



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20535

JAN 15 1988

Project No. 675

MEMORANDUM FOR: The Record

FROM: Guy S. Vissing, Project Manager
Standardization and Non-Power Reactor
Project Directorate
Division of Reactor Projects III, IV, V
and Special Projects
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF MEETING WITH INTERNATIONAL TECHNOLOGY (IT)
CORPORATION TO DISCUSS THE DOE ADVANCED REACTOR SEVERE
ACCIDENT PROGRAM (ARSAP)

INTRODUCTION

A meeting of the NRC Research staff and the Standardization and Non-Power Reactor Project Directorate staff with representatives of International Technology Corporation was held at the NRC offices in Bethesda, Maryland, on December 16, 1987. The purpose of the meeting was to provide information on the ARSAP program, its objectives, participants, structure, accomplishments to date and expected FY88 results. Also, IT Corporation expected to obtain NRC feedback on issues. Enclosure 1 provides a list of those in attendance. Enclosure 2 provides the viewgraphs which IT used to discuss the ARSAP program.

DISCUSSION

The expectations of the discussion are well identified in the view graphs. Also the ARSAP program and objectives are well stated in the view graphs. The expected turnaround time for review of ARSAP topic papers was six months.

EPRI and GE has defined an accident which would be no greater than a probability of 10^{-6} for 25 rems at $\frac{1}{2}$ mile from the reactor. The staff requested the basis for this criterion. It was indicated that a paper was under development to support this criterion.

Much of the discussion related to the use of the MAAP code and how the staff would deal with this code and with the staff sponsored MELCOR code. It was clear that the staff needed to address this issue and committed to respond to the industry. Also, the industry wanted to know how RES and NRR would work together to review the issues. They wanted to know the process which would be implemented to deal with the ARSAP issues. It was clear that RES would be the prime reviewers; however, it was not clear to the industry how NRR and RES would interact. The staff committed to respond to these issues.

8801290161 880115
PDR PROJ
675A PDR

Proj #675

JAN 15 1988

- 2 -

Zoltan Rosztoczy discussed the development of the severe accident regulation. Currently RES has three projects related to this. These include:

1. Development of a Severe Accident Regulation
2. Develop a Commission Policy on Standardize Plants
3. Coordinate major programs.

RES does have a Reg. Guide development program on Severe Accident Statement. They also are developing a Severe accident policy involving accident prevention and containment performance. Also under consideration is a PRA rule. It is their intent to have the rules and reg. guides in place by the first of 1990.

RES will have quarterly meetings with industry to envelope the Reg. Guides. The meetings will be held with NUMARK as information meetings for industry on the most important issues. RES has also considered working with EPRI on the Standardized Plants programs. General requirements will be defined in the rules with the specific details identified in the Reg. Guides.

The staff indicated that the use of the MAAP code and its alternate should be discussed in the Licensing Review Bases.

Guy S. Vissing, Project Manager
Standardization and Non-Power Reactor
Project Directorate
Division of Reactor Projects III, IV, V
and Special Projects

Enclosures:
As stated

DISTRIBUTION:

Central File

NRC PDR
PDSNP Reading
LRubenstein
GVissing
EHylton
OGC-White Flint
EJordan
JPartlow
NRC Participants
ACRS (10)
TKing

PDSNP
GVissing
01/17/88

PDSNP
LRubenstein
01/17/88

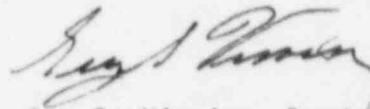
Zoltan Rosztoczy discussed the development of the severe accident regulation. Currently RES has three projects related to this. These include:

1. Development of a Severe Accident Regulation
2. Develop a Commission Policy on Standardize Plants
3. Coordinate major programs.

RES does have a Reg. Guide development program on Severe Accident Statement. They also are developing a Severe accident policy involving accident prevention and containment performance. Also under consideration is a PRA rule. It is their intent to have the rules and reg. guides in place by the first of 1990.

RES will have quarterly meetings with industry to envelope the Reg. Guides. The meetings will be held with NUMARK as information meetings for industry on the most important issues. RES has also considered working with EPRI on the Standardized Plants programs. General requirements will be defined in the rules with the specific details identified in the Reg. Guides.

The staff indicated that the use of the MAAP code and its alternate should be discussed in the Licensing Review Bases.



Guy S. Vissing, Project Manager
Standardization and Non-Power Reactor
Project Directorate
Division of Reactor Projects III, IV, V
and Special Projects

Enclosures:
As stated

Attendance List

For

Meeting With DOE/IT Corp.

Concerning

Advanced Severe Accident Program (ARSAP)

December 16, 1987

<u>Name</u>	<u>Organization</u>
Guy S. Vissing	NRR/PDSNP
R. W. Houston	RES
Mario Fontane	IT Corp.
Tony Buhl	IT Corp.
George David	C-E
Mike Green	C-E
Paul Haas	IT Corp.
Dave Leaver	IT Corp.
Jerry N. Wilson	NRC/RES
Bob Copp	EG&G/INEL
Zoltan R. Rosetoczy	NRR/RES
L. S. Rubenstein	NRC/NRR
Paul Leech	NRR/PDSNP
Dino Scaletti	NRR/PDSNP
Tom King	RES/DRA/ARGIB
William Beckner	RES/DRPS/RHFB
Charlie Brinkman	C-E Bethesda
Rick Summitt	IT Corporation
Dan Giessing	DOE

ADVANCED REACTOR SEVERE ACCIDENT PROGRAM (ARSAP)

TONY BUHL

BOB COPP

MARIO FONTANA

PAUL HAAS

**PRESENTED TO THE NUCLEAR
REGULATORY COMMISSION**

DECEMBER 16, 1987

**THIS MEETING CONTINUES
ARSAP/CE-NRC INTERACTIONS
MEETINGS**

**ERIC BECKJORD AND RES STAFF –
JULY 16, 1987**

**TOM MURLEY AND NRR MANAGERS
– AUGUST 3, 1987**

**GUY VISSING AND NRR AND RES
STAFF – AUGUST 12, 1987**

**WAYNE HOUSTON, GUY VISSING
MARK CUNNINGHAM, –
OCTOBER 14, 1987**

THE PURPOSE OF THIS BRIEFING IS TO:

- (1) PROVIDE INFORMATION ON THE
ARSAP PROGRAM**
 - **MISSION/OBJECTIVES**
 - **PARTICIPANTS/INTERFACES**
 - **STRUCTURE**
 - **ACCOMPLISHMENTS TO DATE
AND EXPECTED FY88 RESULTS**

THE PURPOSE OF THIS BRIEFING IS TO: (2)

- (2) REVIEW THE PLANNED CE/ARSAP
S/A ISSUE RESOLUTION
APPROACH**
 - **PROCESS**
 - **ISSUE TOPIC PAPER**
 - **SCHEDULE**
 - **EXPECTED RESULTS**
- (3) IDENTIFY OPPORTUNITIES FOR
TECHNICAL INFORMATION
EXCHANGE**

EXPECTATIONS FOLLOWING THIS PRESENTATION

- (1) TO IDENTIFY NRC PROGRAMS
AND KEY STAFF IN AREAS
PERTINENT TO ALWR SEVERE
ACCIDENT ASSESSMENT, AND
UNDERSTAND NRR – RES ROLES
AND RESPONSIBILITIES**
- (2) TO OBTAIN NRC VIEWS ON AND
POSSIBLE APPROACHES FOR
CONSIDERING SEVERE ACCIDENTS
IN LICENSING/CERTIFICATION
REVIEWS**
- (3) TO OBTAIN CONCURRENCE ON
THE CE/ARSAP S/A ISSUE
RESOLUTION PROCESS AND
SCHEDULE**
- (4) TO OBTAIN NRC FEEDBACK ON
THE PROPOSED TECHNICAL
INFORMATION EXCHANGE**

THE ARSAP PROGRAM

DOE ARSAP MISSION

- **ASSIST IN THE EARLY
RESOLUTION OF RISK SIGNIFICANT
SEVERE ACCIDENT ISSUES SO
THAT THEY WILL NOT BE MAJOR
ISSUES FOR EVOLUTIONARY
ADVANCED LIGHT WATER
REACTORS DURING THE 1990'S**

DOE ARSAP OBJECTIVES

- SUPPORT DOE DESIGN VERIFICATION PROGRAM REACTOR VENDORS' SEVERE ACCIDENT ASSESSMENT, ANALYSES, AND ISSUE RESOLUTION
- PROVIDE INPUT TO, REVIEW, AND SUPPORT EPRI REQUIREMENTS DOCUMENT IN SEVERE ACCIDENT AREAS.
- ACHIEVE MORE GENERIC RESOLUTION OF SEVERE ACCIDENT ISSUES -- THAN MAY OCCUR THROUGH SUPPORT OF VENDOR CERTIFICATION OR OF EPRI REQUIREMENTS DOCUMENT -- SUCH THAT THEY ARE NOT ISSUES FOR ALWR's.

ARSAP PARTICIPANTS

DOE: SUPPORTING AGENCY

EG&G IDAHO: PROGRAM MANAGER

IT CORPORATION: TECHNICAL
DIRECTOR

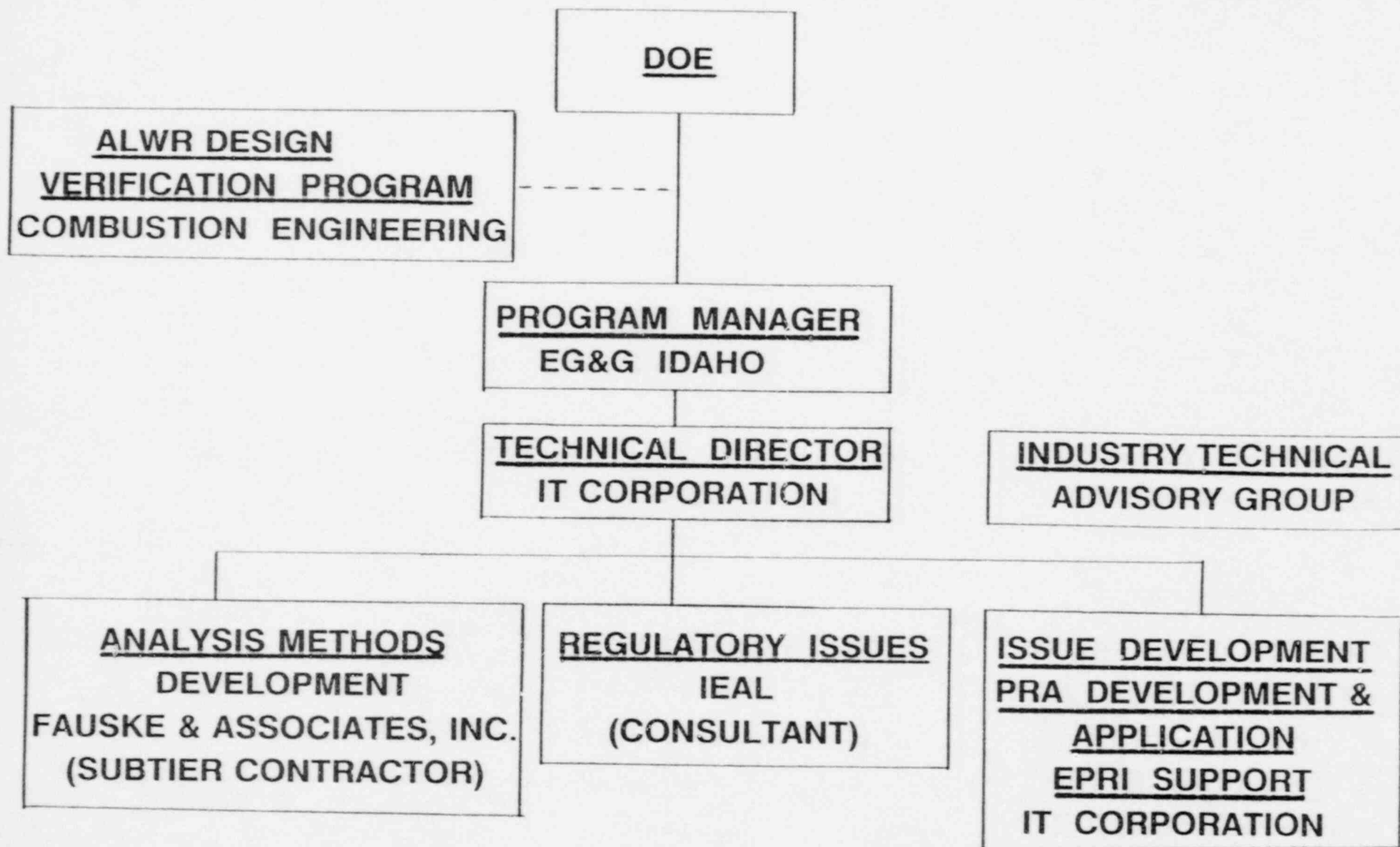
FAI: SUBTIER CONTRACTOR FOR
ANALYSIS METHODS
DEVELOPMENT

IEAL: CONSULTANT FOR
REGULATORY ISSUES

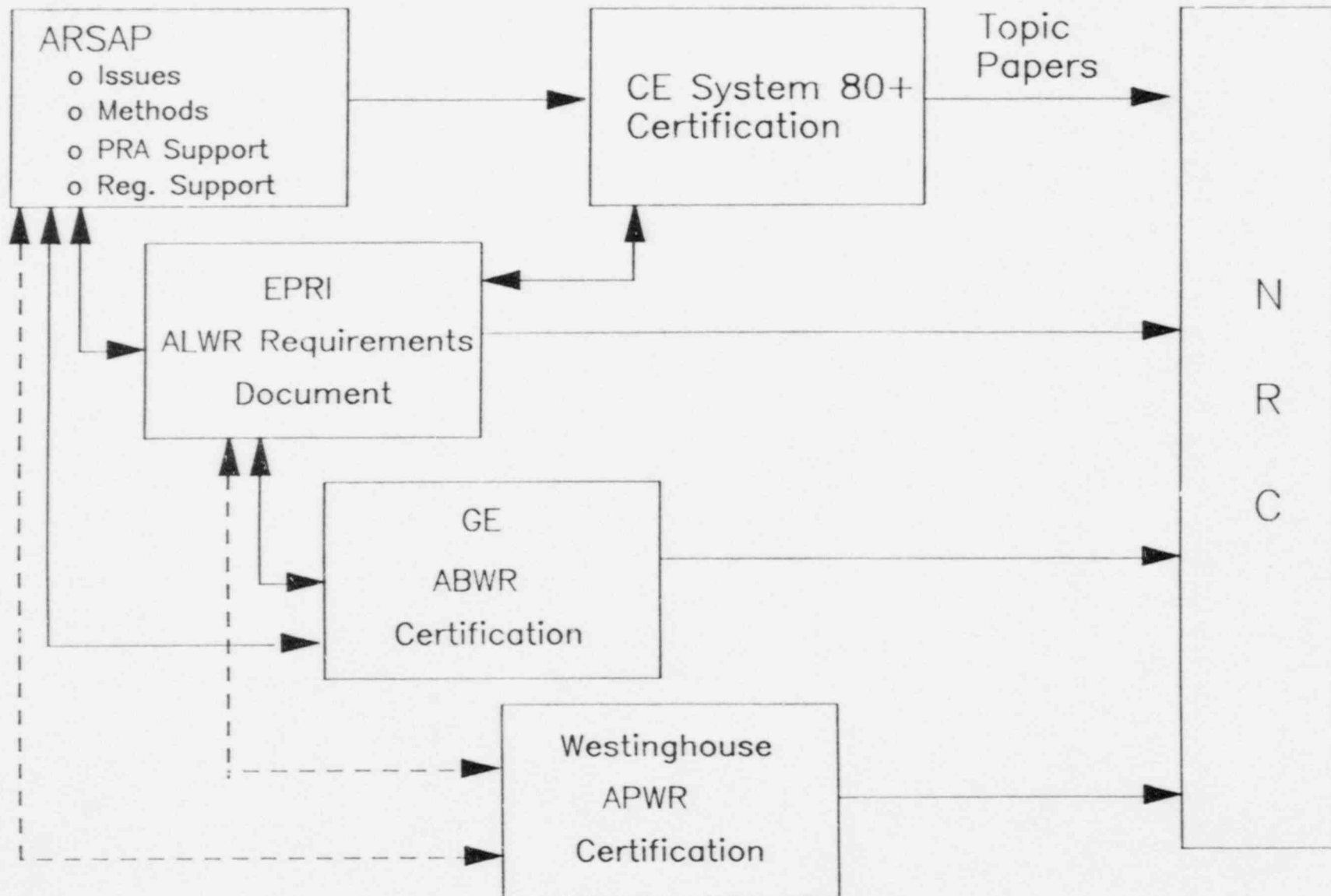
CE: ALWR DESIGN VERIFICATION
CONTRACTOR

ITAG: INDUSTRY TECHNICAL
ADVISORY GROUP

ARSAP ORGANIZATION



ARSAP SUPPORT TO INDUSTRY TO ADDRESS SEVERE ACCIDENT ISSUES WITH NRC



**SEVERE ACCIDENT
REQUIREMENTS FOR ALWRs
ARE IDENTIFIED IN THE NRC
SEVERE ACCIDENT POLICY
STATEMENT APPROVED ON
AUGUST 3, 1985**

- **DEMONSTRATE COMPLIANCE
WITH PRESENT REGULATIONS**
- **DEMONSTRATE TECHNICAL
RESOLUTION OF ALL UNRESOLVED
SAFETY ISSUES AND HIGH
PRIORITY GENERIC SAFETY ISSUES**
- **COMPLETE A PROBABILISTIC
SAFETY ASSESSMENT**
- **COMPLETE STAFF REVIEW OF
DESIGN... DETERMINISTIC
ENGINEERING AND ANALYSIS AND
JUDGEMENT COMPLEMENTED BY
PRA**

ARSAP PROGRAM STRUCTURE

**THE ARSAP PROGRAM IS
STRUCTURED TO SUPPORT
RESOLUTION OF SEVERE ACCIDENT
ISSUES CONSISTENT WITH THE
NRC SEVERE ACCIDENT POLICY
STATEMENT**

- **WBS 1. MANAGEMENT AND
PLANNING**
- **WBS 2. SEVERE ACCIDENT
ISSUES RESOLUTION**
- **WBS 3. SEVERE ACCIDENT
ANALYSIS METHODOLOGY**
- **WBS 4. PRA METHODOLOGY
AND APPLICATION CRITERIA**
- **WBS 5. REGULATORY
COMPLIANCE ALTERNATIVES**
- **WBS 6. CERTIFICATION PROCESS
DEVELOPMENT AND SUPPORT**

ARSAP PROGRAM STRUCTURE

(2)

- **WBS 7. LESSONS LEARNED NOTEBOOK**
- **WBS 8. EPRI REQUIREMENTS DOCUMENT**
- **WBS 9. EPRI/VENDOR 600 MWe PLANT DESIGN AND CERTIFICATION**
- **WBS 10. CE SYSTEM 80 PLANT DESIGN AND CERTIFICATION**
- **WBS 11. GE ABWR PLAN SUPPORT**
- **WBS 12. WESTINGHOUSE APWR PLANT SUPPORT**
- **WBS 13. CHERNOBYL RELATED ISSUES**

WBS 10 ENCOMPASSES SUPPORT FOR CE SYSTEM 80+ PLANT DESIGN AND CERTIFICATION

- **REVIEW OF SEVERE ACCIDENT
ISSUES RELEVANT TO CE DESIGN**
- **DEFINITION OF SEVERE ACCIDENT
SEQUENCES FOR ANALYSIS**
- **PERFORMANCE OF SEVERE
ACCIDENT ANALYSIS**
- **SUPPORT FOR SYSTEM 80+ PRA**
- **ASSESSMENT OF SEVERE
ACCIDENT MITIGATION FEATURES**
- **SUPPORT OF FINAL DESIGN
APPROVAL AND NRC REVIEW
PROCESS**

ARSAP MAJOR ACCOMPLISHMENTS TO DATE

PROGRAM MANAGEMENT AND PLANNING

- **PROGRAM PLAN AND
IMPLEMENTATION PLAN
COMPLETED (ANNUAL UPDATES)**
- **INTERFACES WITH EPRI AND
VENDORS ESTABLISHED**
- **INDUSTRY TECHNICAL ADVISORY
GROUP (ITAG) OPERATING**

ARSAP MAJOR ACCOMPLISHMENTS TO DATE (2)

SEVERE ACCIDENT ANALYSIS METHODOLOGY

- **MAAP AND MELCOR CHOSEN AS
PRIMARY ANALYTICAL
INTEGRATED CODES**
- **MAAP MODELING IMPROVEMENTS
AND BENCHMARKING PLANNED
AND UNDERWAY**
- **MAAP CODE CONFIGURATION
QUALITY CONTROL (CCQC)
PROCEDURE ESTABLISHED**

ARSAP MAJOR ACCOMPLISHMENTS TO DATE (3)

PRA METHODOLOGY AND APPLICATIONS

- **GUIDANCE FOR USE OF PRA IN
DESIGN BEING DEVELOPED**
- **PRA GROUNDRULES AND
ASSUMPTIONS DEVELOPED FOR
EPRI**
- **HIGH LEVEL FUNCTIONAL PRA
MODELS DEVELOPED FOR EPRI**

**ARSAP MAJOR
ACCOMPLISHMENTS TO DATE
(4)**

**REGULATORY ALTERNATIVES AND
CERTIFICATION PROCESS**

- **WHITE PAPERS WRITTEN ON
POTENTIAL ACTIVITIES AND
RESULTS**
- **ON HOLD DUE TO FUNDING
LIMITATIONS**

ARSAP MAJOR ACCOMPLISHMENTS TO DATE (5)

SUPPORT TO VENDORS

- **CE SUPPORT IN PROGRESS**
- **GE SUPPORT IN PROGRESS**
- **MONITORING WESTINGHOUSE
PROGRAM**

ARSAP MAJOR ACCOMPLISHMENTS TO DATE (6)

SUPPORT TO EPRI

- **SIGNIFICANT INPUT TO EPRI
ALWR REQUIREMENTS DOCUMENT
CHAPTERS 1 AND 5**
- **DETAILED REVIEW OF CHAPTERS
1, 2, 3, 4, 5**
- **INPUT ON CHAPTER 6 IN
PROGRESS**
- **TECHNICAL SUPPORT FOR S/A –
RELEVANT REQUIREMENTS, e.g., H₂
CONTROL**

ARSAP MAJOR ACCOMPLISHMENTS TO DATE (7)

RESOLUTION OF S/A ISSUES

- **IDCOR/NRC RESOLUTION
EXPERIENCE AND RELEVANCE TO
ALWRs SUMMARIZED AND
LESSONS LEARNED EXTRACTED**
- **RESOLUTION PROCESS
ESTABLISHED AND
IMPLEMENTATION STARTED**
- **PARTICIPATED IN U.S.
INVOLVEMENT IN IAEA
CHERNOBYL ACTIVITIES**

ARSAP PLANNED FY88 MAJOR RESULTS

- **SIX SETS OF S/A ISSUE TOPIC PAPERS TO NRC, INTERIM GUIDANCE ON MAJORITY OF ISSUES**
- **MODIFICATIONS AND BENCHMARKING OF MAAP COMPLETED**
- **UPGRADED FUNCTIONAL PRA MODELS COMPLETED AND DEMONSTRATED FOR EPRI**
- **FIRST EDITION OF LESSONS LEARNED NOTEBOOK PUBLISHED; ANNUAL UPDATES DRAFTED**

ARSAP PLANNED FY88 MAJOR RESULTS (2)

- **TECHNICAL REPORTS IN SUPPORT OF EPRI REQUIREMENTS DOCUMENT AND CE/ARSAP ISSUE RESOLUTION, e.g., HYDROGEN CONTROL, RCS DEPRESSURIZATION**
- **TECHNICAL REPORTS IN SUPPORT OF CE SYSTEM 80+ SEVERE ACCIDENT ANALYSIS**
- **TECHNICAL REPORTS ON PRA EXTERNAL EVENTS ANALYSIS AND SUPPORT SYSTEM SENSITIVITY**
- **TECHNICAL REPORTS IN SUPPORT OF GE ABWR S/A ANALYSIS, e.g., SEISMIC FRAGILITY DATA, ATWS ANALYSIS**

**SEVERE ACCIDENT ISSUE
RESOLUTION**

DOE/ARSAP/CE ARE WORKING WITH THE NRC TO RESOLVE SEVERE ACCIDENT ISSUES

- **RESOLUTION PROCESS WAS
PRESENTED IN BRIEFINGS TO
BECKJORD, MURLEY, AND
MANAGERS (7/16/87), (8/3/87)**
- **PROCESS AND SCHEDULE
DETAILED WITH NRC NRR STAFF
(8/12/87)**
- **FIRST SET OF ISSUE PAPERS
SUBMITTED TO NRC (11/24/87)**
- **SECOND SET OF ISSUE PAPERS
DRAFTED**
- **TECHNICAL EXCHANGE ON MAAP
AND MELCOR PLANNED (1/5-7/88)**

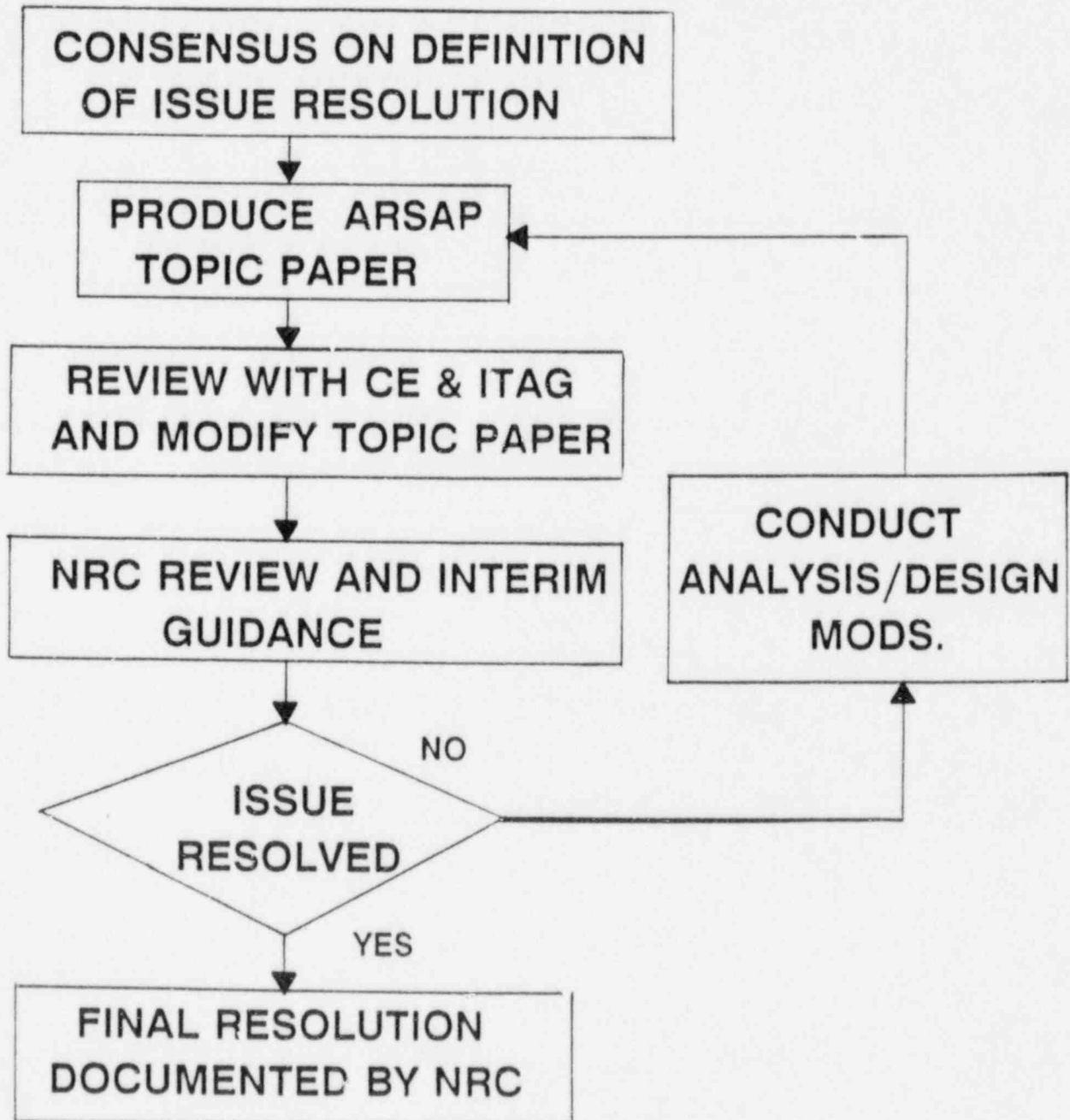
**DOE/ARSAP/CE ARE
INTRODUCING SEVERE
ACCIDENT ISSUES TO NRC FOR
RESOLUTION THROUGH THE CE
SYSTEM 80+ CERTIFICATION
PROCESS**

- **ISSUE TOPIC PAPERS WILL
PRECEDE THE CE SYSTEM 80+
CERTIFICATION SUBMITTAL, BUT
WILL BE PART OF THE
CERTIFICATION PROCESS**

**A PROCESS FOR RESOLUTION
OF SEVERE ACCIDENT ISSUES
WAS PRESENTED TO
BECKJORD, MURLEY, AND NRR
AND RES STAFF**

- (a) A SCHEDULE FOR SUBMITTAL
AND REVIEW OF THE TOPIC
PAPERS**
- (b) A REQUEST FOR NRC TO PROVIDE
INTERIM GUIDANCE SO THAT
SUBSEQUENT WORK WILL BE ON
TRACK**
- (c) A DOCUMENTED FINAL
RESOLUTION**

THE SEVERE ACCIDENT RESOLUTION PROCESS



TOPIC PAPER SETS - SCHEDULE FOR SUBMITTAL TO CE

**SET 1. RESOLVED IDCOR/NRC ISSUES -
APPLICABILITY TO ALWRS (10/87)**

**SET 2. PLANT RESPONSE UNDER SEVERE
ACCIDENT CONDITIONS (12/87)**

SET 3. PROBABILISTIC METHODS (2/88)

SET 4. RISK REDUCTION METHODS (4/88)

SET 5. RISK RESULTS (6/88)

**SET 6. APPLICATIONS OF SEVERE ACCIDENT
ANALYSIS (9/88)**

**RESULTS EXPECTED FROM THE
ARSAP/CE – NRC SEVERE
ACCIDENT ISSUE RESOLUTION
PROCESS INCLUDE:**

- **CONCURRENCE ON
IDENTIFICATION OF ISSUES**
- **CONCURRENCE ON TECHNICAL
APPROACH AND CRITERIA FOR
RESOLUTION**
- **INTERIM NRC GUIDANCE SO
DESIGN CERTIFICATION CAN
PROCEED**
- **RESOLUTION DOCUMENTATION**
- **TIMELY AND STABLE AND
REGULATORY INTERPRETATION
FOR CERTIFICATION**

**ARSAP/CE – NRC TECHNICAL
INFORMATIVE EXCHANGE**

**TECHNICAL INFORMATION
EXCHANGE WITH NRC IS
PROPOSED FOR:**

- **SEVERE ACCIDENT ANALYSIS
METHODOLOGY**
- **REVIEW AND INTERPRETATION
OF EXPERIMENTS**

BOTH NRC AND DOE/ARSAP WILL BENEFIT FROM TECHNICAL INFORMATION EXCHANGE

TECHNICAL ISSUES

- **THE MAAP AND MELCOR CODES
ARE A FORMALIZED STRUCTURE
FOR COMMUNICATING
KNOWLEDGE, ASSUMPTIONS AND
TECHNICAL DATA ABOUT SEVERE
ACCIDENT PHENOMENOLOGY**

BOTH NRC AND DOE/ARSAP WILL BENEFIT FROM TECHNICAL INFORMATION EXCHANGE (2)

MODELING

- **CLEARER UNDERSTANDING OF EACH OTHERS' CODES AS THEY EXIST WILL BE OBTAINED**
- **PLANNED APPROACHES FOR FUTURE DEVELOPMENTS WILL BE CONFIRMED OR POSSIBLY ALTERNATIVE APPROACHES IDENTIFIED**
- **INSIGHTS ON SELECTION OF EXPERIMENTS AND ANALYSIS OF RESULTS FOR BENCHMARKING THE CODES WILL BE DEVELOPED**

**BOTH NRC AND DOE/ARSAP
WILL BENEFIT FROM
TECHNICAL INFORMATION
EXCHANGE (3)**

INTEGRAL CODE COMPARSIONS

- **NRC WILL HAVE A STANDARD
PROBLEM COMPARSION OF MAAP
PRIOR TO CE SUBMITTAL OF
MAAP RESULTS IN THE SYSTEM
80+ CERTIFICATION**
- **DOE/CE/ARSAP WILL GAIN
INSIGHTS ABOUT PLANNED OR
POTENTIAL MAAP MODIFICATIONS
AND BENCHMARKING**
- **SOME DEGREE OF MUTUAL
CONFIRMATION OF CURRENT
MODELS AND RECENT
MODIFICATIONS WILL BE
OBTAINED**

OPPORTUNITITES FOR NRC FAMILIARIZATION WITH MAAP ARE INHERENT IN THE CE/ARSAP – NRC INTERACTION PROCESS

- DURING THE INTERACTIONS ON
S/A TOPIC SET 1
 - NRC QUESTIONS PERTINENT TO
MAAP AND THE PROPOSED ISSUE
RESOLUTIONS WILL BE ADDRESSED
 - ARSAP PLANS FOR MAAP MODELING
IMPROVEMENTS AND
BENCHMARKING WILL BE REVIEWED
 - THE CODE CONFIGURATION
QUALITY CONTROL PROCEDURE
BEING FOLLOWED BY ARSAP IN
DEVELOPING MAAP MODELS WILL
BE PRESENTED

**OPPORTUNITIES FOR NRC
FAMILIARIZATION WITH MAAP
ARE INHERENT IN THE
ARSAP/CE – NRC INTERACTION
PROCESS (2)**

- DURING THE INTERACTIONS ON S/A TOPIC SET 2 UNRESOLVED NRC QUESTIONS PERTINENT TO MAAP AND THE PROPOSED ISSUE RESOLUTIONS WILL BE ADDRESS
- NRC STAFF WILL BE PROVIDED WITH COPIES OF ALL TECHNICAL REPORTS ON ARSAP MODELING AND BENCHMARKING ACTIVITIES AS THEY ARE COMPLETED ALONG WITH PERIODIC BRIEFINGS IF DESIRED

**OPPORTUNITIES FOR NRC
FAMILIARIZATION WITH MAAP
ARE INHERENT IN THE
ARSAP/CE – NRC INTERACTION
PROCESS (3)**

- **PROPOSED TECHNICAL
EXCHANGES ON MAAP AND
MELCOR WILL ADDRESS SPECIFIC
QUESTIONS ON THE TWO
INTEGRATED ACCIDENT ANALYSIS
CODES**
- **A SUMMARY PAPER ON SEVERE
ACCIDENT CODE CAPABILITY WILL
BE ONE OF THE S/A TOPIC
PAPERS**
- **INTERACTIONS WITH NRC STAFF
IN SUPPORT OF CE WILL BE
CONTINUED WHEN MAAP
RESULTS ARE SUBMITTED FOR
SYSTEM 80+**
- **ARSAP ACTIVITIES WILL BE
COORDINATED WITH EPRI USERS'
GROUP**

POTENTIAL ARSAP TECHNICAL EXCHANGE WITH NRC EXPERIMENTS PROGRAMS INCLUDES

- **PROVIDING NRC WITH REVIEW OF RESULTS, INTERPRETATIONS, ETC. MADE BY ARSAP IN THE COURSE OF BENCHMARKING AND ISSUE RESOLUTION**
- **PROVIDING INPUT ON CURRENTLY PLANNED EXPERIMENTS WHICH COULD HELP PROVIDE CONFIRMATORY INFORMATION FOR ADVANCED LWRs WHILE NOT DETRACTING FROM GOALS FOR CURRENT LWRs**
- **PROVIDING INPUT ON POTENTIAL FUTURE EXPERIMENTS**

SUMMARY

SUMMARY

**DOE/CE/ARSAP IS PROVIDING ITS
RESOURCES AND EXTENSIVE
EXPERIENCE IN PRACTICAL
ASSESSMENT OF SEVERE ACCIDENT
ISSUES TO WORK WITH THE NRC TO
RESOLVE ALWR SEVERE ACCIDENT
ISSUES**

THIS WILL BE ACCOMPLISHED BY:

- **CE/ARSAP ISSUE RESOLUTION
PROCESS IN THE SYSTEM 80+
CERTIFICATION EFFORT**
- **SUPPORT OF THE EPRI/NRC
INTERACTIONS ON THE ALWR
REQUIREMENTS DOCUMENT**
- **TECHNICAL INFORMATION
EXCHANGE ON METHODOLOGY
AND EXPERIMENTS**

REMAINING AGENDA

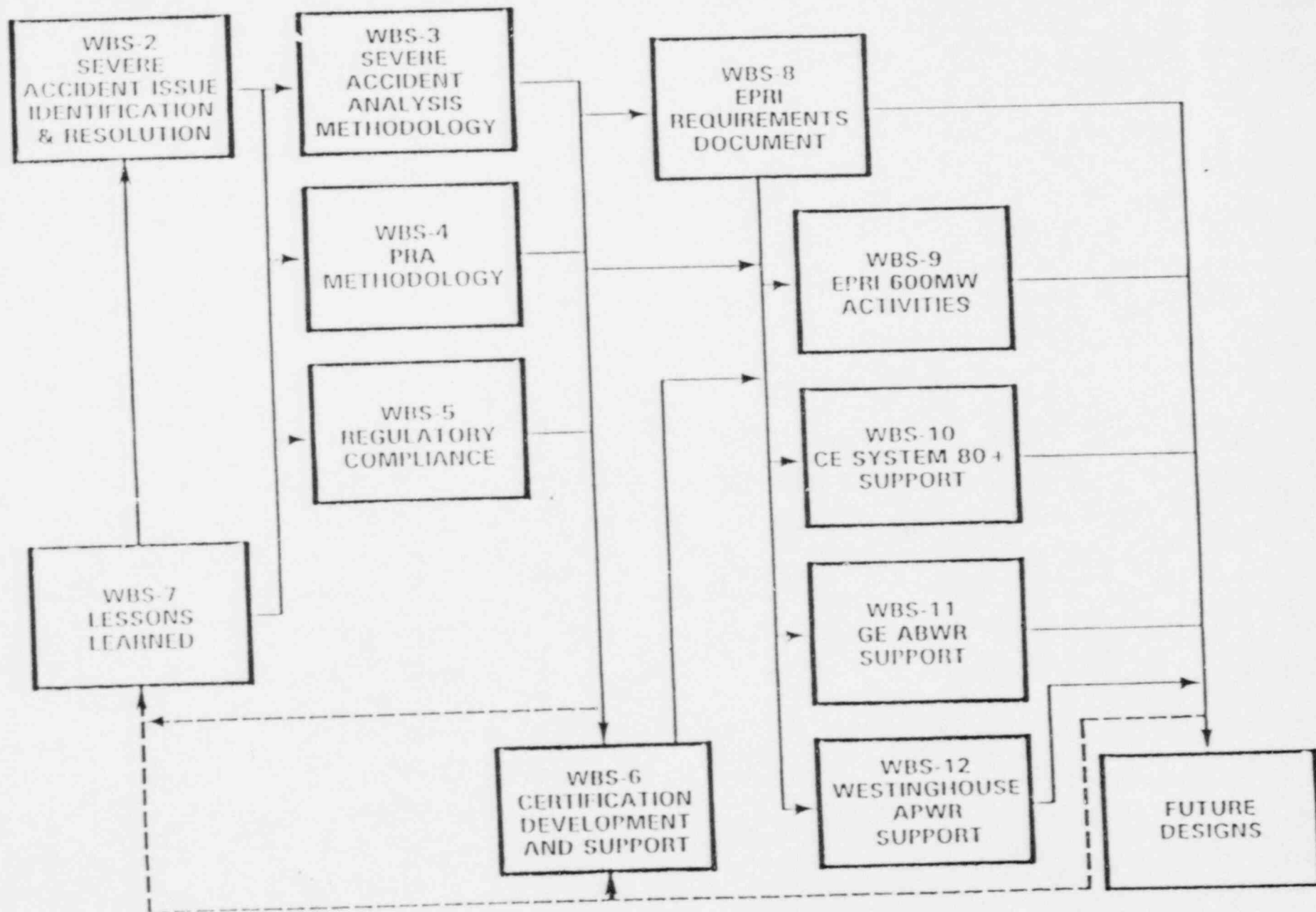
- (1) TO IDENTIFY NRC PROGRAMS AND KEY STAFF IN AREAS PERTINENT TO ALWR SEVERE ACCIDENT ASSESSMENT, AND UNDERSTAND NRR - RES INTERACTIONS**
- (2) TO OBTAIN NRC VIEWS ON AND POSSIBLE APPROACHES FOR CONSIDERING SEVERE ACCIDENTS IN LICENSING/CERTIFICATION REVIEWS**
- (3) TO OBTAIN CONCURRENCE ON THE CE/ARSAP S/A ISSUE RESOLUTION PROCESS AND SCHEDULE**
- (4) TO OBTAIN NRC FEEDBACK ON THE PROPOSED TECHNICAL INFORMATION EXCHANGE**

APPENDIX

ARSAP PROGRAM STRUCTURE

**DETAILED S/A ISSUE RESOLUTION
PROCESS AND INTERFACE WITH TOPIC
PAPER SETS**

ARSAP WBS TASK INTERFACES



ARSAP PROGRAM STRUCTURE

**THE ARSAP PROGRAM IS STRUCTURED
TO SUPPORT RESOLUTION OF
SEVERE ACCIDENT ISSUES,
CONSISTENT WITH THE NRC
SEVERE ACCIDENT POLICY
STATEMENT**

WBS 1. MANAGEMENT AND PLANNING

- POLICY DEVELOPMENT**
- PROGRAM MANAGMENT**
- ORGANIZATION INTERFACES**

WBS 2. SEVERE ACCIDENT ISSUE RESOLUTION

- ISSUE IDENTIFICATION**
- TOPIC PAPER DEVELOPMENT**
- ISSUE RESOLUTION AND
DOCUMENTATION**

ARSAP PROGRAM STRUCTURE (2)

WBS 3. SEVERE ACCIDENT ANALYSIS METHODOLOGY

- SELECTION AND DEVELOPMENT OF
ANALYSIS TOOLS**
- REVIEW OF EXPERIMENTAL DATA
AND RECOMMENDATIONS**
- BENCHMARKING AND VALIDATION
AND VERIFICATION**

WBS 4. PRA METHODOLOGY AND APPLICATION CRITERIA

- GUIDANCE FOR USE OF PRA IN
DESIGN**
- GUIDANCE FOR REGULATORY
APPLICATIONS OF PRA**
- DEVELOPMENT OF EPRI
FUNCTIONAL PRA'S**
- DEVELOPMENT OF EPRI PRA
GROUND RULES AND ASSUMPTIONS**

ARSAP PROGRAM STRUCTURE (3)

WBS 5. REGULATORY COMPLIANCE ALTERNATIVES

- SUPPORT OF RISK BASED
ASSESSMENTS OF INEFFECTIVE
REQUIREMENTS**
- PROPOSAL OF ALTERNATIVES**
- SUPPORT OF VENDOR/EPRI
EFFORTS WITH NRC**

WBS 6. CERTIFICATION PROCESS DEVELOPMENT AND SUPPORT

- REGULATORY ASSISTANCE TO
VENDOR CERTIFICATION EFFORTS**

WBS 7. LESSONS LEARNED NOTEBOOK

- ANNUAL UPDATES**

ARSAP PROGRAM STRUCTURE (4)

WBS 8. EPRI REQUIREMENTS DOCUMENT

- REVIEW, COMMENT, AND INPUT TO
EPRI REQUIREMENTS DOCUMENT IN
SEVERE ACCIDENT AREAS**

WBS 9. EPRI/VENDOR 600 MWe PLANT DESIGN AND CERTIFICATION

- GE DESIGN (SBWR) REVIEW**
- WESTINGHOUSE DESIGN (SPWR)
REVIEW**

ARSAP PROGRAM STRUCTURE (5)

WBS 10. CE SYSTEM 80 PLANT DESIGN AND CERTIFICATION

- REVIEW OF SEVERE ACCIDENT
ISSUES RELEVANT TO CE DESIGN**
- DEFINITION OF SEVERE ACCIDENT
SEQUENCES FOR ANALYSIS**
- PERFORMANCE OF SEVERE
ACCIDENT ANALYSIS**
- SUPPORT TO SYSTEM 80 PRA**
- ASSESSMENT OF SEVERE ACCIDENT
MITIGATION FEATURES**
- SUPPORT OF FINAL DESIGN
APPROVAL AND NRC REVIEW
PROCESS**

ARSAP PROGRAM STRUCTURE (6)

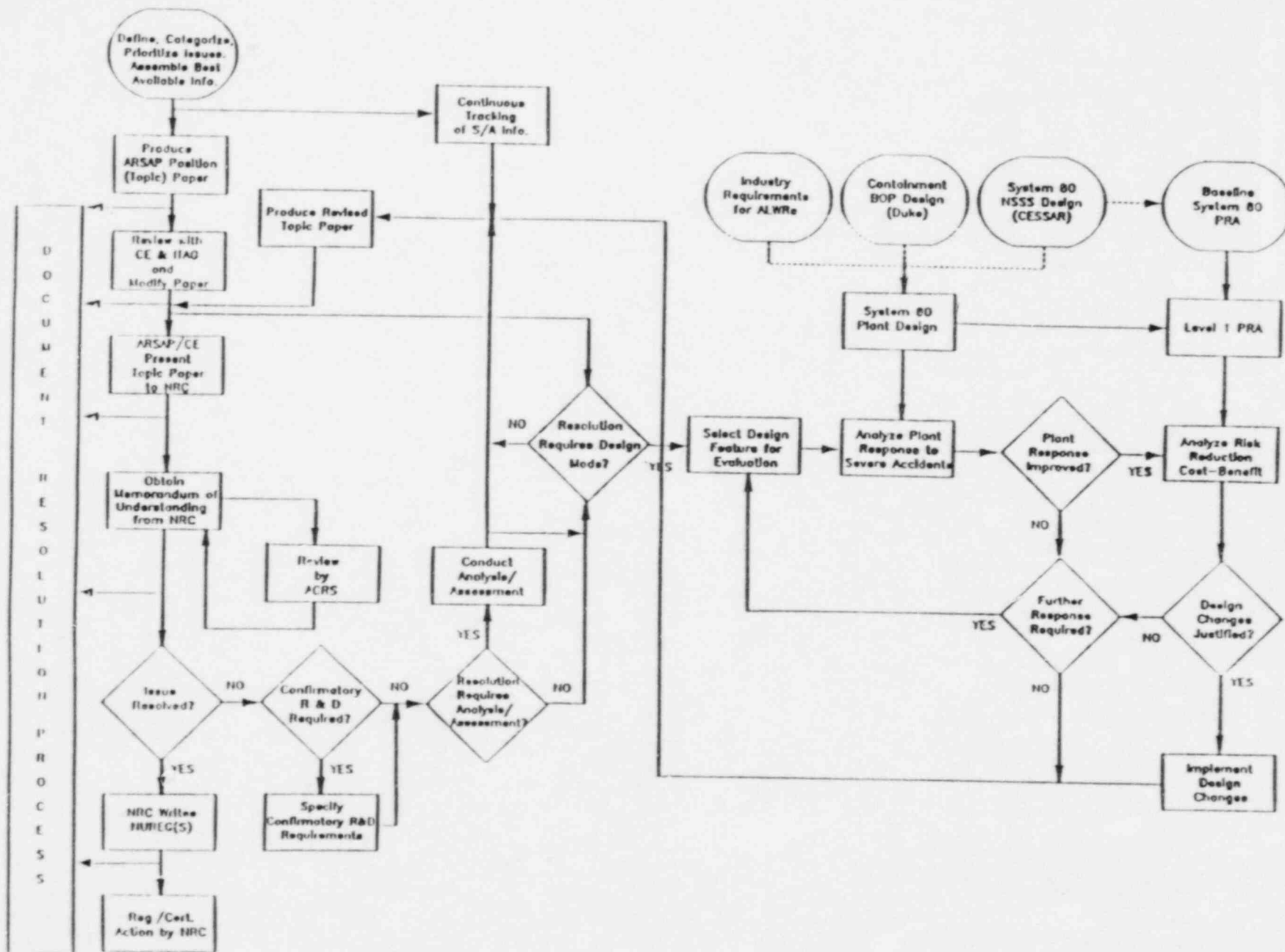
WBS 11. GE ABWR PLAN SUPPORT

- MAAP USER SUPPORT**
- ASSISTANCE IN DEVELOPMENT AND APPLICATIONS OF MAAP MODEL ANALYSIS OF FISSION PRODUCT PARTICLE SIZE — EFFECT ON SUPPRESSION POOL DF**
- SUPPORT FOR PRA SEISMIC ANALYSIS**
- SUPPORT FOR ABWR ATWS ANALYSIS**

WBS 12. WESTINGHOUSE APWR PLANT SUPPORT

- MONITORING OF ACTIVITIES**

WBS 13. CHERNOBYL



Detailed Severe Accident Issue Resolution Process and Interaction with Combustion Engineering

**TOPIC PAPER SET 1: RESOLVED
IDCOR/NRC ISSUES –
APPLICABILITY TO ALWRS
(SINGLE PAPER)**

- **REACTOR COOLANT SYSTEM
NATURAL CIRCULATION (IDCOR
ISSUE 2)**
- **IN-VESSEL STEAM EXPLOSIONS
AND ALPHA MODE FAILURE
(IDCOR ISSUE 7)**
- **EX-VESSEL HEAT TRANSFER
MODELS FROM MOLTEN CORE TO
CONCRETE (IDCOR ISSUE 10)**
- **FISSION PRODUCT RELEASE
PRIOR TO VESSEL FAILURE (IDCOR
ISSUE 1)**
- **RELEASE MODEL FOR CONTROL
ROD MATERIALS (IDCOR ISSUE 3)**
- **FISSION PRODUCT AND AEROSOL
DEPOSITION IN RCS AND
CONTAINMENT (IDCOR ISSUES 4
AND 12)**

**TOPIC PAPER – SET 1:
UNRESOLVED IDCOR/NRC
ISSUES – APPLICABILITY TO
ALWRS (2)**

- **EX–VESSEL FISSION PRODUCT
RELEASE (DURING CORE –
CONCRETE INTERACTIONS) (IDCOR
ISSUE 9)**
- **REVAPORIZATION OF FISSION
PRODUCTS (IDCOR 11)**
- **SECONDARY CONTAINMENT
PERFORMANCE (IDCOR ISSUE 16)**
- **MODELING OF EMERGENCY
RESPONSE (IDCOR ISSUE 14)**

TOPIC PAPER SET 2: PLANT RESPONSE UNDER SEVERE ACCIDENT CONDITIONS

- **IN-VESSEL HYDROGEN
GENERATION (IDCOR ISSUE 5)**
- **CORE MELT PROGRESSION AND
VESSEL FAILURE (IDCOR ISSUE 6)**
- **DIRECT CONTAINMENT HEATING
BY EJECTED CORE MATERIALS
(IDCOR ISSUE 8)**
- **CONTAINMENT PERFORMANCE
(IDCOR ISSUE 15)**
- **HYDROGEN IGNITION AND
BURNING (IDCOR ISSUE 17)**
- **DEBRIS COOLABILITY (IDCOR
ISSUE 10)**

TOPIC PAPER SET 3: PROBABILISTIC METHODS

- **EXTERNAL EVENTS**
- **HUMAN FACTORS -- REQUIRED
OPERATOR ACTIONS**
- **HUMAN FACTORS --
UNEXPECTED OPERATOR ACTIONS
WITH POTENTIAL ADVERSE
EFFECT**
- **HUMAN FACTORS --
QUANTIFICATION OF HUMAN
ERROR PROBABILITIES**
- **SUCCESS CRITERIA**
- **COMMON CAUSE FAILURES**
- **IDENTIFICATION OF DOMINANT
SEQUENCES**

TOPIC PAPER SET 4: RISK REDUCTION MEASURES

- **ESSENTIAL EQUIPMENT
PERFORMANCE (IDCOR ISSUE 18)**
- **SEVERE ACCIDENT MANAGEMENT
— PLANT
EQUIPMENT/INFORMATION
SYSTEM CAPABILITY**
- **SEVERE ACCIDENT MANAGEMENT
— CONDITIONS FOR SAFE
STABLE STATES**
- **MITIGATION FEATURES**

TOPIC PAPER SET 5: RISK RESULTS

- **CONSENSUS ON INTEGRATED SEVERE ACCIDENT ANALYSIS CODE CAPABILITY, VALIDATION , AND APPLICATION**
- **USE OF TMI-2 EXAMINATION RESULTS ON CODE VALIDATION**
- **SAFETY GOAL IMPLEMENTATION — INTERPRETATION OF GOALS AND USAGE OF PRA RESULTS IN COMPARISON WITH GOALS, INCLUDING INTERPRETATION OF UNCERTAINTIES**
- **UNCERTAINTIES IN PLANT RISK — EFFECTS OF SYSTEM ANALYSIS UNCERTAINTIES**

TOPIC PAPER SET 5: RISK RESULTS (2)

- **UNCERTAINTIES IN PLANT RISK –
– EFFECTS OF UNCERTAINTIES IN
SEVERE ACCIDENT ANALYSIS
(PHENOMENOLOGY, PLANT
DAMAGE STATES, METHODOLOGY)**
- **UNCERTAINTIES IN PLANT RISK –
– TREATMENT OF PROPAGATION
OF UNCERTAINTIES**
- **UNCERTAINTIES IN PLANT RISK –
– COMPLETENESS OF CHOICE OF
SEQUENCES AND CUTOFF
PROBABILITIES**

TOPIC PAPER SET 6: APPLICATIONS OF METHODS

- **EFFECT OF SEVERE ACCIDENT
ISSUES ON REGULATIONS --
PROBABILISTIC DESIGN BASES**
- **EFFECT OF SEVERE ACCIDENT
ISSUES ON REGULATIONS --
ASSESSMENT OF REGULATORY
COMPLIANCE ALTERNATIVES**
- **EFFECT OF SEVERE ACCIDENT
ISSUES ON REGULATIONS --
EFFECTIVENESS OF TECHNICAL
SPECIFICATIONS**

THE DIRECT CONTAINMENT HEATING TOPIC PAPER IS AN EXAMPLE OF ISSUE TREATMENT

ISSUE DESCRIPTION AND IMPORTANCE

DEFINITION

- CORE DEBRIS DISPERSED IN
CONTAINMENT AT VESSEL FAILURE**

IMPORTANCE

- CONTAINMENT COULD FAIL
IMMEDIATELY AFTER VESSEL
FAILURE AND COULD OCCUR LARGE
SOURCE TERM**

THE DIRECT CONTAINMENT HEATING TOPIC PAPER IS AND EXAMPLE OF ISSUE TREATMENT (2)

ISSUE STATUS AND TECHNICAL BASIS

IDCOR ACTIONS

- REVIEWED EXISTING CAVITY CONFIGURATIONS AND ESTIMATED THE EFFECT ON DEBRIS DISPERSAL. DEVELOPED SCREENING CRITERIA. PERFORMED EXPERIMENTS.**

NRC ACTIONS

- PERFORMED EXPERIMENTS AND ANALYSES OF DEBRIS DISPERSAL AND DIRECT HEATING.**

QUESTIONS

- EFFECT OF REALISTIC GEOMETRIES ON ENTRAINED DEBRIS.**

THE DIRECT CONTAINMENT HEATING TOPIC PAPER IS AN EXAMPLE OF ISSUE TREATMENT (3)

ISSUE STATUS AND TECHNICAL BASIS (2)

NRC POSITION

- DEMONSTRATE THAT EACH CAVITY IS ACCURATELY REPRESENTED BY MILLSTONE AND AMOUNT OF DISPERSED DEBRIS TO CONTAINMENT VOLUME IS INSIGNIFICANT.**

RECENT RESULT

- EFFECT OF DISPERSED DEBRIS ON FISSION PRODUCT RELEASE MAY BE POTENTIALLY SIGNIFICANT (NUREG 1150 SUBISSUE).**

THE DIRECT CONTAINMENT HEATING TOPIC PAPER IS AN EXAMPLE OF ISSUE TREATMENT (4)

TECHNICAL APPROACH TO RESOLUTION

RESOLUTION

- DESIGN CRITERIA REQUIRES DESIGN
LIKE MILLSTONE. PROVIDE
GEOMETRIC DESIGN CRITERIA FOR
CAVITY. DEVELOP MODEL FOR
FISSION PRODUCT RELEASE. TAKE
ADVANTAGE OF RCS
DEPRESSURIZATION SYSTEM.**

RELATED WORK

- RECOMMEND TEST OF DEBRIS
DISPERSAL FROM MILLSTONE
CAVITY TO RESOLVE ISSUE.
PERFORM STUDIES OF THE EFFECT
OF DEPRESSURIZATION ON
CONDITION AT VESSEL FAILURE.**