



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

June 26, 1987

Docket Nos. 50-327/328

LICENSEE: Tennessee Valley Authority (TVA)  
FACILITY: Sequoyah Nuclear Plant, Units 1 and 2  
SUBJECT: MEETING SUMMARY FOR THE JUNE 19, 1987 MEETING BETWEEN NRC AND  
TVA REGARDING NON-RETRIEVABLE CIVIL CALCULATIONS

On June 19, 1987, a meeting was held in Bethesda, Maryland between NRC staff and representatives of TVA to discuss TVA's plans regarding pipe support calculations for Unit 2. Attachment 1 is a list of attendees. Attachment 2 has handouts from TVA which were used during the meeting.

TVA described its proposed program for regeneration of non-retrievable pipe support calculations and for verification of the technical adequacy of existing calculations. The scope encompasses rigorously analyzed Category 1 (large bore) piping. TVA presently estimates that there are 6000 support calculations altogether. About 2000 calculation packages are available; thus about 4000 calculations would need to be regenerated. As part of this review, existing calculations will also be screened to ensure that the calculation packages are complete.

TVA informed NRC at the meeting that they had just received some records from IMPELL (formerly EDS) which, although not maintained and controlled by IMPELL as design calculations, include drawings and calculation files and thus may assist in the review program. This may reduce the number of non-retrievable calculations.

In the regeneration effort by TVA to date, 929 calculations have been redone. Of these, 688 were found acceptable on initial analysis. More refined analyses were performed on 89 of the remaining cases and 10 supports have been identified as requiring a modification. Based on this effort, TVA has identified attributes which can be used to screen the cases to identify those for which modifications are most likely to be required (referred to as the Category B population). In this first set of calculations, support modifications were needed for cases where loads had changed after the original design or with special geometric configurations. Category A calculations would be the other or non-category B calculations.

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This screening process would be used to prioritize the review such that the Category B calculations would be performed first because they are more likely to result in modifications. However, the completion schedule has been established by TVA such that all calculations would be finished prior to plant restart. This is required by NRC.

TVA noted that three different sets of pipe support calculation acceptance criteria have been used at Sequoyah: one set up to 1979, one set from 1979-1986 and one set from 1986 forward. Existing calculation packages would use the criteria specified in the calculation whereas the regenerated calculations would be performed with the newest criteria.

Once the need for a support modification has been identified, the implementation schedule will be determined by TVA using the approved restart criteria.

The staff stated that TVA should submit a report describing the calculation program and explain the different calculation acceptance criteria and where NRC staff approval has been issued. At the next FSAR update, these criteria should also be incorporated therein. The staff also noted that the current acceptance criteria and recalculation program should address other issues that have been raised on pipe supports, such as base plate flexibility and friction.

Following the meeting on pipe support calculations, a status report on cable pulling testing was provided and discussed (see Attachment 3).

*Eileen McKenna*  
Eileen McKenna, Project Manager  
TVA Projects Division  
Office of Special Projects

Attachments:

1. List of Attendees
2. Handout - Pipe Support Calculations
3. Handout - Cable Pulling

cc w/attachments:  
See next page

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Original Signed By  
Eileen McKenna, Project Manager  
TVA Projects Division  
Office of Special Projects

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cc w/attachments:  
See next page

DISTRIBUTION

Docket File  
NRC PDR  
Local PDR  
Those on attached lists

TVA:OSP  
CJamerson  
6/25/87

TVA:OSP  
EMcKenna:as  
6/25/87

TVA:BC/P  
JDonohew  
6/25/87

TVA/AD/P  
JZwolinski  
6/26/87

DISTRIBUTION FOR MEETING SUMMARY DATED: JUNE 26, 1987

Facility: Sequoyah Nuclear Plant, Units 1 and 2\*

Docket File

NRC & Local PDRs

Projects Reading

SNR Reading

J. Keppler/J. Axelrad

S. Ebner

S. Richardson

J. Zwolinski

J. Donohew

E. McKenna

T. Rotella

S. R. Connelly

C. Jamerson

OGC-Bethesda

F. Miraglia

E. Jordan

J. Partlow

B. D. Liaw

G. Zech, Region II

J. Clifford

J. R. Fair

R. Architzel

R. Hermann

G. Imbro

E. Goodwin

A. Marinos

ACRS (10)

Hon. M. Lloyd

Hon. J. Cooper

Hon. A. Gore

Dr. Henry Myers

Mr. R. King, GAO

P. Gwynn

J. Meyer

J. Austin

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C. Ader

TVA-Bethesda

\*Copies sent to persons on facility service list

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ATTACHMENT 1

JUNE 19, 1987 MEETING

<u>NAME</u>	<u>AFFILIATION</u>
J. Donohew	NRC/OSP
E. Fotopoulos	SERCH Licensing, Bechtel
E. McKenna	NRC/OSP
J. A. Zwolinski	NRC/OSP/TVA
B. D. Liaw	NRC/OSP/TVA
J. W. Clifford	NRC/NRR/OSP
B. Hall	TAV/DNSL/SQN
J. R. Fair	NRC/OSP
R. E. Architzel	NRR/RSIB
R. A. Hermann	OSP/TVA
G. Imbro	NRR/RSIB
J. Kirkebo	TVA/Engineering
S. Ebnetter	NRC/OSP/TVA
R. Meadors	TVA/DNSL/SQN
T. S. Rotella	NRC/OSP/TVA
K. S. Seidle	TVA/DNE/CEB
B. Pennell	TVA/DNE/E&TS
A. Banerjee	SWEC
R. E. Roemer	Stone and Webster
T. A. Ippolito	TVA - Consultant
E. F. Goodwin	NRC/OSP
K. W. Brown	TVA/DNE/EEB
S. S. Chitnis	Bechtel - San Francisco
A. Marinos	OSP

TENNESSEE VALLEY AUTHORITY  
SEQUOYAH NUCLEAR PLANT

REVIEW AND REGENERATION  
OF  
PIPE SUPPORT CALCULATIONS

RIGOROUSLY ANALYZED PIPING:  
UNIT 2 & COMMON SYSTEMS

PRESENTATION TO  
THE NUCLEAR REGULATORY COMMISSION

19 JUNE 1987

## AGENDA:

1. DEFINITION OF SCOPE OF CALCULATIONS
2. BACKGROUND AND PROBLEM DEFINITION
3. INITIAL ESTIMATE OF SCOPE OF CALCULATIONS
4. REGENERATION OF SUPPORT CALCULATIONS FOR POST-OL ECN's
5. REVIEW AND REGENERATION PROGRAM FOR CAT. 1 CALCULATIONS
6. COMPLETION PLAN
7. PIPE SUPPORT DESIGN CRITERIA



## CALCULATION REVIEW AND REGENERATION

### PROGRAM OBJECTIVE:

- o TO EVALUATE/REGENERATE ALL CATEGORY 1  
RIGOROUSLY ANALYZED PIPE SUPPORT CALCULATIONS
  
- o TO ENSURE THAT THE TECHNICAL ADEQUACY REFLECTS  
CORRECTION OF PROBLEMS IDENTIFIED IN THE TVA  
CALCULATION VALIDATION PROGRAM FOR SUPPORTS

### PROGRAM SCOPE:

- o PIPE SUPPORTS FOR RIGOROUSLY ANALYZED PIPE
  
- o CATEGORY 1 PIPE - PRIMARILY LARGE BORE PIPE

## BACKGROUND

- o MOST PRE-OPERATING LICENSE SUPPORT DESIGN BY:
  - EDS - INSIDE CONTAINMENT
  - BASIC ENGINEERING - OUTSIDE CONTAINMENT
  
- o SOME PRE-OL SUPPORT DESIGN BY TVA
  
- o MOST POST-OL SUPPORT MODIFICATIONS WERE DESIGNED BY TVA  
(CALCULATIONS ARE AVAILABLE)

## PROBLEM DEFINITION

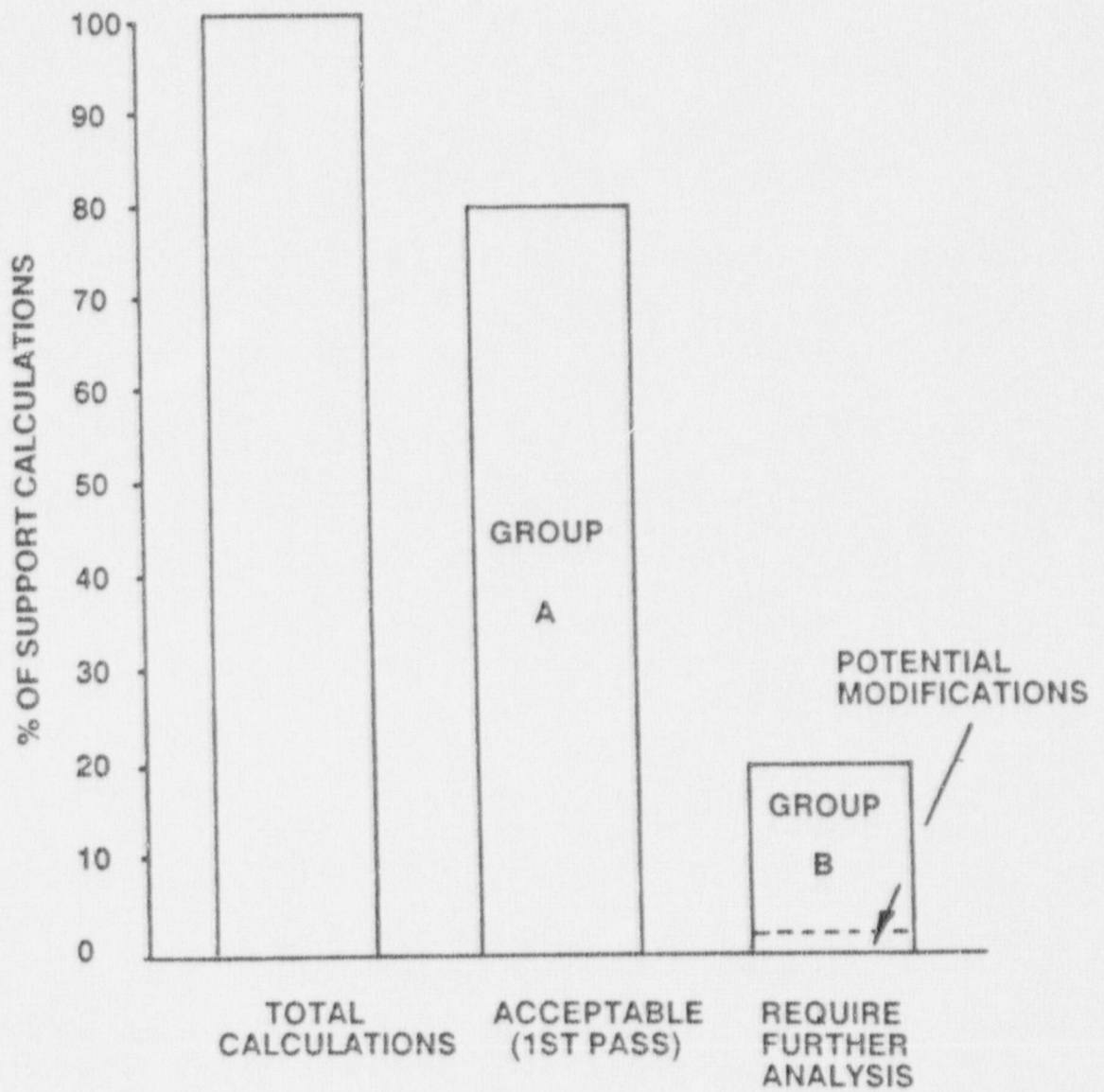
- o SIGNIFICANT NUMBER OF PIPE SUPPORT CALCULATIONS HAVE NOT BEEN RETRIEVED
  
- o TVA CALCULATION VALIDATION PROGRAM RESULTS FOR PIPE SUPPORT CALCULATIONS
  
- o ESTIMATE OF SCOPE (21 MAY 1987)
  - \* TOTAL NUMBER OF SUPPORTS: 7500
  
  - \* RETRIEVABLE DOCUMENTATION: 2500
  
  - \* NON-RETRIEVABLE DOCUMENTATION: 5000

## REGENERATION OF PIPE SUPPORT CALCULATIONS

### CURRENT STATUS:

TOTAL:	929
NUMBER ACCEPTABLE (FIRST PASS):	688
NUMBER REQUIRING FURTHER EVALUATION:	241
NUMBER EVALUATED:	89 (79 ACCEPTABLE)
POTENTIAL MODIFICATIONS:	10

# LESSONS LEARNED



## CALCULATION REVIEW AND REGENERATION

### PROGRAM RATIONALE:

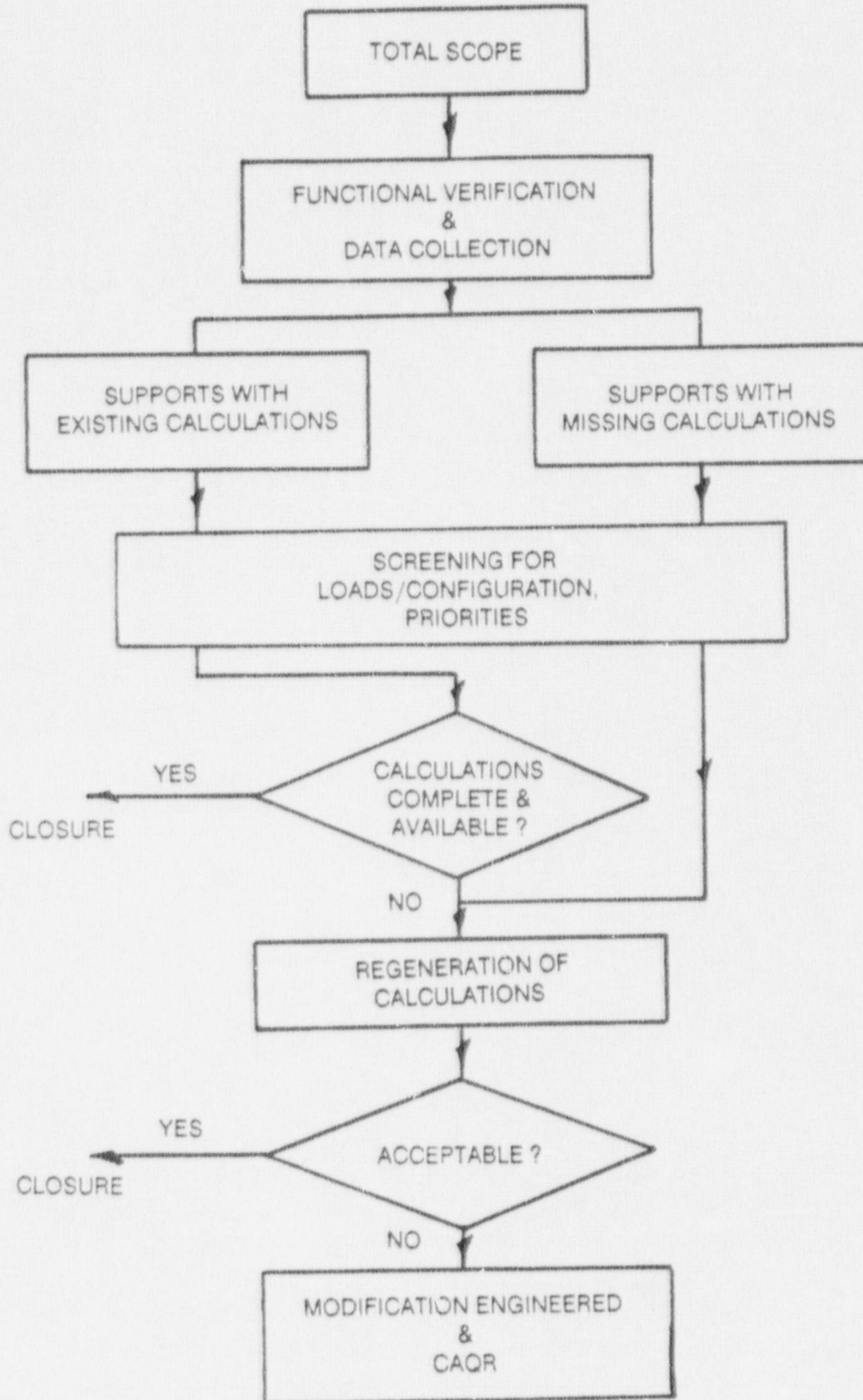
- o ORIGINAL DESIGNS WERE ADEQUATE
  
- o POST-DESIGN CHANGES
  - LOADS
  - GEOMETRY
  
- o SCREEN TO ISOLATE SUPPORTS WITH CHANGES
  
- o REGENERATION POPULATION
  - GROUP A (PRODUCTION ANALYSIS)
  - GROUP B (ADDITIONAL ANALYSIS REQUIREMENTS)

## CALCULATION REVIEW AND REGENERATION

### PROGRAM APPROACH:

- o QUANTIFY AND DOCUMENT TOTAL SCOPE
- o PRIORITIZE OVERALL SCOPE
- o SCREEN SUPPORTS
- o PRIORITIZE REGENERATION
- o EVALUATE EXISTING SUPPORT CALCULATIONS
- o REGENERATE NON-RETRIEVABLE OR INCOMPLETE CALCULATIONS

# PIPE SUPPORT CALCULATION REGENERATION LOGIC DIAGRAM





## DOCUMENTATION AND QUANTIFICATION: NUMBER OF PIPE SUPPORTS

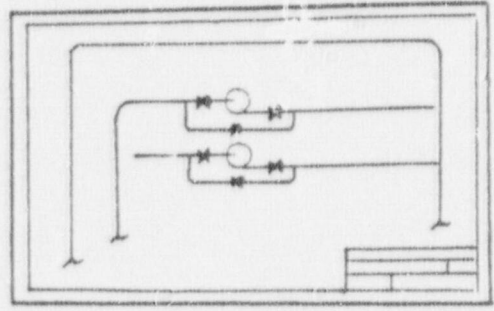
1. MARK UP FLOW DIAGRAMS
  - SSAM<sup>1</sup> BOUNDARIES
  - CATEGORY 1 BOUNDARIES
  
2. IDENTIFY STRESS ANALYSIS ISOMETRICS IN SSAM AND  
CAT. 1 BOUNDARIES
  
3. IDENTIFY PIPE SUPPORTS ON STRESS ANALYSIS ISOMETRICS
  
4. CCRIS<sup>2</sup> INPUT UPDATE

<sup>1</sup> SAFE SHUTDOWN ACCIDENT MITIGATION

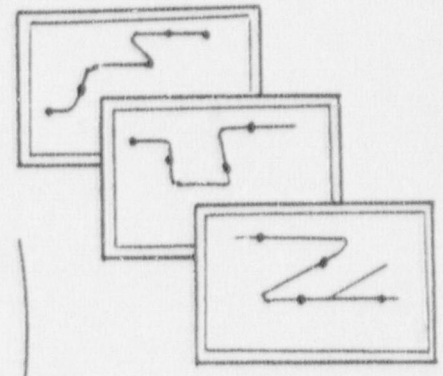
<sup>2</sup> CALCULATION CROSS REFERENCE INFORMATION SYSTEM

# NUMBER OF PIPE SUPPORTS: ACTIVITIES AND INFORMATION FLOW

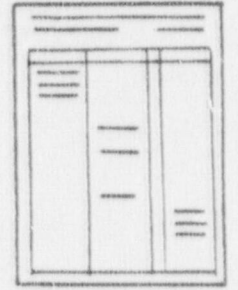
FLOW DIAGRAMS



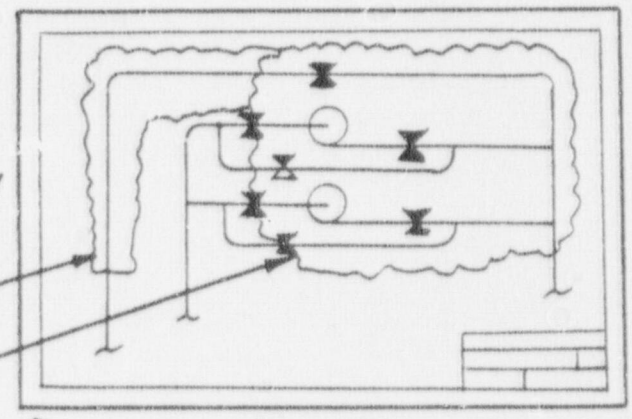
ANALYSIS ISOMETRICS



RIGOROUS ANALYSIS  
CALCULATION LOG



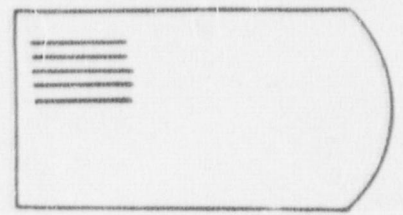
STRESS ANALYSIS  
PROBLEM CONNECTIVITY  
DIAGRAMS (PCD's)



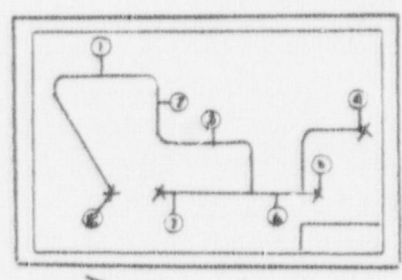
CATEGORY 1 BOUNDARIES

SSAM BOUNDARIES

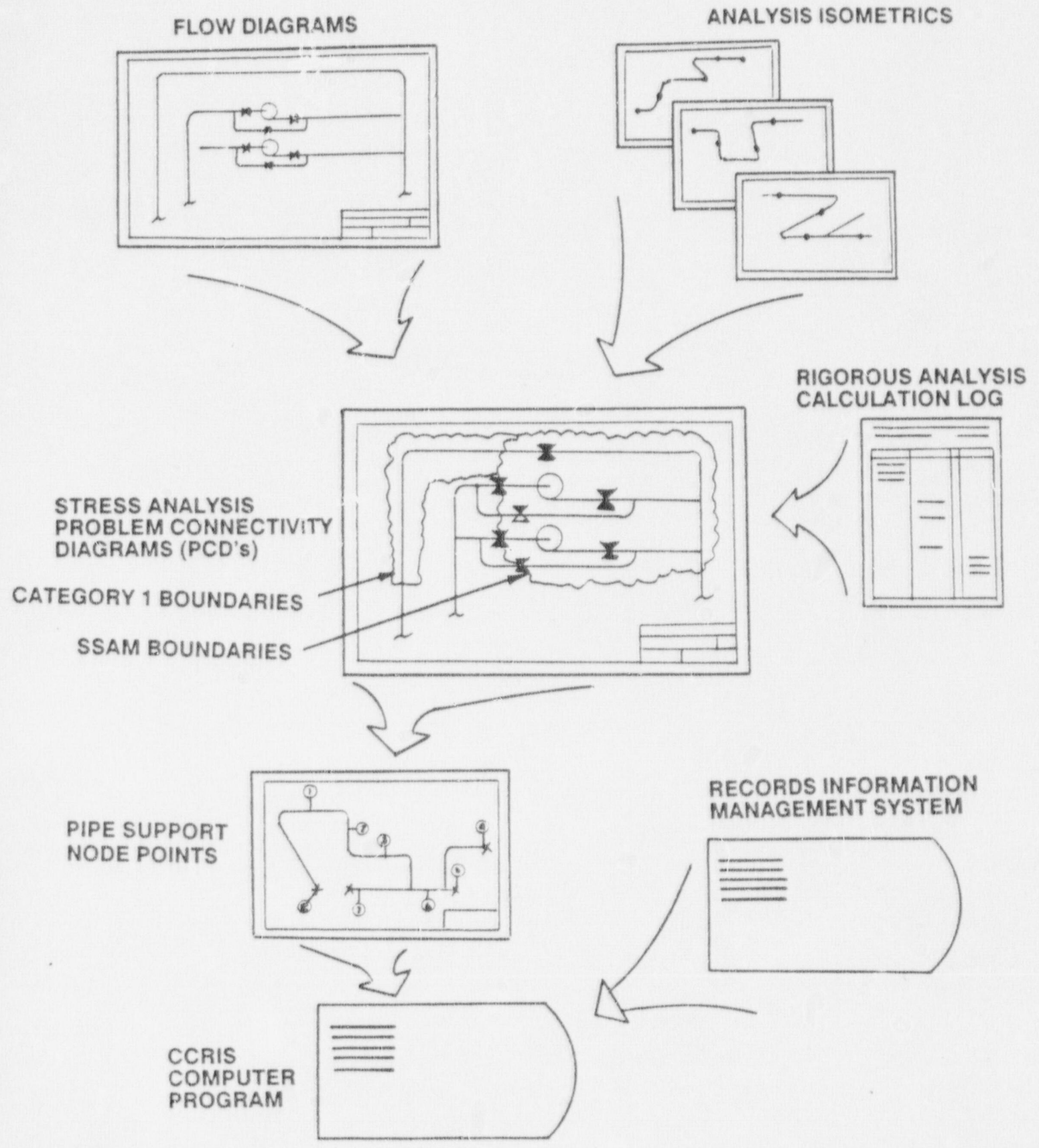
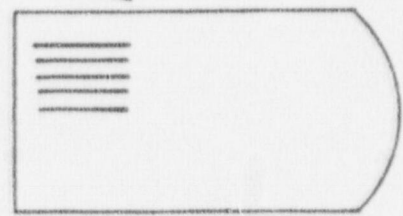
RECORDS INFORMATION  
MANAGEMENT SYSTEM



PIPE SUPPORT  
NODE POINTS



CCRIS  
COMPUTER  
PROGRAM



## COMPLETION PLAN

SCOPE	GROUP B		GROUP A		TOTAL
	<u>SUPPORTS</u>	<u>PRIORITY</u>	<u>SUPPORTS</u>	<u>PRIORITY</u>	
I.C. [SSAM]	600	1	1500	5	2100
I.C. [CAT. 1 - SSAM]	200	2	400	7	600
O.C. [SSAM]	700	3	1800	6	2500
O.C. [CAT. 1 - SSAM]	200	4	600	8	800
TOTAL	1700		4300		6000

I.C. = INSIDE CONTAINMENT

O.C. = OUTSIDE CONTAINMENT

## PIPE SUPPORT SCREENING

### PURPOSE:

IDENTIFY SUPPORTS WHICH WILL PROBABLY REQUIRE ADDITIONAL ANALYSIS

### BASIS OF APPROACH:

REVIEW OF 928 SUPPORTS OF WHICH 241 REQUIRED REFINED ANALYSIS DURING REGENERATION OF SUPPORT CALCULATIONS.

### METHOD:

TEAM OF SENIOR EXPERIENCED SUPPORT ENGINEERS ASSEMBLED:

- o UNDER THE SAME SUPERVISION
- o IN A SINGLE LOCATION
- o USING THE SAME SCREENING ATTRIBUTES

## PIPE SUPPORT SCREENING

### PRINCIPAL SCREENING ATTRIBUTES

- o TUBE STEEL TO TUBE STEEL CONNECTIONS
- o SUPPORT LOAD INCREASES
- o UNUSUAL CONNECTIONS
- o UNUSUALLY LONG MEMBERS
- o ANCHOR BOLT LOADS
- o BASEPLATE EVALUATIONS
- o MULTIPLE SUPPORTS
- o NON-STANDARD USE OF VENDOR STANDARD SUPPORT COMPONENTS
- o ANGULARITY OF STRUTS/SNUBBERS
- o SNUBBER AND SPRING MOVEMENTS
- o DIRECTION OF RESTRAINT
- o INTEGRAL WELDED ATTACHMENT

## PIPE SUPPORT DESIGN CRITERIA

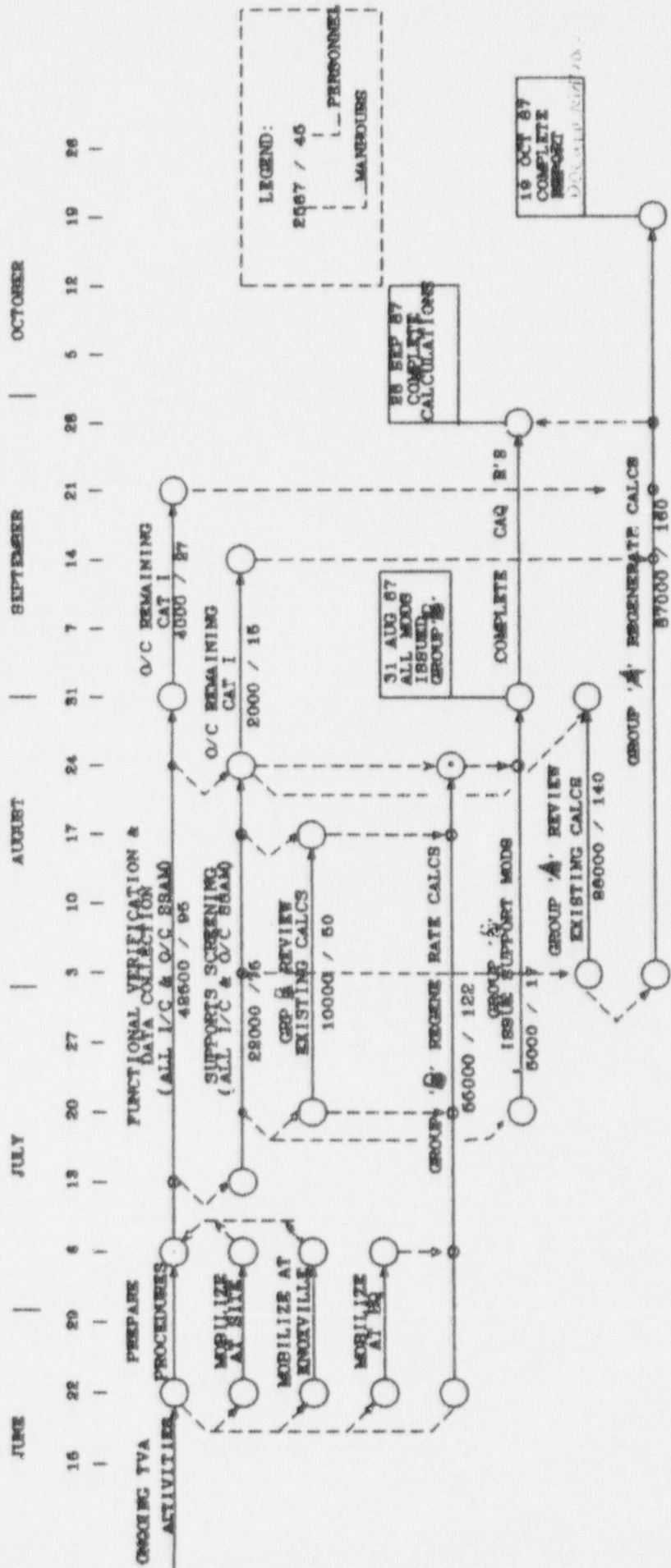
o EVALUATION OF EXISTING CALCULATIONS:

CRITERIA APPLICABLE AT TIME CALCULATION WAS GENERATED

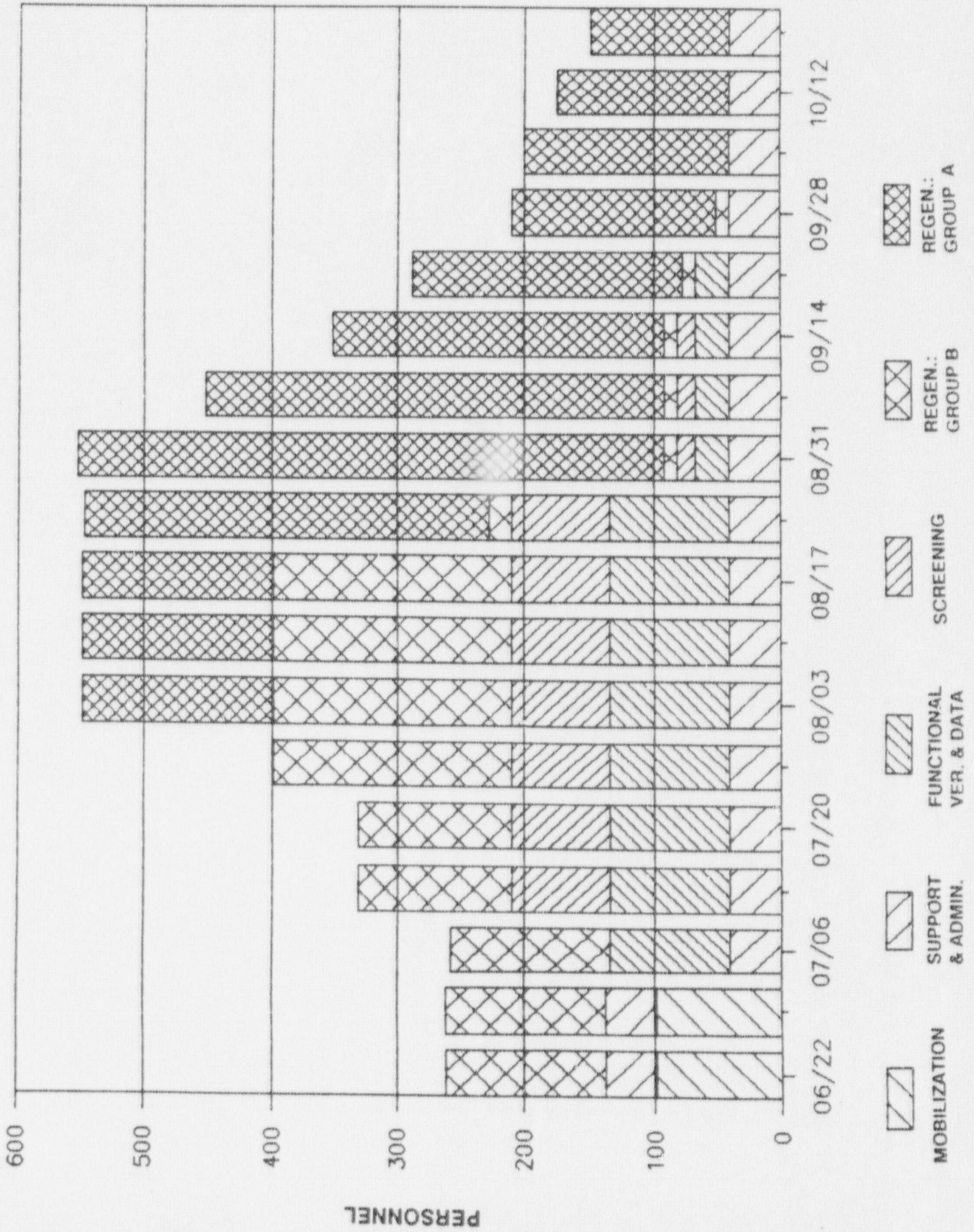
o REGENERATION OF CALCULATIONS: SQN-DC-24.1

# TARGET SCHEDULE: REVIEW AND REGENERATION OF PIPE SUPPORT CALCULATIONS

SEQUOYAH NUCLEAR PLANT - UNIT 2 AND COMMON SYSTEMS



REVIEW AND REGENERATION OF PIPE SUPPORT CALCULATIONS  
PERSONNEL REQUIREMENTS







THIS IS THE FIRST TIME I HAVE EVER

(today)

BEEN IN THE HOUSE SINCE

THE FIRST TIME I WENT TO THE

HOUSE SINCE I WENT TO THE



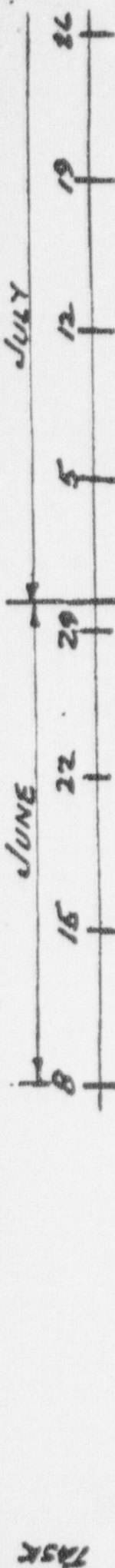
A. Fitzpatrick

W. S. Raughley

June 8, 1987

CABLE TASK FORCE - OUTLINE OF CHARTER

1. Establish task force of experts in cable, testing, qualification to be paid through SWEC.
2. Determine the minimum acceptable DC field test voltage that will not induce a failure but detect an incipient failure.
3. Determine whether water needs to be used to establish an adequate ground plan.
4. Develop response to NRC questions endorsed.
5. Re-evaluate technical basis of NRC recommendations as presented in TER as a result of TVA experience to date.
6. Are NRC statements in TER relative to industry concensus correct?
7. Substantiate go - no go acceptance criteria.
8. Re-evaluate need to do jamming tests.
9. Look at vertical cable in conduit failure locations in raceway.
10. Evaluate University of Connecticut tests.



A: KICKOFF MTGS

B: COMMENTS TO SEN

C: ANALYSIS TO SEN

- 01 ORGANIZE TASK FORCE
- 1. REVIEW TEST
- 2. RESPONSE TO NRC QUESTIONS
- 3. REVIEW SEN TEST APPROACH
- 4. EVALUATE U-CONN TESTS
- 6. INDUSTRY CONSENSUS COMMENT
- 6. SAMMING ISSUE
- 7. FAILURES IN VERTICAL CONDUIT
- 8. DETERMINING FIELD TEST V. <sup>PRELIM.</sup> <sub>EXPERIM.</sub>
- 9. SUBSTANTIATE 80-AMP "CENTERING"
- 10. GROUND PLANE ISSUE
- 11. IDENTIFY CABLE AND RACKING & OPERATING REQUIREMENTS (TVA)
- 12. PREPARE FINAL REPORT

COMPLETION OF COMMENTS

PREPARATION OF COMMENTS

PREPARATION OF TEST

FINAL PRINTING

FINAL REPORT TO TVA

6/15

6/20 7/1

6/25

6/25

7/5

SWIEC  
ACTIVITY

SWIEC  
CONSULT  
ACTIVITY