UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

October 11, 2002

MEMORANDUM TO: ACRS Members

FROM: Tim Kobetz, Senior Staff Engineer
ACRS

SUBJECT: CERTIFICATION OF THE MINUTES OF THE ACRS SUBCOMMITTEE MEETING ON FIRE PROTECTION, SEPTEMBER 11, 2002, ROCKVILLE, MARYLAND

The minutes of the subject meeting, issued October, 9, 2002, have been certified as the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc: ACRS Members:

G. Apostolakis
M. Bonaca
T. Kress
D. Powers
J. Sieber
G. Wallis

cc: via E-Mail:

J. Larkins
S. Bahadur
R. Savio
H. Larson
S. Duraiswamy
ACRS Staff Engineers
ACRS Fellows

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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WASHINGTON, D.C. 20555-0001

MEMORANDUM TO: Tim Kobetz, Senior Staff Engineer
ACRS

FROM: Mr. Stephen L. Rosen, Chairman
Fire Protection Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES OF THE ACRS SUBCOMMITTEE MEETING ON FIRE PROTECTION SEPTEMBER 11, 2002 - ROCKVILLE, MARYLAND

I hereby certify that, to the best of my knowledge and belief, the minutes of the subject meeting issued on October 9, 2002, are an accurate record of the proceedings for the meeting.

Mr. Stephen L. Rosen, Chairman
Fire Protection Subcommittee

10/11/02
Date

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

October 9, 2002

MEMORANDUM TO: Mr. Stephen L. Rosen, Chairman
Fire Protection Subcommittee

FROM: Tim Kobetz, Senior Staff Engineer
ACRS

SUBJECT: WORKING COPY OF THE MINUTES OF THE ACRS SUBCOMMITTEE MEETING ON FIRE PROTECTION SEPTEMBER 11, 2002 - ROCKVILLE, MARYLAND

A working copy of the minutes for the subject meeting is attached for your review. I would appreciate your review and comment as soon as possible. Copies are being sent to the Fire Protection Subcommittee members, and other ACRS members who attended the meeting, for information and/or comment.

Attachment: As stated

cc: G. Apostolakis
M. Bonaca
T. Kress
D. Powers
J. Sieber
G. Wallis

cc via e-mail:
J. Larkins
S. Bahadur
S. Duraiswamy

Issued: October 9, 2002
Certified: ROSEN - OCTOBER 11, 2002

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
MINUTES OF ACRS SUBCOMMITTEE MEETING ON
FIRE PROTECTION
SEPTEMBER 11, 2002
ROCKVILLE, MD

The ACRS Subcommittee on Fire Protection held a meeting on September 11, 2002, at 11545 Rockville Pike, Rockville, Maryland, in Room T-2B3. The purpose of this Subcommittee meeting was to discuss the staff's Fire Protection Research Plan, status of the fire protection research activities, fire protection inspection process and findings, and other related matters including industry activities. Mr. Timothy Kobetz was the cognizant ACRS staff engineer for this meeting. The meeting was convened at 8:30 AM and adjourned at 4:40 PM on the same day.

PARTICIPANTS:

ACRS
S. Rosen, Chairman
M. Bonaca
G. Leitch
T. Kress
J. Sieber
G. Wallis
D. Powers

Office of Nuclear Regulatory Research (RES)
Mark Cunningham
J.S. Hyslop
N. Siu

Office of Nuclear Reactor Regulation (NRR)
Mark Reinhart
See-Meng Wong
Doug Coe

Sandia National Laboratory (Sandia)
S. Nowlen

Nuclear Energy Institute (NEI)
Fred Emerson

There were no written comments or requests for time to make oral statements received from members of the public. Two members of the public attended the meeting. A list of meeting attendees is available in the ACRS office files.

ACRS SUBCOMMITTEE CHAIRMAN'S INTRODUCTION

Mr. Stephen Rosen, Chairman of Fire Protection Subcommittee, convened the meeting and stated that the purpose of this Subcommittee meeting was to discuss the staff's Fire Protection Research Plan, status of the fire protection research activities, fire protection inspection process and findings, and other related matters including industry activities. Mr. Rosen then called upon NRC staff to begin.

NRC STAFF INTRODUCTION - Mr. Mark Cunningham, NRR

Mr. Cunningham, Chief, Probabilistic Risk Analysis Branch, stated that the Office of Nuclear Regulatory Research (RES) had an extensive research program underway to improve the methods, tools and guidance that could be used by a number of different organizations to perform fire risk analysis. The program focused on improvements in probabilistic risk assessment (PRA). RES plans to use this research to enhance the significance determination process used by licensees and the NRC staff to develop fire protection PRA's and implement risk informed regulation of fire protection.

Dr. Powers noted that the Subcommittee was interested in hearing about tools that are provided to the regional senior reactor analysts to determine risk associated with fires. Mr. Rosen stated that the Subcommittee was also interested in fire protection research being performed on issues unique to advanced reactor designs such as the use of graphite.

FIRE RISK RESEARCH PLAN - Mr. Nathan Siu, Mr. J. S. Hyslop, RES, and S. Nowlen, Sandia

Mr. Hyslop stated that the Fire Protection plan [Reference 1] is being updated through 2006. The program objectives, taken from the previous plan, are to: 1) improve the qualitative and quantitative understanding of risk contribution due to fires in nuclear power plants, 2) support ongoing or anticipated fire protection activities, including development of the risk informed performance based approaches, and 3) develop improved fire risk assessment methods and tools.

The requantification studies are being performed as joint efforts between NRC research and the Electric Power Research Institute (EPRI). They represent the integration of many tasks in the research plan. The studies are being performed to reduce uncertainty associated with the old risk values. The old values were used in the individual plant examination of external events (IPEEEs) and the uncertainty prompted many discussions between the staff and industry. While many issues were resolved, both the staff and the industry believed better values should be developed for future risk analysis.

Mr. Rosen noted that future advanced reactors will rely on safety features that will be mainly passive. Therefore, it appears that the overall core damage frequency for these new plants will be mainly dominated by fire. Mr. Rosen questioned if this was considered by RES. Mr. Nowlen stated that the fire protection goal for advanced reactors was to minimize the opportunity for fires.

Mr. Hyslop stated that Sandia National Laboratories (Sandia) is assisting NRC in the development of risk related guidance to support inspection of fire protection circuit analysis. Mr. Hannon, Chief, Plant Systems Branch, added that in November 2001, NRC stopped inspecting in this area until better inspection guidance was developed. Inspections are scheduled to resume in 2003, once the guidance is developed and implemented.

Mr. Hyslop next discussed the planned and potential activities to be included in the Fire Risk Research Plan. There are three planned activities: 1) fire model benchmarking and validation, 2) fire protection for gaseous diffusion plants, and 3) fire risk assessment for precursor analysis. In addition, there were two potential activities: 1) fire protection rulemaking support, and 2) fire risk assessment guidance assessment.

Dr. Powers questioned how the NRC and industry decided who should fund and perform the experiments, the NRC or industry. Mr. Cunningham stated that there is no clear-cut agreement on this issue. The determination is made on an issue specific basis.

Dr. Powers noted that fire protection issues involving the mixed-oxide fuel fabrication facility, which utilizes several flammable processes, is not contained in the research plan. Further, Dr. Powers noted that the staff should review this issue closely because it may have consequences to the public because the design basis for fire protection at these facilities is not well defined compared to nuclear power plants.

Mr. Hyslop discussed research accomplishments for existing tasks including circuit analysis and fire detection and suppression that will be discussed later during the meeting and the fire modeling toolbox which RES developed. The toolbox includes a collection of references for heat release rates, cable fragilities, and ignitability. Current research also includes quantification of the frequency of challenging fires. The RES has produced a model for handling the early stages of fire development. It is a mechanistic model and looks at fire starting and fire spreading using a step by step approach that relies on expert judgment to provide the probabilities.

The RES is also reviewing experience from major fires. Mr. Hyslop noted that the fire risk analysis framework captures the chain of events observed during real fires. However, multiple fires have not been analyzed.

Mr. Rosen questioned whether multiple fires could be incorporated into a fire model, with the idea that multiple hot shorts could take place during an event (e.g., a recent event at San Onofre). Mr. Rosen stated that the fire risk analysis would be incomplete unless it included a way to analyze the effects of multiple fires igniting from the original fire, resulting in phenomena that cause additional remote fires. Mr. Siu stated that it is extremely challenging to model multiple fires. Mr. Nowlen added that the problem is understanding why and when and where multiple fires might occur and being able to do that in a statistical analysis. The knowledge base is very weak in this area and so this is one task that is going to take a lot of work. Mr. Nowlen did not think the staff was going to perform analysis of multiple fires at this time. Mr. Rosen was concerned noting that not analyzing for multiple fires was not conservative. Mr. Siu added that out of the many hundreds of events that the staff has reviewed, less than five involved multiple fires.

Mr. Hyslop discussed fire model bench marking validation where cable tray fire models were compared to one another and were found to produce consistent results. Mr. Nowlen noted that the threshold smoke level for digital circuitry is very highly concentrated and that there is evidence from San Onofre that high voltage breakers are vulnerable to smoke arching.

Dr. Powers, Mr. Rosen, and Dr. Kress expressed concern with the uncertainty associated with the cleanup of smoke residue and operational testing subsequent to extinguishing a fire. Mr. Nowlen noted that there are criteria and that contacts can be cleaned fairly simply with soap and water. One of the things that the recovery companies have stated is getting it right away, within 24 hours, is ideal and try to take actions immediately. For example, by the time an aerosol calculation is performed, the battle may have already been lost, and you will be replacing your components. At that point, it's an inspection for what needs to be replaced, not an inspection for what needs to be recovered. There is a trade-off, and in a lot of cases it is easier to replace the component rather than clean it.

Mr. Hyslop discussed development of a model to roughly quantify the effectiveness of actions taken for remote shut-down of a plant during a fire. Mr. Leitch noted that this information seemed to be based on operator actions and questioned how the data was generated since many plants do not have simulators for the remote shut-down panel. Mr. Siu responded that this activity is performed for significance determination process (SDP) report and was kept at a very simple level. Various factors that could effect the performance of the crew, such as the location of the panel, distractions, and the kind of indications that are available on the panel, are reviewed and a modification factor is developed for the SDP.

FIRE RISK RE-QUANTIFICATION AND FIRE PRA GUIDE UPGRADE REPORT - Mr. J. S. Hyslop, RES and Mr. Steve Nowlen, Sandia

Mr. Hyslop stated that the Fire Risk Requantification Studies are a joint effort between NRC and EPRI which is being performed under a memorandum of understanding (MOU) between the two entities. The Fire Risk Requantification Studies are one of several technical elements being performed under the MOU. The MOU also identifies cooperation on circuit analysis and fire modeling.

The objectives of the studies are to: 1) develop state-of-the-art fire risk estimates with new improved methods, tools and data, 2) determine the qualitative and quantitative impact of these methods, tools and data on predicted fire risk, 3) develop guidance for conducting a fire risk analysis (FRA), and 4) develop guidance on strength and weakness of these methods, tools and data and implement technology transfer. The scope of the studies includes estimates of large early release frequencies at full power but excludes low power and shutdown, spent fuel pool accidents, sabotage and Level III estimates of consequence. Mr. Rosen was concerned with the exclusions because low power and shutdown risk for fire is significant and potentially as significant as fire during operation modes. Mr. Sieber added that fires were more likely to occur during periods of reactor shutdown.

Mr. Hyslop discussed how the industry was participating in the requantification studies. The pilot plants are Millstone 3 and D.C. Cook who will utilize the methods to update their Fire Risk Analyses (FRAs). In addition, there are six non-pilot participating plants. The product of the studies will be NUREGs on insights and methods for performing FRAs. EPRI will produce an updated fire PRA Implementation Guide [Reference 2] with improved methods and tools that are developed from the requantification studies. The pilot plants will develop updated FRAs. The

non-pilot plants (Exelon, Southern Cal Edison, Duke Power Company, Florida Power and Light, Nuclear Management Corporation, and Ontario Power Group) will perform a peer review

Mr. Rosen expressed concern with the amount of time and effort credited for operator actions during recovery. During backshifts, when there is very little support available, the fire brigade is also the operations staff. This could increase the stress on the crew resulting in human performance issues. The workload on the operators is magnified in the case of fire. Mr. Nowlen acknowledged that it was a typical practice for members from the operating staff to be assigned to the fire brigade. The rest of the fire brigade is normally made up from security and maintenance personnel or dedicated personnel who do fire protection for the plant. Mr. Nowlen noted that there was an explicit task to make improvements in human resource assessment (HRA) for fire PRA as a part of the requantification studies.

RISK METHODS INSIGHTS GAINED FROM FIRE INCIDENTS (NUREG 6738) - Steve Nowlen, Sandia

Mr. Nowlen noted that the staff last discussed this topic with the Subcommittee in October 2000 At that time, the presentation was based on a draft of the NUREG that had been issued for public comment. Subsequent to review of public, industry, and staff comments, the conclusions basically remain the same. The report has been published as NUREG/CR 6738 "Risk Methods Insights Gained from Fire Incidents," dated September 2001 [Reference 3].

FIRE DETECTION AND SUPPRESSION ANALYSIS - Mr. Steve Nowlen, Sandia

Mr. Nowlen stated that the objectives of this task were to: 1) provide an improved modeling framework and data for estimating the reliability, including effectiveness, of automatic and manual fire suppression activities, 2) develop estimates of conditional probabilities for current operating nuclear power plants, and 3) identify and quantify key uncertainties in these estimates.

Mr. Nowlen noted that with regard to the modeling framework, the first activity was to review current detection and suppression practices. This was accomplished by reviewing historical event data. This review had the advantage that it inherently captures experience relating to long duration fires. The second activity was to estimate the fire brigade response time assuming that the fire brigade is really the ultimate line of defense for fire suppression.

Dr. Wallis questioned how the staff modeled the probability of success of the fire brigade in putting out a fire. Mr. Nowlen responded that it varied from application to application. In estimating fire brigade response time the staff noted that a brigade would have to assess the situation and plan an attack. Each fire brigade required a critical number of brigade members before it could execute the attack. The staff would perform a sensitivity study to assess what happened if the fire duration was extended by some period of time.

Mr. Nowlen noted that the historical data review used a classical statistical approach to plot the duration of fires from the current EPRI fire data base. This approach captures all of the fires happening within the plant buildings and excluded outdoor and offsite fires. Mr. Nowlen stated that approximately 80 percent of all plant fires will last less than 20 minutes and approximately

10 percent were over an hour. The data base contains 1300 events total of which 651 were inside buildings.

Mr. Nowlen stated that the staff used a paper written by Siu and Apostolakis, dated 1983, that proposed a mechanistic model for doing detection/suppression analysis. The model begins with the ignition of the fire and postulates whether there is an immediate detection, actuation, and ultimately suppression. However, this model had some weaknesses such as it lacked a self-extinguished fire path. The staff revised the model and presented it in a fault tree format to encourage its use by the industry [Reference 4].

Mr. Rosen questioned whether the arrival of the fire brigade will always be a good thing. There are cases where the fire brigade can make things worse. Mr. Nowlen acknowledged that was a difficult question and that the staff presumed that the arrival of the fire brigade is, indeed, a good thing. Mr. Rosen was concerned that safety related equipment could be damaged by the fire brigade as they put out a fire (e.g., equipment getting sprayed by a fire hose). Mr. Nowlen stated that the staff looked for that but could not find any evidence of it, however, he still feels it may be a concern.

Dr. Wallis noted that there are incidents which activate the fire suppression erroneously when there is no actual fire. Dr. Wallis questioned how that was modeled. Mr. Nowlen acknowledged that it was not modeled.

Dr. Wallis questioned whether sabotage was included as an ignition source. Mr. Siu stated that it is hard to address, however, there are some events in the fire data base representing things that may have been due to intentional actions.

Mr. Rosen expressed concern that the potential effects of smoke on equipment has not been considered for advanced reactors. Specifically, digital equipment could increase the vulnerability to different failure modes or multiple common cause or common mode failure due to fire in advanced plants. In addition, the use of graphite is a new fire protection issue. Mr. Sieber added that there will be a lot of fiber optics in advanced plants.

CIRCUIT ANALYSIS - FAILURE MODE AND LIKELIHOOD ANALYSIS - Steve Nowlen, Sandia

Mr. Nowlen noted that the topic of circuit analysis remains a focal point for NRC and industry. The staff last met with the Subcommittee on this topic in October of 2000. Circuit analysis evaluates the potential of other fault modes that might occur (e.g., the spurious actuation of equipment) and evaluates how likely those events are to occur and how they contribute to the overall fire risk. The findings of the circuit analysis will be documented in a NUREG-6776 [Reference 6].

The presentation focused on NRC conducted testing, however, NEI also performed testing as discussed below. Mr. Nowlen stated that a series of 18 tests were performed, all were conducted with a gas burner diffusion flame, a range of fire intensities. The tests were

conducted in a steel plate room, 10 feet by 10 feet by eight feet high. All tests were conducted with natural ventilation (an open doorway) as opposed to a forced ventilation system.

Dr. Powers expressed concern that the test environment (a free standing steel room) did not reflect actual nuclear power plant conditions. Mr. Nowlen replied that the idea was not to try to reproduce the conditions in a typical nuclear power plant, the idea was to construct some fires that would lead to cable damage and then to observe how that cable damage manifested itself.

Mr. Nowlen described that there was one cable tray in each test. Some were performed in vertical trays and some in horizontal trays. Some of the tests also had cables inside of a conduit. The tests focused primarily on multi-conductor control cables, and these were often typically bundled with single conductor light power cables. The test looked at both thermalset and thermalplastic cables, and at armored and unarmored cables.

There were a number of cable configurations tested during the tests. The most common was a seven-conductor, multi-conductor cable with three single conductor cables bundled with it. There were also a number of arrangements exercised for the raceways. During the test all of the cables eventually short to ground. In general, the outer conductors failed first. Some testing with DC power supplies and AC power supplies were performed that resulted in inclusive failure data. It was concluded from the test results that for multi-conductor cables in trays, 80 percent of the initial failures were intra-cable conductor-to-conductor shorts.

Mr. Wallis questioned what would happen if the sprinkler actuated before the cables failed. Mr. Nowlen replied that the sprinklers were turned on in a number of the tests but normally after the cables had all failed and fuses had blown. Therefore, the tests did not assess this condition.

Next Mr. Emerson from the Nuclear Energy Institute (NEI) discussed testing performed by NEI to complement NRC research. Mr. Emerson noted that the NRC research was focused on insulation resistance breakdown and that NEI focused on assessing the potential for spurious actuations in MOV circuits.

Dr. Powers questioned how repeatable the tests were. Mr. Emerson stated that they did not run two tests exactly the same. With a sequence of 18 tests as much variation in parameters was used to obtain useful information. Dr. Kress and Mr. Sieber expressed concern that by not repeating tests the opportunity was missed to obtain some information on uncertainties.

Mr. Emerson stated that from the tests it was concluded that, given cable damage, single or multiple actuations can take place. External cable hot shorts are credible, but none resulted in spurious actuations for thermoset cable. The overall likelihood of spurious actuations (given cable damage) is higher than previously thought. There exist predictable thresholds below which cable failures do not occur. The average time to cable failure was more than 30 minutes. Low energy supplies reduce the likelihood of spurious actuations. Mr. Emerson noted that the other primary product of the testing were fragility curves which plotted the probability of any cable damage versus the temperature at the cable. Curves were developed for thermoset, thermoplastic cable, and for armored cable.

IMPROVEMENTS IN THE SIGNIFICANCE DETERMINATION PROCESS FOR FIRE PROTECTION - Mr. Mark Reinhart, NRR and Mr. See-Meng Wong, NRR

Mr. Reinhart, Chief, Licensing Section of the Probabilistic Safety Assessment Branch, NRR stated that the purpose of the presentation was to discuss the fire protection significance determination process (SDP), which NRR has been refining for approximately 3 years. In July 2002 public meetings were held with stakeholders, mostly NEI and licensees, to discuss progress and obtain feedback on the SDP.

Mr. Wong noted that the fire protection SDP is currently described in Inspection Manual Chapter 0609, Appendix F, "Determining Potential Risk Significance of Fire Protection and Post-Fire Safe Shutdown Inspection Findings." The fire protection SDP is one of the many SDP tools that used in the reactor oversight process. It is designed to assess the significance of degradations in fire protection defense-in-depth principles, mainly fire prevention, fire detection and suppression, and protection of the systems, structures, and components important to safety. Fire protection SDPs are designed to support the risk informed focus of the triennial fire protection inspections that are being performed. The SDP uses a two-phased methodology. The first phase methodology is a qualitative screening process that screens the fire protection findings that are related to operational or functional fire protection future conditions, that means it will ask whether there are the fire protection systems, whether there are fixed suppression systems, or are there fire barriers. If degradation occurred then the event screens into the Phase 2 of the process.

Mr. Wong stated that the Phase 2 methodologies are also screening methodologies and are more of a quantitative approach to try to assess the significance of the collective impact of the findings on the fire protection defense in-depth elements. This Phase 2 methodology is a nine-step process which uses a simplified fire risk equation to provide an integrated assessment of the fire ignition frequency with the degraded fire protection defense in-depth elements. The Fire protection defense-in-depth elements are fire barrier effectiveness, automatic suppression effectiveness, and manual suppression effectiveness.

Mr. Johnson, Chief, Probabilistic Safety Assessment Branch, NRR, stated that Phase 1 sets aside those issues that are clearly green but certainly no more than green. If something does not screen beyond Phase 1, it is a green. If it goes beyond Phase 1, that does not necessarily mean that it will more than a green, but it receives further evaluation under Phase 2. The simple screening in Phase 1 cannot make the determination past green.

Mr. Wong stated that, since April 2000, there have been 50 triennial fire protection inspections completed which identified 73 inspection findings. And out of these 73, 39 issues were related to safe shutdown and alternate safe shutdowns and 17 of these 73 were related to problems with suppression systems and detection systems. Then there were 13 fire barrier issues which related to degradations observed in fire barriers. There are four procedural adherence issues. These are problems related to not taking appropriate corrective actions to correct some of the problems.

Mr. Sieber questioned whether any inspection findings were related to thermolag. Mr. Wong responded that one was.

Mr. Wong next summarized the major issues related to the fire protection SDP. One of the first issues is a determination of the performance deficiency that is related to the fire protection finding. This is one of the areas which require a broader generic resolution, therefore, currently there is no clear guidance for inspectors.

Mr. Wong noted that for Phase 1 screening process there is no guidance for the inspectors on the definition of SDP entry conditions. There are four main issues that have been identified for the Phase 2 screening methodologies. The first is the use of the fire ignition frequencies. Mr. Sieber questioned whether the staff was using the Houghton study to obtain the data. Mr. Reinhart responded that the staff wants to make sure the data base or data bases used are recognized by the staff and are in the public domain.

The second major issues are the degradation ratings for the defense-in-depth elements (e.g., fire barriers, the automatic suppression, and the manual suppression). The staff has developed degradation ratings to assess whether that fire barrier is highly degraded, moderately degraded, or in the normal operating state. There is a great deal of subjectivity in this area.

The third issue is the use of the fire severity factors and the fourth issue is the development of the fire scenario. These are just the major issues. There are other issues as well in the Phase 2 that the staff have identified and are trying to resolve. The Phase 2 objectives and the goals, are associated with making the process transparent, repeatable and reasonable.

Mr. Wong noted that credit for compensatory measures has not, to date, been vigorously addressed in fire PRA methodology. Mr. Sieber questioned if fire watches were an example of compensatory measures. Mr. Wong stated that compensatory measures included fire watches, closed circuit TV, roving watches and so forth. Mr. Wong added that the staff was investigating how to credit critical human actions and safe shutdown actions. The staff is also looking at the treatment of Appendix R exemption. Currently, there is no guidance for these exemptions. Mr. Sieber questioned the basis for past Appendix R exemptions before risk consideration were predominant. Ms. Black, Deputy Director, Division of Safety Systems and Analysis, stated that the staff used, the 10 CFR Part 50 criteria for exemptions. Mr. Sieber noted that the staff should determine the design basis for each plant to ensure that inspections and the SDP are appropriately applied.

Mr Rosen asked the staff if there is a vision for fire protection, specifically, about fire protection research. Mr. Reinhart responded that the staff would like to firm up the fire protection licensing basis and use the information in the SDP, then develop a scrutable and repeatable Phase 2 process.

PLANT FIRE PROTECTION INSPECTIONS - Mr. D. Coe, NRR and Mr. P. Koltay, NRR

Mr. Coe stated that there have been 156 fire protection findings which fall into four categories. The first category is the safe shutdown/alternate safe shutdown (e.g., inadequate protection of

safe shutdown components, emergency lighting deficiencies for performing manual actions for the alternative safe shutdown path, shutdown outside the control room where the procedure could not be performed as written under the circumstances that the procedure assumed, or inadequate procedure for implementing alternate safe shutdown for fire in the main control room).

The second category are fire protection issues (e.g., inadequate detection and suppression, inadequate smoke detectors, inadequate testing with sprinkler system, inadequate Halon system, failure to maintain full area detector coverage, smoke detector or flame or fire detector, and fire brigade problems.

The third category are barrier issues. Typical barrier degradation issues are holes in barrier walls, lagging or a thermal lagging that did not meet its required rating, fire doors that had been left open, compensatory measures that have not been maintained, and inadequate thermal barriers.

The fourth category are issues involving failure to follow procedures. In addition, there is a category of findings that are sent directly to traditional enforcement. Impeding the regulatory process is an example of a case that would be sent directly to traditional enforcement. These cases could involve escalated enforcement and civil penalties. Impeding the regulatory process may involve failure to obtain NRC approval when it was required, or failure to provide the NRC with complete and accurate information.

Dr. Powers questioned how the staff felt about inspecting for fire protection. Mr. Koltay replied that inspectors, at all levels, are becoming more confident with the process. However, the inspections do not yet utilize real PRA risk information such as ignition frequency or how to grade barriers, or how to assess fire brigade not performing properly.

Mr. Rosen expressed concern that fire brigade performance was not input into inspection reports. Mr. Koltay replied that inspectors do inspect fire brigade performance at least once per year. However, there is not an SDP to assess the brigade performance. Mr. Rosen found that alarming since fire protection relies heavily on manual suppression. Mr. Coe added that there is a threshold above which an inspector will write a fire brigade finding (e.g., A fire brigade receives a failing grade during a drill).

STAFF AND INDUSTRY COMMITMENTS

None.

SUBCOMMITTEE DECISION

The Subcommittee discussed this meeting with the full Committee during the 495th ACRS Meeting on September 13, 2002. The Committee will not prepare a letter regarding information gathered at this meeting. The Subcommittee will use the information gathered at the meeting to prepare comments, if appropriate, and recommendations for inclusion in the 2003 ACRS report to the Commission on the NRC Safety Research Program.

FOLLOW-UP ACTIONS

None.

PRESENTATION SLIDES AND HANDOUTS PROVIDED DURING THE MEETING

The presentation slides and handouts used during the meeting are available in the ACRS office files and as attachments to the transcript which will be made available in ADAMS.

REFERENCE MATERIAL PROVIDED TO THE SUBCOMMITTEE

1. U. S. Nuclear Regulatory Commission Fire Risk Research Plan: Fiscal Years 2001-2002, dated April 12, 2001.

2. Fire Risk Re-quantification and Fire PRA Guide Upgrade, Revision A, dated May 2002.

3. U. S. Nuclear Regulatory Commission NUREG-6738, "Risk Methods Insights Gained from Fire Incidents," dated September 2001.

4. Fire Detection and Suppression Analysis: An Assessment and Updating of PRA Methods and Data, dated March 30, 2001.

5. Circuit Analysis - Failure Mode and Likelihood Analysis, dated May 2002.

6. U.S. Nuclear Regulator Commission NUREG-6776, "Cable Insulation Resistance Measurements Made During Cable Fire Tests, Completed April 2002.

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NOTE: Additional details of this meeting can be obtained from a transcript of this meeting available in the NRC Public Document Room, One White Flint North, 11555 Rockville Pike, Rockville, MD, (301) 415-7000, downloading or view on the Internet at http://www.nrc.gov/reading-rm/doc-collections/acrs/ can be purchased from Neal R. Gross and Co., 1323 Rhode Island Avenue, NW, Washington, D.C. 20005, (202) 234-4433 (voice), (202) 387-7330 (fax), nrgross@nealgross.com (e-mail).

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
FIRE PROTECTION SUBCOMMITTEE MEETING
SEPTEMBER 11, 2002, ROCKVILLE, MARYLAND

Contact: Tim Kobetz (301-874-8716, tjk1@nrc.gov)

-PROPOSED SCHEDULE-

	Topics	Presenters	Time
I.	Opening Remarks	S. Rosen, ACRS	8:30-8:35 a.m.
II.	RES Staff Introduction	Mark Cunningham	8:35-8:45 a.m.
III.	Fire Risk Research Plan, FY 2001-2002	Nathan Siu/J.S. Hyslop	8:45-9:45 a.m.
	BREAK		**9:45-10:00 a.m.**
IV.	a. Fire Risk Re-quantification and Fire PRA Guide Upgrade Report b. Risk Methods Insights Gained from Fire Incidents (NUREG-6738)	J.S. Hyslop/Steve Nowlen (SNL)	10:00-11:00 a.m.
V.	Fire Detection and Suppression Analysis: An Assessment and Update of PRA Methods and Data	Steve Nowlen (SNL)	11:00-12:00 noon
	LUNCH		**12:00-1:00 p.m.**
VI.	Circuit Analysis - Failure Mode and Likelihood Analysis	Steve Nowlen (SNL)	1:00-2:30 p.m.
	BREAK		**2:30-2:45 p.m.**
VII.	Improvements in the Significance Determination Process for Fire Protection	Mark Reinhart/See-Meng Wong, NRR	2:45-3:45 p.m.
VIII.	Plant Fire Protection Inspections	Doug Coe, NRR	3:45-4:45 p.m.

NOTE:

- Presentation time should not exceed 50 percent of the total time allocated for specific item. The remaining 50 percent of the time is reserved for discussion.
- 25 copies of the presentation materials to be provided to the Subcommittee

various locations to solicit stakeholder input. Specifically the staff plans to hold meetings and workshops, tentatively scheduled at the following locations and dates:

- Hanford, WA: Week of September 2, 2002
- Chicago, IL: Week of September 16, 2002
- San Diego, CA: Week of September 23, 2002
- New Orleans, LA: Week of October 7, 2002
- Washington, DC: Week of October 14, 2002

The staff will provide specific information regarding the meeting dates times and locations on the NRC's Web site at *www.nrc.gov* select What We DO, then Public Involvement in Enforcement. Once the actions identified above have been completed, the staff will provide the Commission a proposed pilot program for approval or will provide an alternative recommendation regarding the use of ADR.

Dated at Rockville, Maryland, this 13th day of August, 2002.

For the Nuclear Regulatory Commission.

Frank J. Congel,

Director, Office of Enforcement.

[FR Doc. 02–21255 Filed 8–20–02; 8:45 am]

BILLING CODE 7590–01–P

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards; Subcommittee Meeting on Thermal-Hydraulic Phenomena; Notice of Meeting

The ACRS Subcommittee on Thermal-Hydraulic Phenomena will hold a meeting on September 9, 2002, Room T–2B1, 11545 Rockville Pike, Rockville, Maryland.

The entire meeting will be open to public attendance.

The agenda for the subject meeting shall be as follows: Monday, September 9, 2002—1 p.m. until the conclusion of business.

The Subcommittee will continue its review of the proposed resolution of Generic Safety Issue (GSI)–185, "Control of Recriticality Following Small-Break LOCAs in PWRs." The purpose of this meeting is to gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

Oral statements may be presented by members of the public with the concurrence of the Subcommittee Chairman. Written statements will be accepted and made available to the Committee. Electronic recordings will be permitted only during those portions of the meeting that are open to the public, and questions may be asked only by members of the Subcommittee, its consultants, and staff. Persons desiring to make oral statements should notify the Designated Federal Official named below five days prior to the meeting, if possible, so that appropriate arrangements can be made.

During the initial portion of the meeting, the Subcommittee, along with any of its consultants who may be present, may exchange preliminary views regarding matters to be considered during the balance of the meeting.

The Subcommittee will then hear presentations by and hold discussions with representatives of the NRC staff and other interested persons regarding this review.

Further information regarding topics to be discussed, whether the meeting has been canceled or rescheduled, and the Chairman's ruling on requests for the opportunity to present oral statements and the time allotted therefor can be obtained by contacting the Designated Federal Official, Mr. Paul A. Boehnert (telephone 301–415–8065) between 7:30 a.m. and 5 p.m. (EDT). Persons planning to attend this meeting are urged to contact the above named individual at least two working days prior to the meeting to be advised of any potential changes to the agenda that may have occurred.

Dated: August 14, 2002.

Howard J. Larson,

Acting Associate Director for Technical Support, ACRS/ACNW.

[FR Doc. 02–21256 Filed 8–20–02; 8:45 am]

BILLING CODE 7590–01–P

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards; Subcommittee Meeting on Fire Protection; Notice of Meeting

The ACRS Subcommittee on Fire Protection will hold a meeting on September 11, 2002, Room T–2B3, 11545 Rockville Pike, Rockville, Maryland.

The agenda for the subject meeting shall be as follows: Wednesday, September 11, 2002—8:30 a.m. until the conclusion of business.

The Subcommittee will review the staff's Fire Protection Research Plan, status of fire protection research activities, fire protection inspection process and findings, and other related matters, including industry activities. The purpose of this meeting is to gather information, analyze relevant issues and facts, and to formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

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Dated: August 14, 2002.

Howard J. Larson,

Acting Associate Director for Technical Support, ACRS/ACNW.

[FR Doc. 02–21257 Filed 8–20–02; 8:45 am]

BILLING CODE 7590–01–P

PEACE CORPS

Proposed Peace Corps Information Quality Guidelines

AGENCY: Peace Corps.

ACTION: Proposed guidelines.

various locations to solicit stakeholder input. Specifically the staff plans to hold meetings and workshops, tentatively scheduled at the following locations and dates:

- Hanford, WA: Week of September 2, 2002
- Chicago, IL: Week of September 16, 2002
- San Diego, CA: Week of September 23, 2002
- New Orleans, LA: Week of October 7, 2002
- Washington, DC: Week of October 14, 2002

The staff will provide specific information regarding the meeting dates times and locations on the NRC's Web site at *www.nrc.gov* select What We DO, then Public Involvement in Enforcement. Once the actions identified above have been completed, the staff will provide the Commission a proposed pilot program for approval or will provide an alternative recommendation regarding the use of ADR.

Dated at Rockville, Maryland, this 13th day of August, 2002.

For the Nuclear Regulatory Commission.

Frank J. Congel,

Director, Office of Enforcement.

[FR Doc. 02–21255 Filed 8–20–02; 8:45 am]

BILLING CODE 7590–01–P

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards; Subcommittee Meeting on Thermal-Hydraulic Phenomena; Notice of Meeting

The ACRS Subcommittee on Thermal-Hydraulic Phenomena will hold a meeting on September 9, 2002, Room T–2B1, 11545 Rockville Pike, Rockville, Maryland.

The entire meeting will be open to public attendance.

The agenda for the subject meeting shall be as follows: Monday, September 9, 2002—1 p.m. until the conclusion of business.

The Subcommittee will continue its review of the proposed resolution of Generic Safety Issue (GSI)–185, "Control of Recriticality Following Small-Break LOCAs in PWRs." The purpose of this meeting is to gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

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Howard J. Larson,

Acting Associate Director for Technical Support, ACRS/ACNW.

[FR Doc. 02–21256 Filed 8–20–02; 8:45 am]

BILLING CODE 7590–01–P

NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards; Subcommittee Meeting on Fire Protection; Notice of Meeting

The ACRS Subcommittee on Fire Protection will hold a meeting on September 11, 2002, Room T–2B3, 11545 Rockville Pike, Rockville, Maryland.

The agenda for the subject meeting shall be as follows: Wednesday, September 11, 2002—8:30 a.m. until the conclusion of business.

The Subcommittee will review the staff's Fire Protection Research Plan, status of fire protection research activities, fire protection inspection process and findings, and other related matters, including industry activities. The purpose of this meeting is to gather information, analyze relevant issues and facts, and to formulate proposed positions and actions, as appropriate, for deliberation by the full Committee.

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Dated: August 14, 2002.

Howard J. Larson,

Acting Associate Director for Technical Support, ACRS/ACNW.

[FR Doc. 02–21257 Filed 8–20–02; 8:45 am]

BILLING CODE 7590–01–P

PEACE CORPS

Proposed Peace Corps Information Quality Guidelines

AGENCY: Peace Corps.

ACTION: Proposed guidelines.

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
SUBCOMMITTEE MEETING ON FIRE PROTECTION

SEPTEMBER 11, 2002
Date

PLEASE PRINT

ATTENDEES PLEASE SIGN BELOW

NAME	AFFILIATION
STEVE NOWLEN	SANDIA NATIONAL LAB'S
~~PAUL LAIN~~	NRR/DSSA/SPLB
~~FRED~~	
FRED EMERSON	NEI
~~Doug Coe~~	

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
SUBCOMMITTEE MEETING ON FIRE PROTECTION

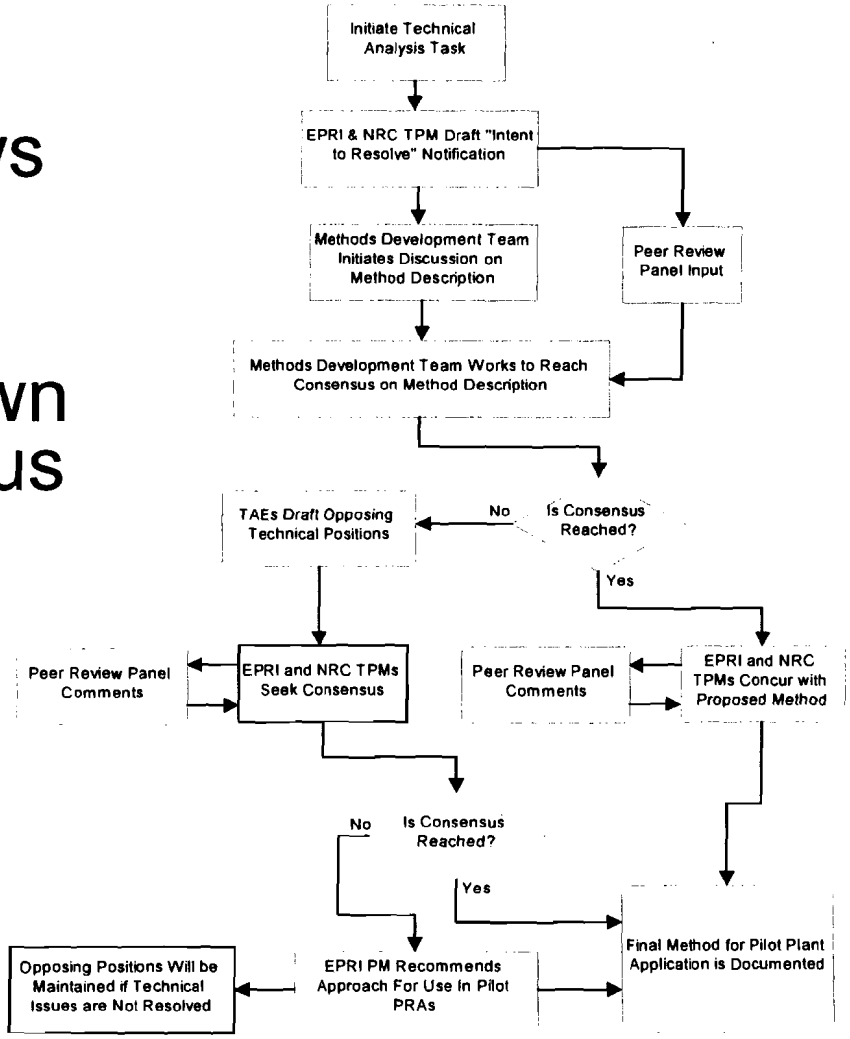
SEPTEMBER 11, 2002
Date

NRC STAFF PLEASE SIGN BELOW
PLEASE PRINT

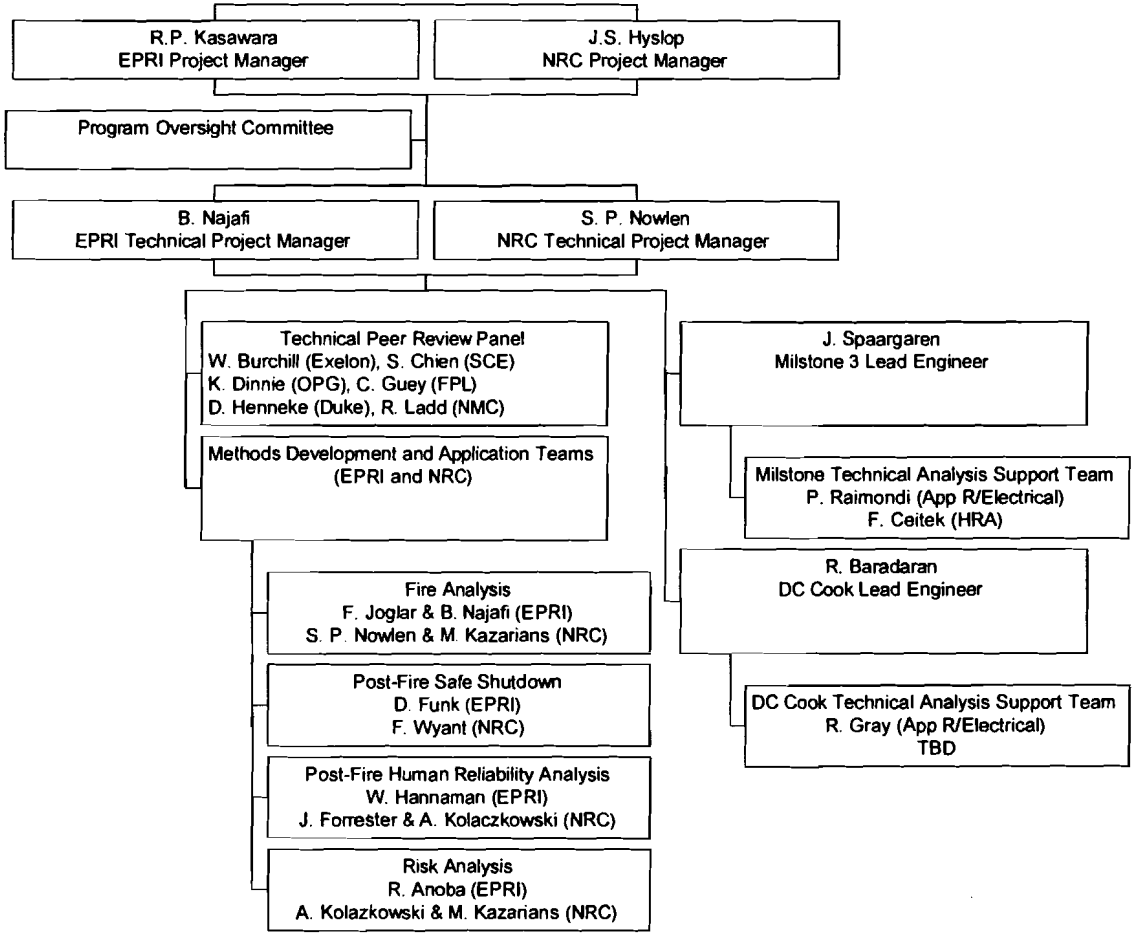
NAME	NRC ORGANIZATION
PETER WEN	NRR/DRIP/RPRP
AMARJIT SINGH	RES/DRAA/PRAB
John Hannon	NRR/DSSA/SPLB
Roy Woods	RES/DRAA/PRAB
SUZANNE BLACK	NRR/DSSA
PETTERI TIIPPANA	NRR/DIPM/IIPB
See-Meng Wong	NRR/DSSA/SPSB
RICK RAMOUSSEL	NRR/DSSA/SPSB
NATHAN SIU	RES/DRAA/PRAB
J S Hyslop	RES/PRAB
E Cobey	NRR/SPCT
ERIC WEISS	NRR/SPLB
Gareth Parry	NRR/DSSA
MISSEN GIBBS	NRR/DSSA
Mark Reinhart	NRR/DSSA/SPSB
PAUL LAIN	NRR/DSSA/SPLB
Doug Coe	NRR/DIPM/NRR

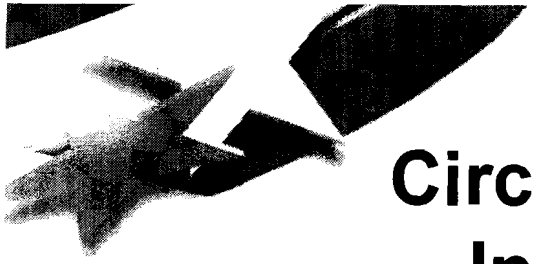
TECHNICAL ISSUE RESOLUTION

- Clear process to allow consideration of all views
- Strive for consensus at many points in process
- Each party maintains own point of view if consensus not reached



Project Team





Circuit Analysis – Insights from Industry/NRC Joint Testing

Presented to:

Advisory Committee On Reactor Safeguards

Fire Protection Subcommittee Meeting

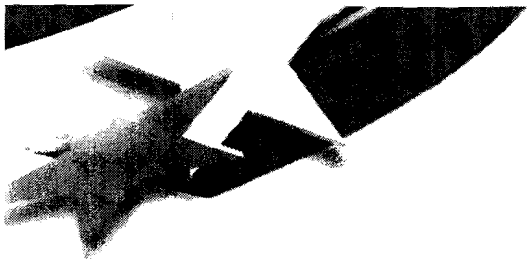
September 11, 2002

Presented by:

Steve Nowlen

Sandia National Laboratories

Sandia National Laboratories



Background

- Fire-induced circuit faults remain a focus point for NRC and industry (EPRI/NEI)
- RES efforts related to fire PRA circuit analysis methods and data were presented to this subcommittee in 10/00
  - This is a follow-up presentation on new information developed since that presentation
- One of the shortcomings identified on 10/00 was that test data on cable failure modes was sharply limited
- New cable failure / circuit fault mode experiments conducted during 2000-2001 by industry
  - EPRI & NEI with utility support

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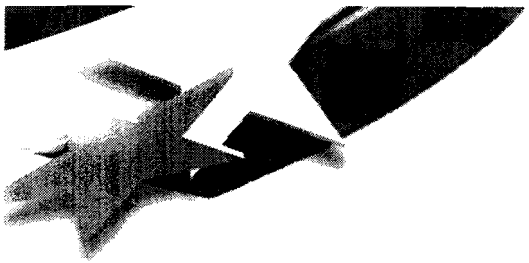

Background (cont)

- NRC was invited to, and did, participate in tests
  - Test planning
  - Test execution
  - Data analysis and interpretation
- NRC and industry agreed to share all test data
- Each party to analyze and interpret all test data independently
- This presentation discusses our initial analysis of the test results:
  - Primary source: Draft NUREG/CR on circuit analysis
    - Undergoing internal NRC review
  - Supporting: NUREG/CR-6776 NRC/SNL test report
    - Now in NRC print shop

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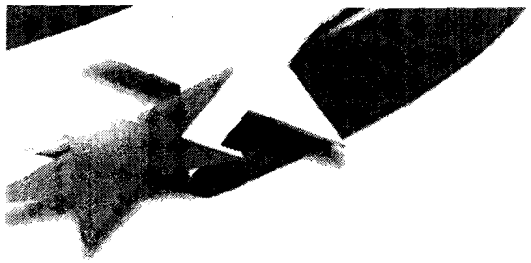

General Test Approach

- A series of 18 fire tests conducted
- Gas burner diffusion flame – 70-450 kW
- Test conducted in a plate steel box/room
  - 10'x10'x8'
  - natural ventilation
- One cable tray in each test, some tests also used one conduit
- Tests focus on multi-conductor control cables – often bundled with single conductor light power cables
- Thermoset and thermoplastic cables
- Armored and non-armored cables

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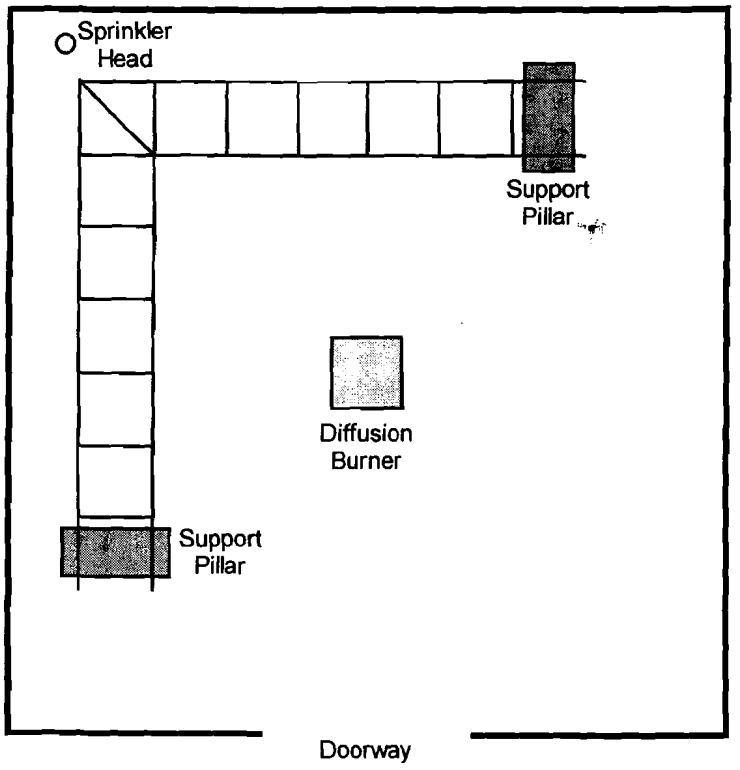
Room Layout



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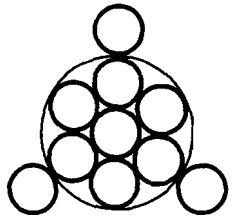
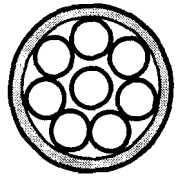
Cable Bundles Tested

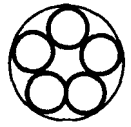
CABLE TESTED IN TEST #3



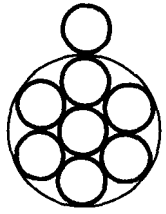
10/c Bundle



8/c Armored Cable

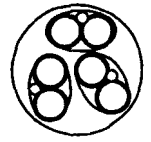


5/c Cable

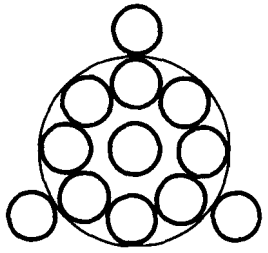


8/c Bundle

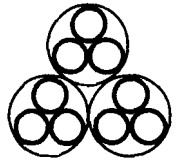
2/c Cable



6/c Cable



12/c Bundle



9/c Bundle

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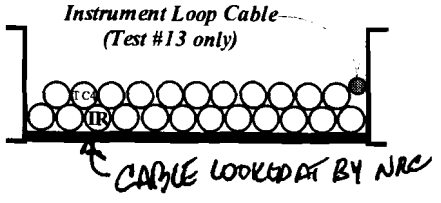
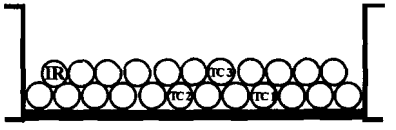
Cable Raceway Arrangements



Tests #1, 2, 3, 4, 5, 7 & 13



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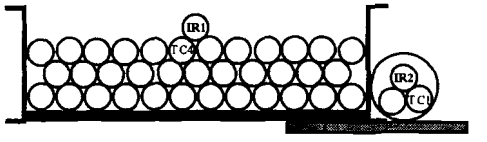

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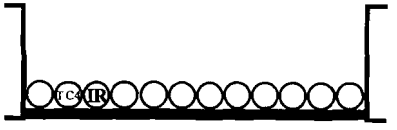
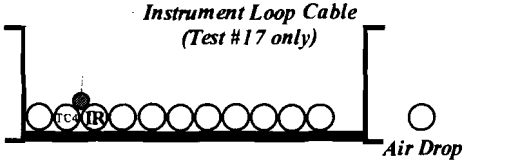
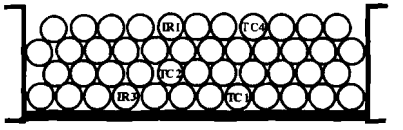


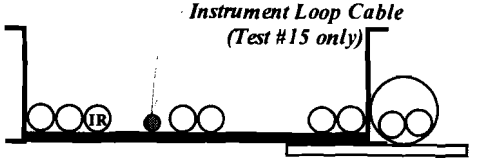
Test #9



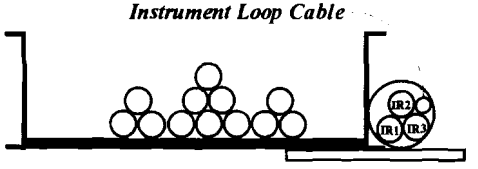
Tests #10 & 17



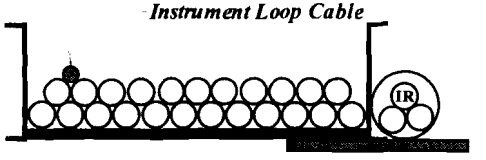
Test #11



Tests #12 & 15



Tests #14 & 18



Test #16

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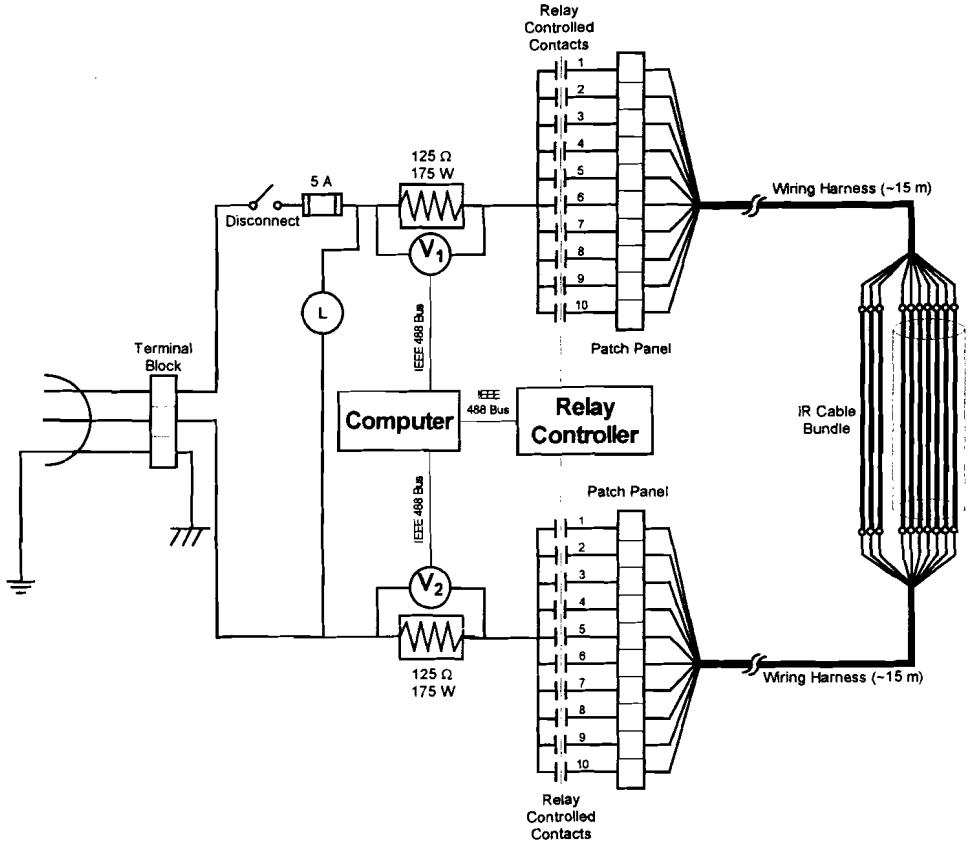
NRC effort measured insulation resistance of the exposed cables



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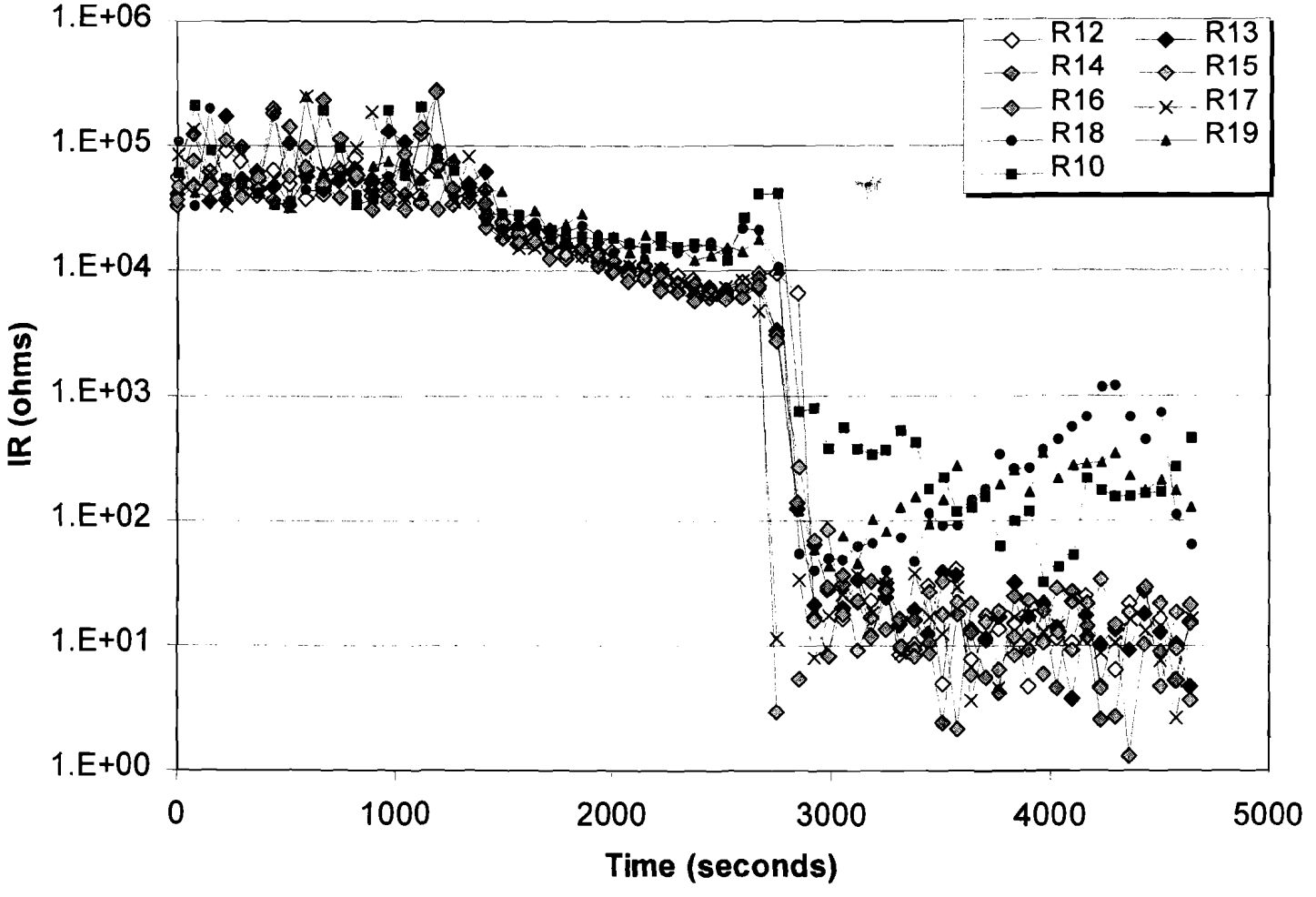
Representative IR test results (Test 3)



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IR Test Observations

- For multi-conductor cables:
  - In trays 80% of initial failures were intra-cable conductor-to-conductor shorts
  - Conductor shorting groups/combinations were complex and transient
    - Number of conductors in a shorted groups varied from 2 to all available conductors
    - Outer ring of conductors shorted first, core conductor last
    - Shorts generally involved nearest-neighbor groups
    - Often saw two separate conductor shorting groups

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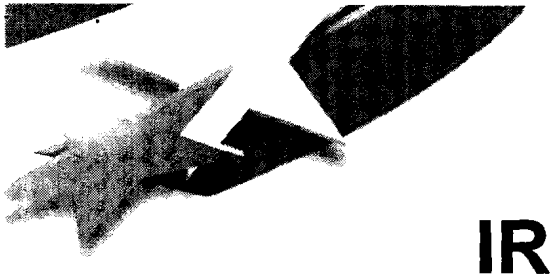

IR Test Observations (cont)

- If the cables failed during a test, all conductors eventually shorted to ground
  - Transition times ranged from seconds to several minutes
- Various factors were seen to influence cable failure mode behavior:
  - Routing in conduits appears to increase likelihood of a short to ground as first failure mode
    - Conduit data very limited - inconclusive
  - Armored cables also appear to increase likelihood of a short to ground as first failure mode
    - Shorting to the grounded armor

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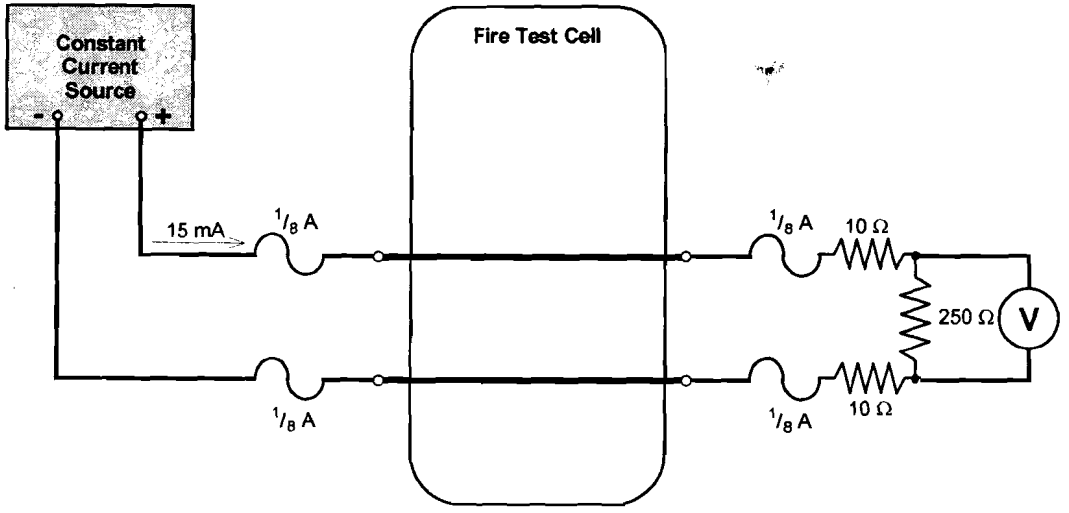
IR Test Results and Observations (cont)

- Inter-cable conductor-to-conductor shorts were less likely than intra-cable, but were observed
  - Thermoplastic cables appear more likely to experience inter-cable shorting than do thermoset cables
  - Cables in conduits also experienced inter-cable hot shorting behaviors
- DC versus AC power may impact shorting behavior, but data is inconclusive
- No loss of continuity conductor failures observed
  - Behavior associated with more intense fires and/or high potential cables

Sandia National Laboratories

Surrogate 4-20mA Instrument Loop Also Tested Under NRC Efforts



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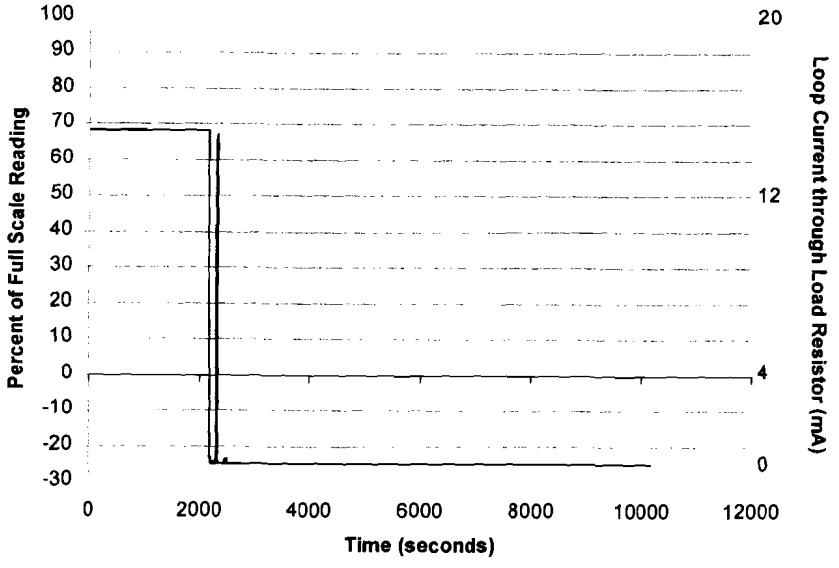
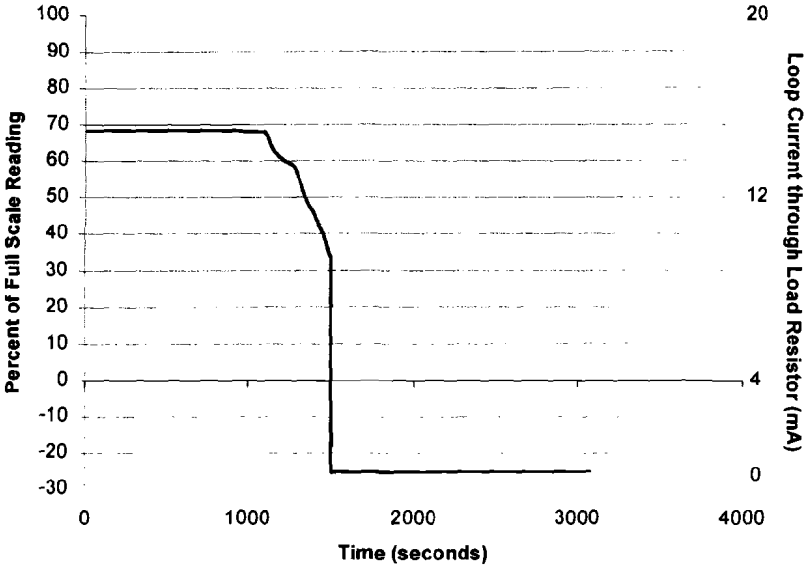
Instrument Loop Results



Thermoplastic Cable



Thermoset Cable

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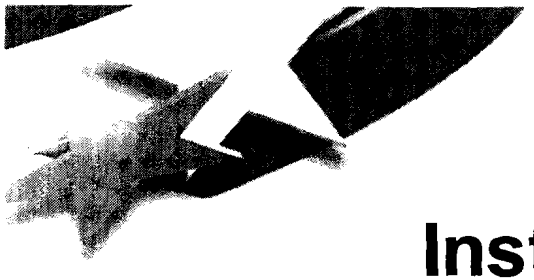

Instrument Loop Observations

- Pronounced behavioral differences observed between thermoplastic and thermoset cables
  - Thermoplastic cables: no signal degradation prior to the complete loss of signal
  - Thermoset cables: substantial signal degradation for a relatively prolonged time period prior to the total loss of signal.

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Complementary Industry Circuit Testing

- Focus on surrogate MOV control circuit
- Data analyzed in Appendix D of our draft NUREG/CR report on circuit analysis
  - NRC was given full access to all industry test data as a part of data sharing agreement
  - Based largely on my own input to EPRI expert panel
  - Report currently under review
  - Our findings reflect our current interpretation of the test data
- EPRI Expert Panel report is published
- Industry test report is being prepared, but not yet public
  - Presentations have been made at NEI Fire Protection Information Forum 2001, 2002

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Overall Conclusions

- Many of our previous findings were confirmed:
  - Multiconductor cables will initially fail conductor-to-conductor with a high probability (on the order of 80% or more)
  - The shorting pattern will be complex and transient
- A number of influence factors were verified as important to the cable failure – circuit fault behavior:
  - Raceway type - i.e. conduit vs. tray
  - Cable tray loading and cable position within raceway
  - Armored versus unarmored cables
  - Circuit to cable wiring scheme
- At least one new influence factor was identified:
  - CPTs in control circuit

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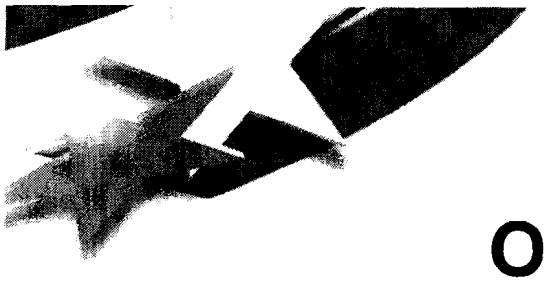

Overall Conclusions (cont)

- IR and MOV results are broadly self-consistent:
  - Embedded conductors are likely to fail later than outer ring of conductors
  - Conductors will likely short to nearest neighbors first
  - Shorting combinations complex and transient
  - Duration of a hot short / device actuation ranged from momentary up to ten minutes
  - All conductors of failed cables eventually shorted to ground given a persistent fire

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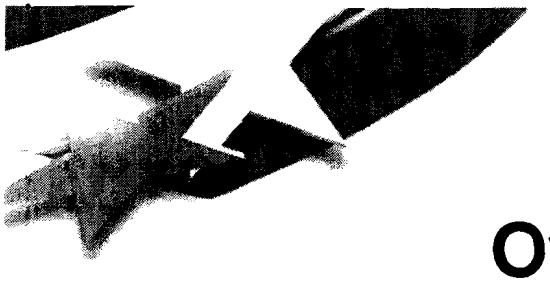

Overall Conclusions (cont)

- The MOV circuit testing lent a number of unique insights:
  - In most tests with cable failures, at least one device actuation observed
  - In several tests, more than one device actuation was observed
  - In one test all four cable bundles saw at least one device actuation
  - Device actuations due to intra-cable hot shorts were most common
  - A smaller number of device actuations due to inter-cable hot shorts were also observed

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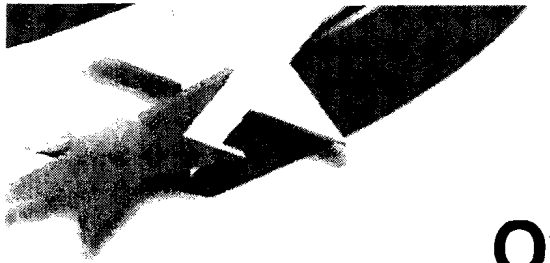

Overall Conclusions (cont)

- Areas of uncertainty and challenge remain:
  - Combinatorial models for cable failure behavior proposed but not yet validated
  - DC vs. AC may be a factor but not fully explored
  - Behavior of conduits appears different from trays, but data is limited and somewhat contradictory
  - Some potential influence factors not explored in these tests
  - Quantification for a specific case still requires application of expert judgment
  - Dealing with the transient nature of the faults – e.g., simultaneous vs. concurrent vs. sequential, fault duration

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Risk Methods Insights from Fire Incidents – A Brief Status Update

Presented to:

Advisory Committee On Reactor Safeguards

Fire Protection Subcommittee Meeting

September 11, 2002

Presented by:

Steve Nowlen

Sandia National Laboratories

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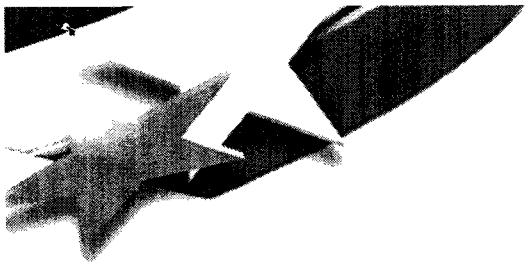

Background

- Task presented to ACRS Fire Protection Subcommittee October 2000
  - Objectives
  - Approach
  - Results and insights
- 10/00 presentation was based on a draft for public comment of the task report

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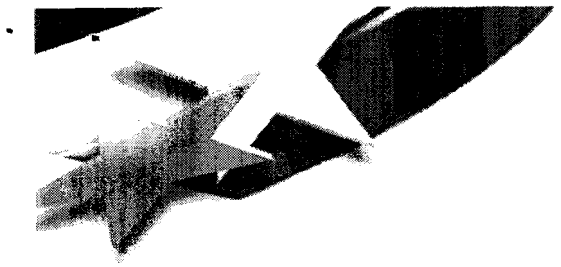

Current Status

- Insights and conclusions of study remained essentially unchanged given review comments
  - Editorial changes only
- Report has been published – NUREG/CR-6738
- Positive feedback received from both domestic and international readers

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JOINT NRC/EPRI FIRE RISK REQUANTIFICATION STUDIES

J.S. Hyslop, RES/PRAB
Steve Nowlen, SNL

Presented to ACRS Subcommittee on Fire Protection,
Sept. 11, 2002

BACKGROUND

- MOU between NRC-RES and EPRI
- Fire risk addendum
- One of several elements on fire risk addendum

OBJECTIVES

- Develop state-of-art fire risk estimates
- Determine qualitative and quantitative impact of improved methods, tools, and data on predicted fire risk
- Develop guidance for conducting FRA
- Develop guidance on strengths and weaknesses
- Technology transfer

SCOPE

- Full power, including estimates of LERF
- Excludes
  - Low power and shutdown modes of operation
  - Spent fuel pool accidents
  - Sabotage
  - Level 3 estimates of consequence

PARTICIPANTS

- NRC
- EPRI
- Pilot plants
  - Millstone Unit 3
  - D. C. Cook
- Six non-pilot participating plants

TECHNICAL ISSUE RESOLUTION

- Provides clear process to allow consideration of all party's views in development of methods
- Strive for consensus at many points in process
- Each party maintains own point of view if consensus not reached

PRODUCTS

- NRC-RES will produce NUREGs on insights, and methods
- EPRI will produce updated Fire PRA Implementation Guide (FPRAIG)
- Pilot plants will develop updated FRAs

DEMONSTRATION STUDIES

- Analyses performed jointly by NRC and EPRI using case examples from pilot plant FRA.
- Purpose
  - Demonstrate that methods can be implemented successfully in FRA
  - Technology transfer to pilot plant
- Demonstration studies comprise NRC's full involvement in pilot plant FRA
- NRR retains its independence in review of applications based upon pilot plant FRA

SCHEDULE

- APRIL 2002 EPRI/NRC DEVELOPED JOINT PLAN
- Kickoff at Millstone in May 2002
- Kickoff at D.C. Cook in Oct 2002
- Complete Millstone in Sept 2003
- Complete Cook in Nov 2003
- EPRI update FPRAIG in Dec 2003
- NRC produce NUREGs in spring 2004
- Workshop (TBD)

REQUANTIFICATION STUDIES TECHNICAL STATUS

- Current technical activities focused on two areas:
  - Defining a consistent set of analysis steps
  - Writing procedures for early analysis steps
- Analysis process being broken into manageable pieces for purposes of procedure writing
  - Example of early task elements leading to qualitative screening:
    - Plant Partitioning
    - Selection of critical equipment – the fire PRA equipment list
    - Selection of critical cables and circuits – the circuit analysis list
    - Fire PRA database development

LEVEL OF ADVANCEMENT VARIES BY TASK

- Consolidation of existing methods, e.g.:
  - Plant partitioning
  - Screening
  - Documentation guidance
- Incremental improvements, e.g.:
  - Fire PRA database
  - Fire ignition frequency
  - Uncertainty and sensitivity analysis

LEVEL OF ADVANCEMENT VARIES BY TASK (cont)

- Significant advancement:
  - Plant Fire-Induced Risk Model
  - Circuit Analysis Tasks
    - Identification of Critical Cables/Circuits
    - Detailed Circuit Analysis
    - Circuit Fault Mode Quantification
  - Detection and Suppression
  - HRA
  - Fire modeling

Detection and Suppression Analysis

Presented to:

Advisory Committee On Reactor Safeguards

Fire Protection Subcommittee Meeting

September 11, 2002

Presented by:

Steve Nowlen

Sandia National Laboratories

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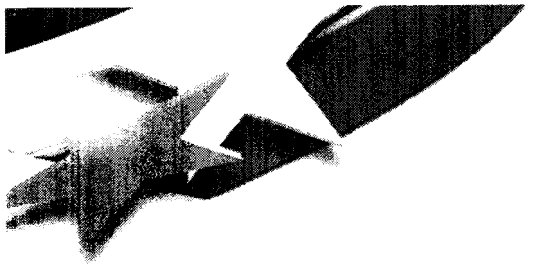

Presentation Outline

- Task Objectives
- Approach – task structure
- Results – by task
- General Insights

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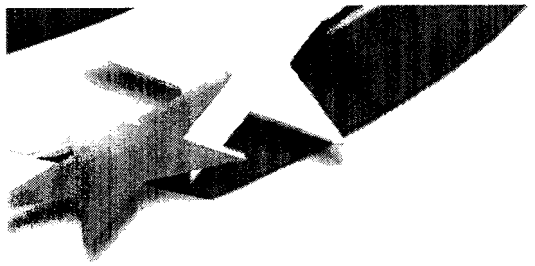

Task Objectives

- Provide an improved modeling framework and data for estimating the reliability (including effectiveness, to the extent possible) of automatic and manual suppression activities

- Develop estimates of these conditional probabilities for currently operating nuclear plants

- Identify and quantify key uncertainties in these estimates

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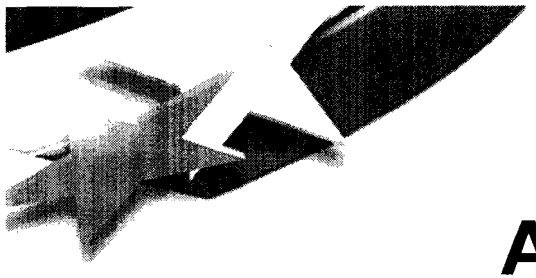

Approach – task structure

- Modeling Framework
- Information Gathering and Data Analysis
- Document Results

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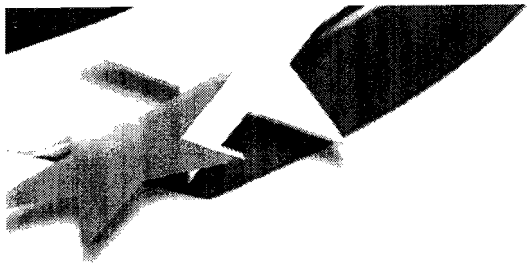

Modeling Framework

- Review of current practice reveals predominance of two detection/suppression methods
- Method 1: Direct use of historical data
  - Advantage: inherently captures long duration events
  - Disadvantage: difficult to tailor to specific application
- Method 2: Estimation of fire brigade response time
  - Advantage: nominally case specific analysis
  - Disadvantage: results vary little and may minimize contribution of long duration fires
- Conclusion: A more mechanistic approach might capture advantages of both methods

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Example of Historical Data Approach

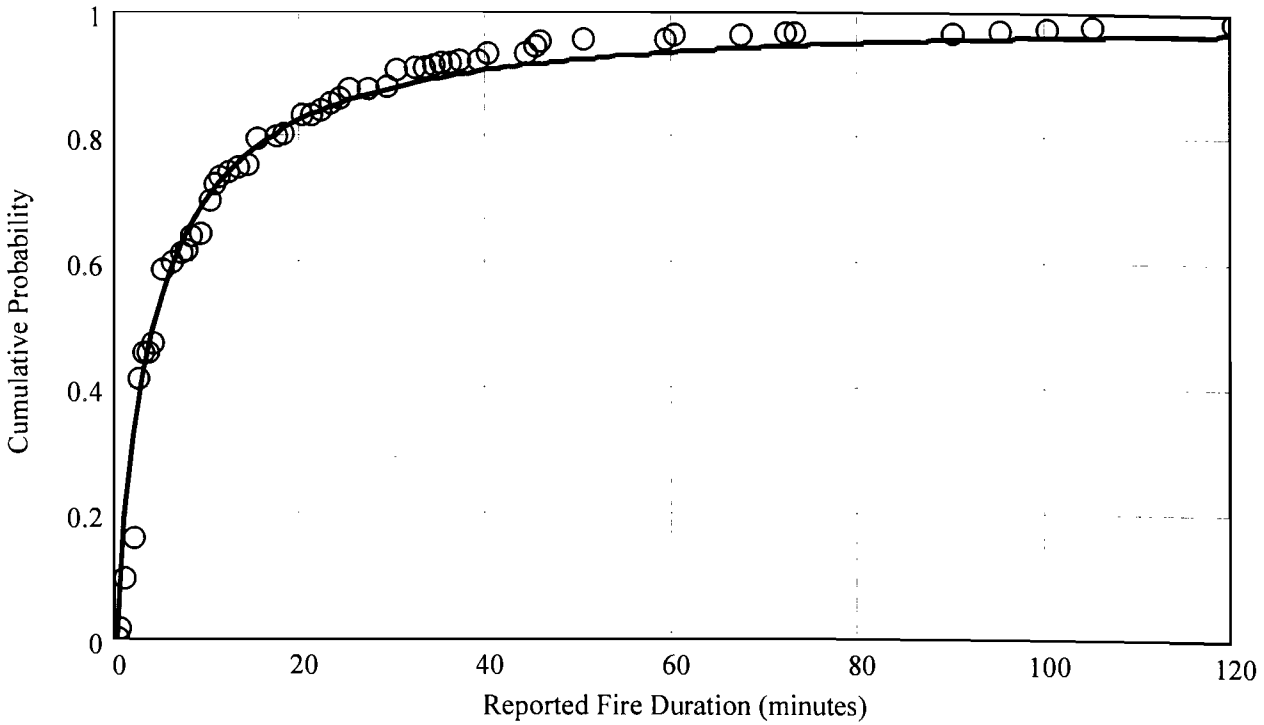

Figure 1: Example cummulative probability distribution curve for indoor NPP fires in the US (based on 651 events with reported fire duration times out of a database of over 1300 events).

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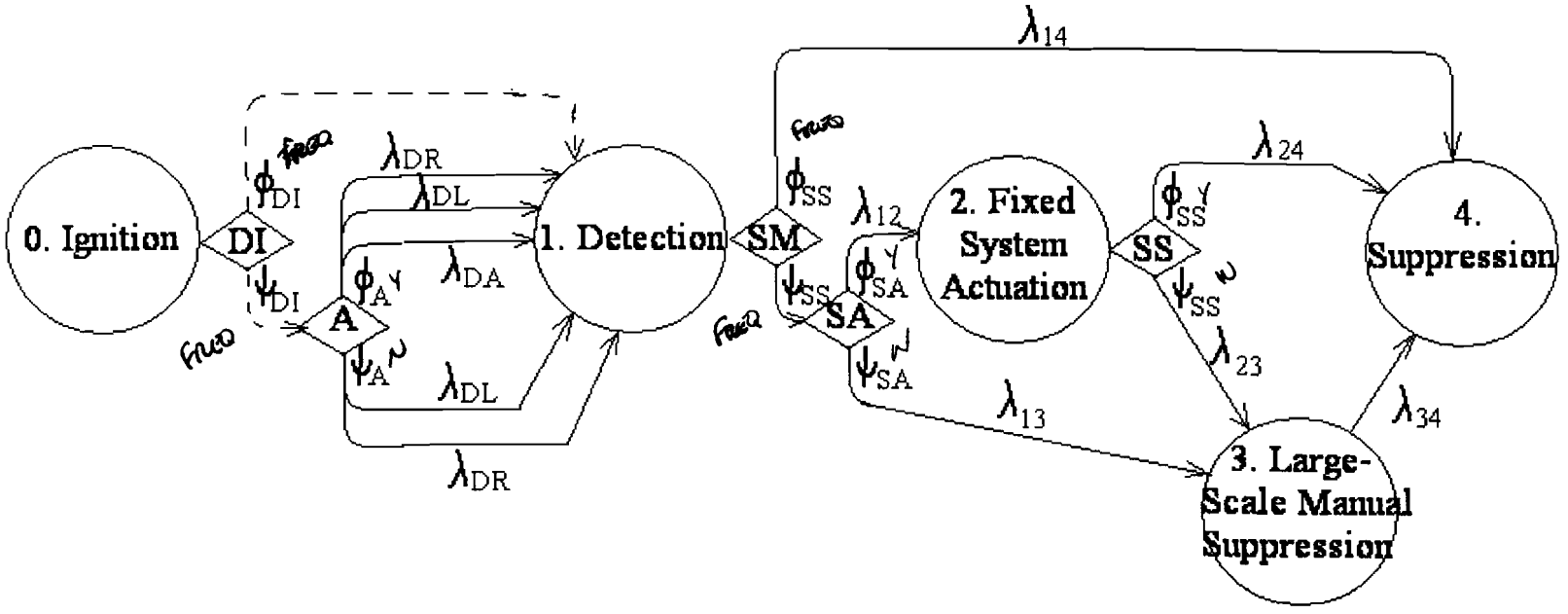
Modeling Framework (cont)

- **Siu & Appostolakis published a mechanistic model in 1983:**



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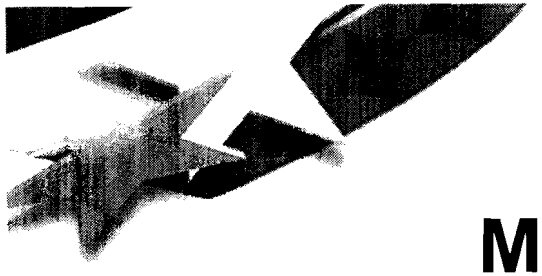

Modeling Framework (cont)

- Conclusions on model applicability:
  - Siu/Apostolakis model includes key features of interest
  - Identified desirable modifications:
    - Add path for self extinguished fires
    - Combine local and remote manual detection paths
    - Revise/redefine manual suppression paths:
      - Original model:
        - Manual suppression by on-site personnel
        - Large-scale manual suppression with off-site support
      - Revised model:
        - Prompt manual suppression (e.g., fire watch)
        - Delayed manual suppression (i.e., fire brigade)
    - Add suppression path for remove power or isolate fuel source when applicable (e.g., electrical fires, gas leaks)

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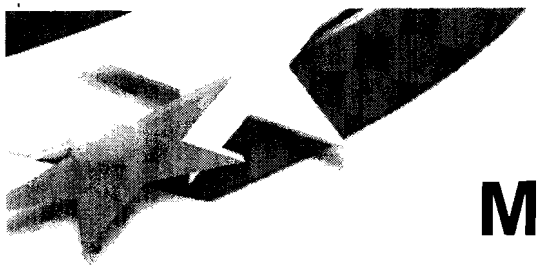

Modeling Framework (cont)

- Format as network model potential barrier to acceptance (unfamiliar format)
- Translation to an event tree format is possible
  - No feedback paths
  - May increase acceptability/use

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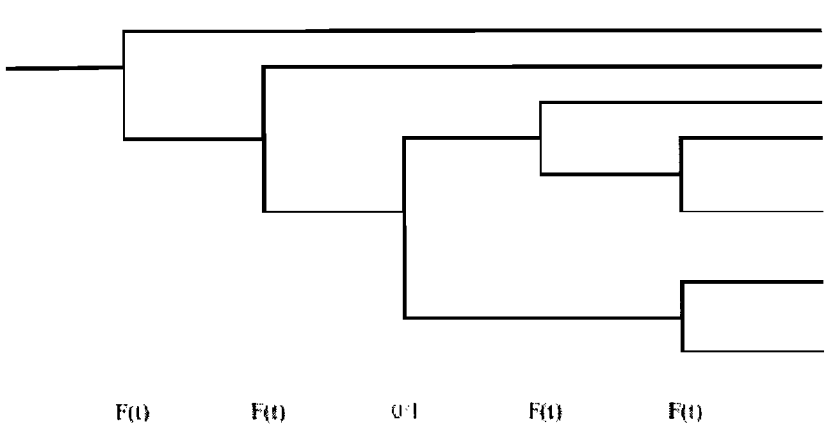
Fire Detection Event Tree

Fire ignition (initiating event)	Fire self-extinguished	Prompt local detection	Auto detectors installed	Auto detectors actuate	Delayed manual detection	Sequence	OUTCOME
IGN	FSE	PLD	ADINS	ADDET	DMD		



Fully General
Fire Detection Event Tree

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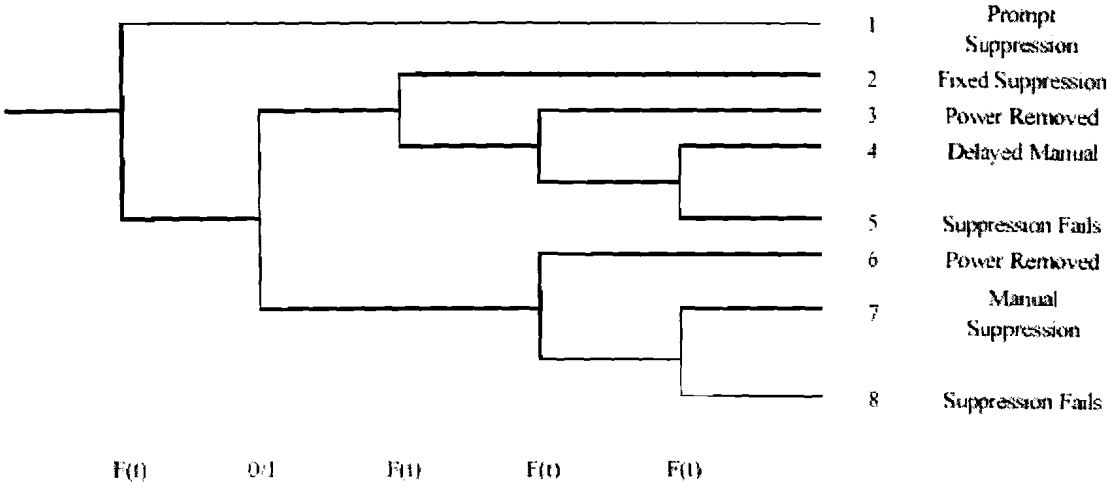
Fire Suppression Event Tree

Entry From Detection Tree	Prompt Local Suppression	Fixed Suppression System Installed	Fixed Suppression System Successful	Power Source Removal Stops Fire	Fire Suppressed Manually	Sequence	OUTCOME
	PLS	FSSINS	FSSS	PSRSF	FSM		



Fully General
Fire Suppression Event Tree

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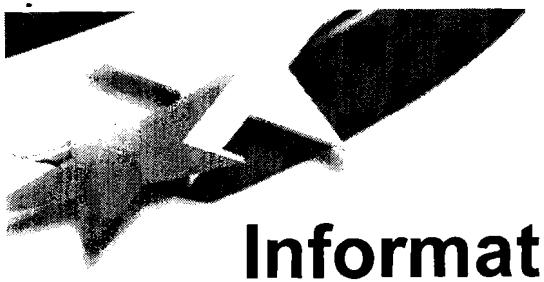

Information Gathering and Data Analysis

- Based on USNRC/Houghton data base
  - Covers years 1986-1999
  - Over 350 events
- Data Parsed and analyzed – e.g.:
  - Method of detection
  - Manual vs. auto/fixed vs. self suppression
    - Manual suppression method (extinguishers, hose stream, removing power, isolating fuel source)
  - Indoor vs. outdoor fires
  - Fires for key locations (e.g., T.B., R.B., containment, etc.)
  - Fires involving key sources
- Fire duration for various event sets estimated using Bayesian analysis

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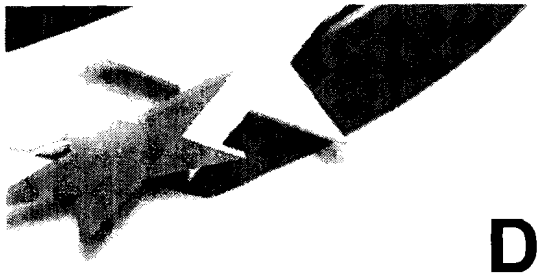

Data Limitations Identified:

- Fire detection times not available / not reported
  - Need independent means for detection time analysis or must treat implicitly (e.g., modeling assumptions)
- Limited data on fixed suppression system actuation timing, reliability, effectiveness
- Data base does not provide insights on suppression success/failure paths
  - May be possible by searching underlying event information – this activity not pursued
- Data does not support 'fine tuning' suppression analysis based on path to detection
  - Exception – prompt detection/suppression paths

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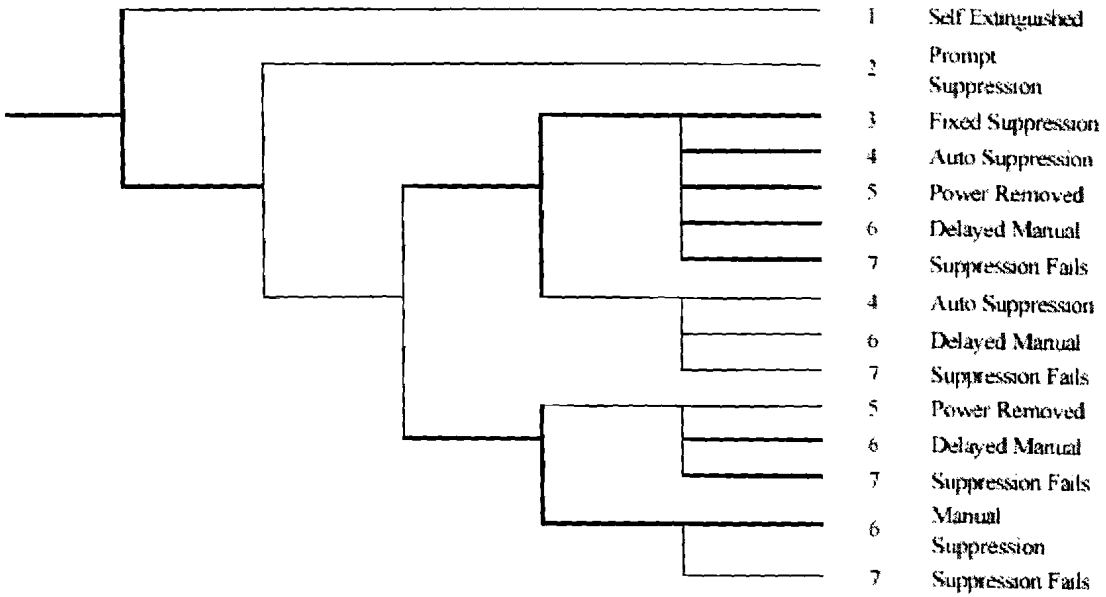
Simplified Det./Supp. Event Tree

Ignition	Fire Self-Extinguished	Prompt Local Detection and Suppression	Fixed Suppression System Installed	Electrical Fire (or other fuel source that can be isolated)	Fire is Suppressed	Sequence	OUTCOME
IGN	FSE	PLDS	FSSINS	ELEC	FS		



Simplified Fire Detection and Suppression Event Tree

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General Insights

- Limitations of event data remain an obstacle to more detailed analysis of detection and suppression

- Detection methods:
  - Nearly 25% of fires (in this data base) report prompt detection (e.g., fire watches, reports of an explosion, flash of light, etc.)
  - Only 6% of fires (in this data base) reportedly detected by fixed detection systems
  - Majority assumed to be delayed manual detection, but not all events report detection method

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General Insights (cont)

- **Suppression method – all onsite fires:**
  - **Manual suppression – 63%**
  - **Self-extinguished – 18%**
  - **Power removed / fuel isolated – 16%**
  - **Fixed system (deluge – manual or auto) – 3%**
- **– Focus on manual suppression in fire PRAs appropriate**

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General Insights (cont)

- Involvement of fixed detection and suppression systems relatively rare in event reports
  - Reasons for lack of involvement not clear
  - How we treat fixed systems in fire PRA remains a challenge
    - Reliability
    - Timing
    - Effectiveness

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SEPTEMBER 11, 2002

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS FIRE PROTECTION SUBCOMMITTEE MEETING

IMPROVEMENT INITIATIVE FOR THE SIGNIFICANCE DETERMINATION PROCESS (SDP) FOR FIRE PROTECTION

CONTACTS:

MARK F. REINHART, NRR/DSSA/SPSB, 415–1185, FMR@NRC.GOV

SEE-MENG WONG, NRR/DSSA/SPSB, 415-1125, SMW1@NRC.GOV

BACKGROUND

- Fire Protection SDP (IMC 0609A, Appendix F)
  - One of many SDP tools used in the Reactor Oversight Process
  - Assess significance of degradations in fire protection defense-in-depth elements:
    (1) fire prevention
    (2) fire detection and suppression
    (3) protection of SSCs important to safety against fire damage to accomplish plant safe shutdown
  - Supports the risk-informed focus of triennial fire protection inspections

FIRE PROTECTION SDP (IMC 0609A, Appendix F)

- **PHASE 1 METHODOLOGY**
  - Screens inspection findings related to operational or functional fire protection feature conditions

- **PHASE 2 METHODOLOGY**
  - Nine-step process
  - Simplified fire risk equation provides an integrated assessment of fire ignition frequency with degraded fire protection defense-in-depth elements
  - Provides a quantitative assessment of significance of collective impact of findings on fire protection defense-in-depth elements

FIRE PROTECTION INSPECTION ISSUES

- 50 Triennial Fire Protection Inspections Completed Since April 2000

- 73 Fire Protection Inspection Findings
  - 39 Safe Shutdown/Alternate Safe Shutdown issues
  - 17 Fire Protection System issues
  - 13 Fire Barrier issues
  - 4 Procedural Adherence issues

- SDP Characterization
  - 19 findings of significance "to be determined"
  - 2 Finalized White findings
  - 52 Green findings

MAJOR FIRE PROTECTION SDP ISSUES

- **Determination of Performance Deficiency**
- **Issues Related to Phase I Screening Process**
  - Definition of SDP entry conditions
- **Phase 2 Technical Issues**
  - Fire ignition frequencies
  - Degradation ratings for defense-in-depth elements
  - Fire severity factors
  - Development of fire scenario

PHASE 2 ISSUES (Continued)

- Phase 2 Objectives and Goals
- Quantification Approach
- Credit for Compensatory Measures
- Credit for Human Actions
- Treatment of Safe Shutdown Actions
- Treatment of Appendix R Exemptions

Status of SDP Improvement Initiative

- **Completed Actions**
  - User Need Request to RES, April 9, 2002
  - Compiled Feedback from Regional Offices, NEI, RES and ACRS
  - Internal NRC Stakeholders Meeting that Began Prioritizing Issues for Short-term and Long-term Resolution, May 23, 2002
  - Status Briefings to NRC Senior Management, May 30 & June 12, 2002
  - Public Meeting with External Stakeholders (NEI Working Group) to Discuss Issues and Fixes, July 09, 2002
  - Core Group Meeting to Discuss Issues and Fixes for Phase 2 SDP Methodology, August 14, 2002
  - Public Meeting with External Stakeholders (NEI Working Group) to Discuss Phase 1 Screening Process and Results of August 14 Core Group Meeting, September 4, 2002

Status of SDP Improvement Initiative (Continued)

- **Future Activities**

  - ACRS Fire Protection Subcommittee Briefing, September 11, 2002
  - Implement Interim Improvements, Ongoing as Developed
  - Public Workshop to Reach Agreement on Phase 2 SDP Issues, November 2002
  - Issue Initial Draft of Revised Guidance to NRC Regional Offices and Industry Stakeholders for Comment, January 2003
  - Issue Revised Draft, April 2003
  - Conduct Tabletop Exercises, May 2003
  - Develop Final Revised Guidance, July 2003
  - Implement Revised SDP, August 2003
  - Training of Fire Protection Inspectors and Senior Reactor Analysts, August 2003

EPRI / NEI FIRE-INDUCED CIRCUIT FAILURE INITIATIVE

ACRS Fire Protection
Subcommittee Meeting

Fred Emerson, NEI
September 11, 2002

EPRI NEI

Fire-Induced Circuit Failure Activities

- EPRI fire test report
- Expert elicitation panel report

EPRI NEI

EPRI Test Report Includes...

- Detailed description of all tests
- Test-by-test review & analysis
  - Test arrangement & parameters
  - Temperature profiles
  - Electrical profiles
  - Sequence of events

EPRI NEI

Test Results...

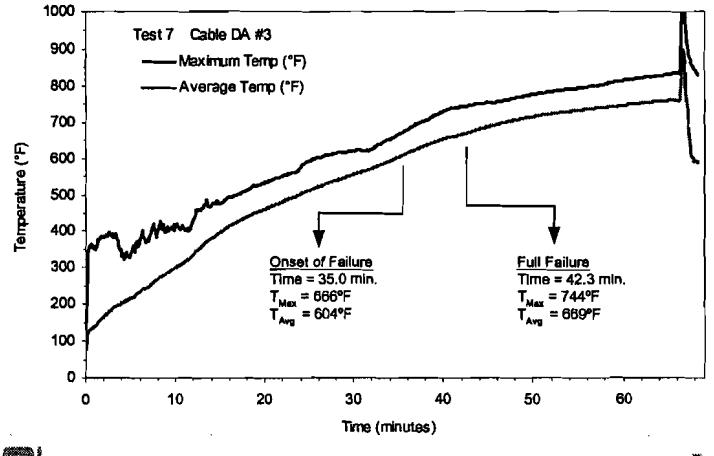
- Temperature & electrical profiles
  - Developed for all cables tested
  - Graphical depiction of cable performance
  - Helpful in identifying patterns and trends
- Key observations & conclusions
  - Fault Modes - hot shorts, ground faults, open circuits
  - Characterization of spurious actuations
- Implications for NEI 00-01

EPRI NEI

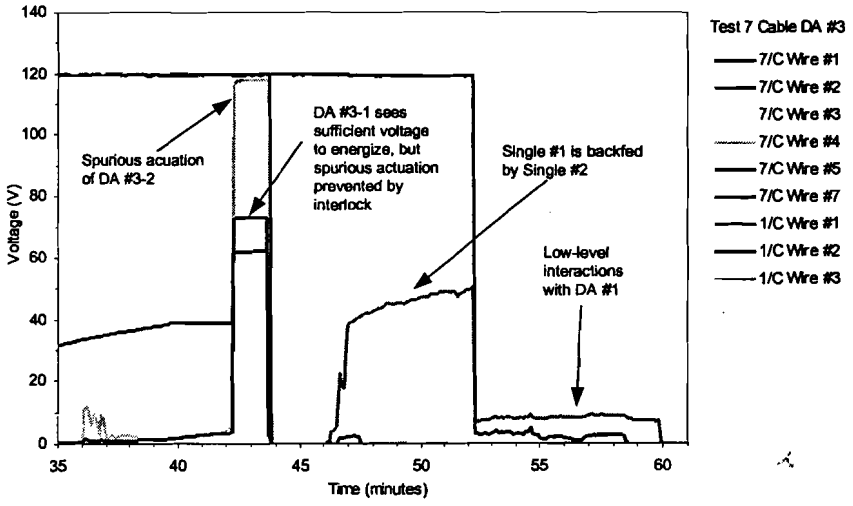
Example Profiles

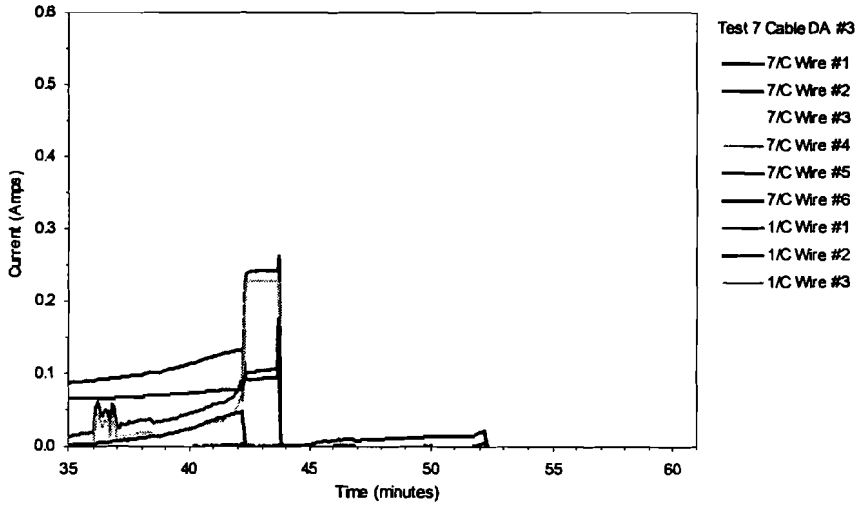
- Test 7 cable bundle DA #3
  - 7/C & 1/C thermoset cable
  - 350 kW HRR with cables in HGL
  - Located in bottom row of tray
  - Laboratory power supply

Temperature Profile (Typical)

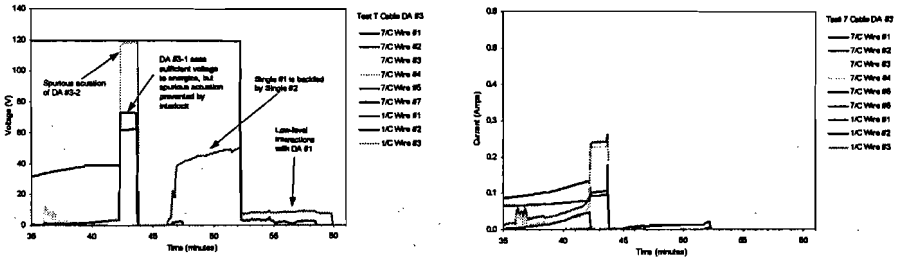


Electrical Profile (Typical)





Electrical Profile (Typical)



Overall Results Summary

Failure Mode Summary by Cable Type

	Armored Cable		Thermoset Cable		Thermoplastic Cable		Total	
Open Circuits	0	0%	0	0%	0	0%	0	0%
Ground Faults	6	85.7%	47	69.1%	25	64.1%	78	68.4%
Hot Shorts	1	14.3%	21	30.9%	14	35.9%	36	31.6%
Total Failures	7	100%	68	100%	39	100%	114	100%

EPRI

NEI

Failure Mode Summary Multi vs. Single Conductor

	7/C Cable		1/C Cable		Total	
Open Circuits	0	0%	0	0%	0	0%
Ground Faults	22	50.0%	56	80.0%	78	68.4%
Hot Shorts	22	50.0%	14	20.0%	36	31.6%
Total Failures	44	100%	70	100%	114	100%

EPRI

NEI

Overall Spurious Actuation Summary by Cable Type

	Armored Cable		Thermoset Cable		Thermoplastic Cable		Total	
Total Devices	16	100%	126	100%	39	100%	181	100%
Spurious Actuations	2	12.5%	26	20.6%	19	48.7%	47	26.0%
Cable Failures	7	100%	68	100%	39	100%	114	100%
Spurious Actuations	2	28.6%	26	38.2%	19	48.7%	47	41.2%
Average Time to Failure	36.1 min.		46.3 min.		25.9 min.		37.6 min.	
Average Duration	0.8 min.		1.7 min.		2.8 min.		2.1 min.	

General Observations

- Proximity of conductors to each other is the predominant influence factor in determining fault mode
- Statistical characterization is achievable
  - General trends predictable
  - Better understanding of primary influence factors
  - Probability values still carry relatively high uncertainty

General Observations

- Definitive predictions not supported
  - The specific behavior and characteristics of any one fault cannot be predicted with full certainty
  - Failure mode is a function of localized conditions and subtle aspects of geometry and configuration
  - A full understanding of the fault dynamics and interdependencies is beyond the current state of knowledge

EPRI NEI

Important Influence Factors

- Cable type
- Tray fill
- Conductor connection pattern
- Power source characteristics

EPRI NEI

Second Order Influence Factors

- Orientation
- Exposure Type
- Water Spray

EPRI

NEI

Internal vs. External Hot Shorts

- External hot shorts do occur, but overall likelihood is much lower than internal hot shorts
- External hot shorts occurred in thermoset cable, but **NONE** resulted in spurious actuations
- Thermoplastic cable showed significantly higher propensity for externally generated spurious actuations (47% from external shorts)

EPRI

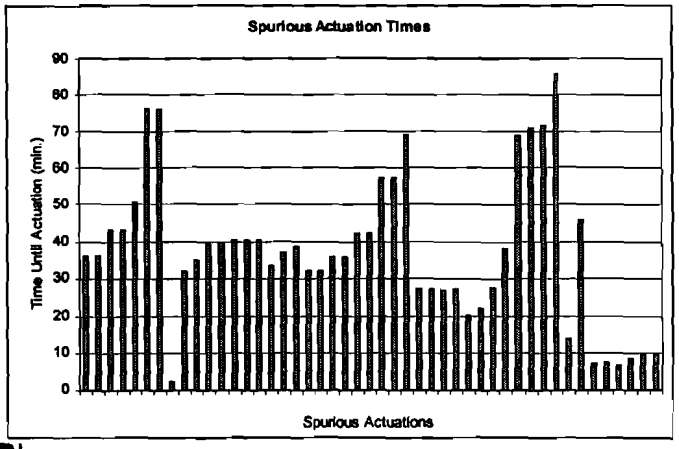
NEI

Multiple Simultaneous Hot Shorts

- Given that a hot short occurs in a multi-conductor cable, it is highly probable (over 80%) that multiple target conductors will be affected (i.e., multiple simultaneous dependent hot shorts)
- Multiple independent (different source conductor) hot shorts occurred for a specific cable bundle, with some occurring simultaneously

EPRI NEI

Time to Spurious Actuation



EPRI NEI

Spurious Actuation Duration

	Armored (min.)	Thermoset (min.)	Thermoplastic (min.)	Overall (min.)
Longest Duration	0.9	13.0	10.1	13.0
Shortest Duration	0.7	0.1	0.1	0.1
Average Duration	0.8	1.8	2.8	2.1
Standard Deviation	0.1	2.8	3.2	2.9

Key Conclusions

- Given cable damage, single spurious actuations are credible and multiple spurious actuations cannot be ruled out
- External cable hot shorts are credible, but none resulted in spurious actuations for thermoset cable
- The overall likelihood of spurious actuations (given cable damage) is higher than previously thought (NUREG-2258)

Key Conclusions

- There exist predictable thresholds below which cable failures do not occur
- The overall average time to cable failure was more than 30 minutes – early time critical actions can significantly reduce risk for high consequence failures/spurious actuations
- Low energy power supplies (e.g., CPTs, isolation transformers) reduce the likelihood of spurious actuations

EPRI NEI

Implications for NEI 00-01

- Deterministic methods
- Risk-informed methods

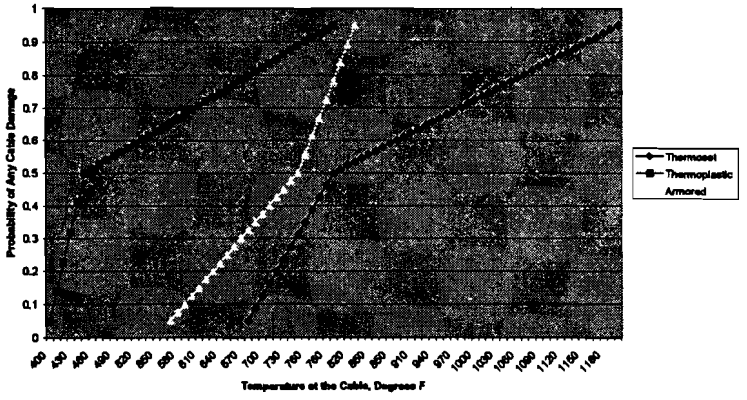
EPRI NEI

Expert Panel Probabilities

Expert Panel Probabilities

Cable Type & Raceway	Description of Hot Short	Best Estimate	High Confidence Range
Thermoset Tray	M/C Intra-cable w/CPT	0.30	0.10 – 0.50
	M/C Intra-cable w/o CPT	0.60	0.20 – 1.0
	1/C Inter-cable	0.20	0.05 – 0.30
	MC & 1/C Inter-cable	0.10	0.05 – 0.20
	MC & MC Inter-cable	0.01 – 0.05	
Thermoset Conduit	M/C Intra-cable w/CPT	0.075	0.025 – 0.125
	1/C Inter-cable	0.05	0.0125 – 0.075
	MC & 1/C Inter-cable	0.025	0.0125 – 0.05
	MC & MC Inter-cable	0.005 – 0.01	
Thermoplastic Tray	M/C Intra-cable	0.30	0.10 – 0.50
	1/C Inter-cable	0.20	0.05 – 0.30
	MC & 1/C Inter-cable	0.10	0.05 – 0.20
	MC & MC Inter-cable	0.01 – 0.05	
Armored Tray	M/C Intra-cable w/CPT	0.075	0.02 – 0.15
	M/C Intra-cable w/CPT w/ single protective device	0.0075	0.002 – 0.015

Expert Panel Cable Fragility Curves



FIRE RISK RESEARCH PROGRAM: STATUS UPDATE

J.S. Hyslop & Nathan Siu

Probabilistic Risk Analysis Branch
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission

ACRS Subcommittee on Fire Protection
September 2002

OUTLINE

- Status
- Program objectives
- Recently initiated tasks
- Planned/potential activities
- Accomplishments (existing tasks)
- General elements of plan
- Events since plan development
- Concluding remarks

STATUS

- Program plan being updated
  - Last version for 2001-02
- Considering 4 year plan for new version (2003-06)
  - Detailed plan for 2003-04
  - Less detail for 2005-06

PROGRAM OBJECTIVES*

- Improve qualitative and quantitative understanding of the risk contribution due to fires in nuclear power plants.
- Support ongoing or anticipated fire protection activities, including the development of risk-informed, performance based approaches to fire protection
- Develop improved fire risk assessment methods and tools (in support of above objectives)

*From FY 2001-2002 plan

RECENTLY INITIATED TASKS

- Fire risk requantification studies (technical activities)
  - Joint NRC-RES/EPRI studies
  - Represent integration of many tasks
  - Many objectives, including new methods
  - Expected to support ANS fire risk standard
- ANS fire risk standard development
  - RES is providing two members of the writing committee
  - Kickoff meeting recently held
- Fire protection SDP revision
  - RES is supporting NRR direction to revise
  - Comprehensive review
- Providing assistance to NRR to develop risk-related guidance to support inspection of fire protection circuit analysis issues

PLANNED/POTENTIAL ACTIVITIES

- Fire model benchmarking and validation (and testing)
- Fire protection for gaseous diffusion plants
- Fire risk assessment for precursor analysis
- Fire protection rulemaking support
- Fire risk assessment guidance assessment

} POTENTIAL ACTIVITIES

ACCOMPLISHMENTS (EXISTING TASKS)

- Tools for circuit failure mode and likelihood analysis
- Tools for fire detection and suppression analysis
- Fire modeling toolbox HEAT RELEASE RATES
  - Collection of references re: HRRs, cable fragilities, ignitability
- Frequency of challenging fires
  - Model for handling early stages of fire development (expert judgement)
- Experience from major fires
  - FRA framework captures chain of events observed in real fires
  - Some exceptions, i.e. multiple fires

ACCOMPLISHMENTS (EXISTING TASKS) (cont.)

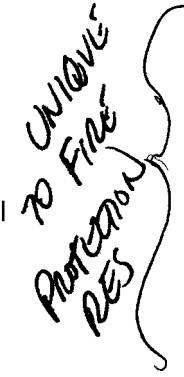
- Fire model benchmarking and validation
  - Various fire models provide consistent results for cable tray fires
- Integrated model and parameter uncertainty
  - Bayesian technique for addressing modeling uncertainty
- Significance of smoke effects (review of literature)
  - Threshold smoke level for damage for digital circuitry is very high concentration (films provide adequate protection)
  - Some evidence that high voltage is vulnerable
- Fire protection SDP support
  - Model for quantifying the effectiveness of manual actions at remote shutdown operations
- NFPA 805 development support

GENERAL ELEMENTS OF PLAN

- Overall objectives
- Background (e.g. initial prioritization, RIRIP)
- Program outputs and regulatory uses
- Relationship with other programs/activities
- Specific technical objectives
- Tasks and Milestones
- Communications plan

EVENTS SINCE PLAN DEVELOPMENT

- Issuance of risk-informed, performance based fire protection rulemaking plan
- Issuance of NFPA 805
- Plan to revise the fire protection SDP
- Industry development of risk-informed approach to resolve the circuit analysis issue (NEI 00-01)
- Potential needs established for non-reactor applications
- Cooperative activities initiated
  - NRC-RES/EPRI MOU
  - Fire modeling
  - COOPRA, WGRISK (in process)
- NRC Public Workshop on RES Fire Risk Research Program (Aug 2001)
  - Discussed technical progress of tasks
  - Attended by industry, user offices of NRC (including Regions)
  - Feedback very positive



CONCLUDING REMARKS

- Research results are addressing ongoing regulatory technical issues
- Staff is participating in cooperative efforts with industry and international organizations
- Needs for research are evolving
- Research program is evolving to meet needs

FIRE PROTECTION FINDINGS

APRIL 2000 - PRESENT

	SSD / ASSD	FIRE PROTECTION	BARRIER	PROCEDURES
WHITE	0	1	1	0
GREEN	44	38	25	17
URI	13	6	10	0
TOTAL	57	45	37	17

White issues:

Smoke detectors inadequate in Cable Spreading Room (Palisades)

Failure to maintain fire area separation barrier between B Train switchgear room and A Train CSR as 3-hour rated (Harris)

SAFE SHUTDOWN / ALTERNATE SAFE SHUTDOWN

EXAMPLES OF FINDINGS

- Inadequate protection of safe shutdown components.
- Emergency lighting deficiencies for performing alternative shutdown actions.
- Shutdown outside control room procedure could not be performed as written.
- Inadequate procedure for implementing alternate S/D for fire in Main Control Room.

FIRE PROTECTION ISSUES

EXAMPLES

- Smoke detectors inadequate.
- Inadequate testing of sprinkler system.
- AFW pump room Halon system inadequate.
- Failure to maintain full area detector coverage.
- Fire brigade receives failing grade during drill; failure to use self-contained breathing apparatus during drill.

BARRIER ISSUES

EXAMPLES

- 3-hour fire barrier degraded.
- Unsecured fire door.
- Failure to establish compensatory measures for inoperable fire door.
- Adequacy of HEMYC cable wrap 1-hour fire barrier. (URI - 8 plants)

FAILURE TO FOLLOW PROCEDURES

EXAMPLES

- Failure to control transient combustibles.
- Failure to follow procedure associated with fire damper surveillance test.
- Failure to follow equipment control procedure.
- Failure to follow procedure resulting in a fire.

TRADITIONAL ENFORCEMENT

FINDINGS

- 4 Issues (impeding the regulatory process)
  - Failure to obtain approval prior to changing fire protection program.
  - Failure to provide complete and accurate information.
  - ~~Failure to complete monthly inspections of extinguishers~~.
  - Failure to perform safety evaluations and submit to NRC.

X-Mailer: Novell GroupWise 5.5.4
Date: Fri, 11 Oct 2002 08:38:43 -0400
From: "Barbara Jo White" <BJW2@nrc.gov>
To: <wjshack@anl.gov>, <FPCTFord@aol.com>, <GMLeitch@aol.com>,
<TSKress@aol.com>, <ransom@ecn.purdue.edu>, <apostola@mit.edu>,
<dapower@sandia.gov>, <mvbonaca@snet.net>
Subject: Fwd: FYI: LODGING RES. FOR ACRS MEMBERS, OCT,NOV & DEC
X-Virus-Scanned-ECN: by AMaVIS version 11 (http://amavis.org/)

please review attached file regarding your loding for Oct/Nov/Dec 2002. Let me know as soon as possible the changes/additionals.

Thanks - BJo
Date: Thu, 10 Oct 2002 14:20:38 -0400
From: "Barbara Jo White" <BJW2@nrc.gov>
To: "RI, Bethesda DOS" <RI.WASBR.DOS@Marriott.com>
Subject: FYI: LODGING RES. FOR ACRS MEMBERS, OCT,NOV & DEC
Mime-Version: 1.0
Content-Type: text/plain; charset=ISO-8859-7
Content-Disposition: inline

Hi Francisco - Please note the changes for the subject reservations.
ARRIVE DEPART
Dr. George Apostolakis (NON SMOKING)
OCT 28 NOV1 (CONF.#82150541)
change to: NOV 4 NOV 9 (CONF.#85464616)
DEC 3 DEC 7 (CONF.#85465170)

Dr. Mario Bonaca (NON SMOKING)
OCT 29 OCT 31 (CONF.#82152132)
change to: NOV 4 NOV 9 (CONF.#85468579)
DEC 3 DEC 7 (CONF.#85469254)

Dr. F. Peter Ford (NON SMOKING)
NOV 6 NOV 9 (CONF.#85478022)
DEC 4 DE 7 (CONF.#85478313)
NEW DEC10 DEC 12 (CONF.#

Dr. Thomas S. Kress (NON SMOKING)
change to: OCT 30 NOV 1 (CONF.#82155851)
change to: NOV 4 NOV 9 (CONF.#85482388)
DEC 3 DEC 7(CONF.#85493306)
New DEC 10 DEC 12 (CONF.#

Mr. Graham Leitch
change to: OCT 29 NOV1 (CONF.#82177450)
change to: NOV 4 NOV 9(CONF.#85504849)
DEC 4 DEC 7(CONF.#85505298)

Dr. Dana A. Powers
change to: OCT 29 NOV1 (CONF.#82179590)

change to: NOV 4 NOV 9(CONF.#85511486)
DEC 4 DEC 7(CONF.#81016574)

Dr. Victor. H. Ransom
NEW OCT 31 NOV1 (CONF.#
change to: NOV 4 NOV 9(CONF.#85518996)
DEC 4 DEC 7(CONF.#85520931)
NEW DEC10 DEC 12 (CONF.#

Dr. William J. Shack
NEW OCT 29 NOV1 (CONF.#
change to: NOV 4 NOV 9 (CONF.#85542636)
DEC 4 DEC 7 (CONF.#85543256)

Dr. Graham Wallis
change to: OCT 29 NOV 1 (CONF.#82181289)
change to: NOV4 NOV 9 (CONF.#85550593)
NEW NOV 11 NOV 14 (CONF.#
DEC 4 DEC 7(CONF.#85551033)
NEW DEC 10 DEC 12 (CONF.#

Mr. John J. Barton
NEW OCT 29 OCT 30 (CONF.#

Dr. Virgil Schrock
NEW NOV 11 NOV 15 (CONF.#
NEW DEC 10 DEC 13 (CONF.#

Dr. Sanjoy Banerjee
NEW NOV11 NOV 15 (CONF.#
NEW DEC10 DEC 13 (CONF.#

Dr. Frederick Moody
NEW NOV 11 NOV 15 (CONF.#
NEW DEC 10 DEC 13 (CONF.#

A copy is being FAX'd to you also - please email or fax back to me. Thank you so much for your help.

Barbara Jo

To: <ransom@ecn.purdue.edu>
Subject: FYI: 496TH ACRS MEETING AGENDA ATTACHED

10/10-12/02

 496AGENDA.10-12-14.02-ACRS.wpd

Initial draft: 3/31/2000
G:\Kobetz\Official Record Folders.wpd

CONTENTS OF OFFICIAL RECORD FOLDERS FOR ACRS SUBCOMMITTEES

The Federal Advisory Committee Act requires retention of certain documents related to every advisory committee meeting. The ACRS has applied this requirement to all ACRS subcommittee meetings. The cognizant staff engineer is responsible for assembling an official record folder for each subcommittee meeting. The folder is retained on file by the Operations Support Branch (Michele Kelton). The following is a list of the documents that should be included in the official record folder.

- ✓ Original copy of the certified minutes,
- ✓ Signed Subcommittee Chairman certification sheet,
- ✓ Memorandum forwarding the certified minutes to the members,
- ✓ Memorandum forwarding the working draft of the minutes to the members,
- ✓ Marked-up agenda or proposed schedule,
- ✓ List of attendees
- ✓ Federal Register Notice, and
- ✓ Slides presented at the subcommittee meeting.

A copy of the certified minutes should be provided to the ACRS secretary.

Three copies of the certified minutes and an electronic copy of the certified minutes should be provided to the Operations Support Branch (Ethel Barnard) for further distribution.