicated Shutdown Capability – Note that (c)(6) of Section 50.48 permits a licensee to request an exemption from any of the specific requirements of Appendix R, just the same as the first footnote of BTP 9.5-1. This item has been viewed by some, including some NRC officials, as evidence that Appendix A is basically flawed. I reject that opinion, and not because of pride of authorship. I believe that statement, and Footnote 1 of BTP 9.5-1 have been key to whatever success the staff has had with respect to fire protection upgrades at NPPs. It was also the most important item allowing the Federal court to find for NRC during the legal challenge by the industry following publication of Appendix R. (See United States Court of Appeals for the District of Columbia, Case No. 81-1050, Connecticut Light and Power Co., et. al. vs. NRC, Petition for Review of an Order of the NRC. Argued January 29, 1982. Decided March 16, 1982)

III. Specific Requirements

A. Water Supply for Fire Suppression Systems – Two separate water supplies, each to provide at least two hours of maximum expected fire flow demand as determined by the Fire Hazards Analysis. Independent power supply for fire pumps. Reactor safety folks said NO to connection to Emergency Diesels!

B. Sectional Isolation Valves – Consistent with NFPA and AWWA

C. Hydrant Isolation Valves – Exceeds requirements of NFPA and AWWA.

D. Manual Fire Suppression – Standpipe and hose to provide at least one effective hose stream to reach any location that contains or presents an exposure fire hazard to structures, systems, or components important to safety.

E. Hydrostatic Hose Tests – Consistent with NFPA standards.

F. Automatic Fire Detection – Consistent with NFPA standards.

G. Fire Protection of Safe Shutdown Capability – Separation requirements: 2.a. Requires separation of redundant trains with minimum 3-hour rated fire barriers. (Explain 3-hour as minimum construction using only non-combustible materials); or 2.b. Requires 20 feet horizontal separation (this was a compromise – I originally specified 50 feet) without intervening combustibles AND fire detection and automatic fire suppression in the area; or 2.c. Requires enclosure of one redundant train with a 1-hour barrier AND fire detectors and automatic suppression installed in the area

H. Fire Brigade – Minimum of five members

I. Fire Brigade Training – AEC Rocky Flats fire of Mother's Day, 1969; Ft. St. Vrain fire, Saturday, October 3, 1987; Maine Yankee fire, April 29, 1991

J. Emergency Lighting – Arizona Public Service Palo Verde plant visit in March 1990 and Enforcement Conference at Region V office in Walnut Creek, California July 1990. (Frank Garrett, Chuck Ramsey & Jack Martin) Explain 8-hour batteries.

K. Administrative Controls

L. Alternative and Dedicated Shutdown Capability

M. Fire Barrier Cable Penetration Seal Qualification – NRC actions created need for approved seal material.

N. Fire Doors – NRC actions created need for "Fire Door Dampers" (BTP 9.5-1 and its Appendix A)

O. Oil Collection System for Reactor Coolant Pump