GPU 2210

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To
S. H. Duerson, Project Management

From
L R Cartin
L. R. Cartin, Plant Integration (2835)

BDS 663.5

Cust.
205/145FA Plants

File No. or Ref.

Subj.
Small Break - Auxiliary Feedwater Level

Date
August 1, 1978

This letter to cover one customer and one subject only.

Re: 1) R. C. Jones to S. J. Engel, "Auxiliary Feedwater Steam Generator Overfill Problem," Standard Plant 205, T.3.4, March 14, 1977.

2) L. R. Cartin to S. H. Duerson, "Small Break Auxiliary Feedwater," All 205 Plants, September 15, 1977.

3) N. H. Shah to D. H. Roy, "Status of 205FA Small Break LOCA Analysis," Standard 205FA, T3.4, March 30, 1978.

4) A. F. McBride/E. W. Swanson to D. H. Roy, "A Brief History of ECCS Steam Generator Level Requirements for 205FA Plant Design," March 28, 1978.

5) D. H. Roy to B. A. Karrasch, "Auxiliary Feedwater Level Control for 205FA Plant," April 27, 1978.

6) E. W. Swanson to Distribution, "Auxiliary Feedwater Level Control," All 205's, April 27, 1978.

7) E. W. Swanson to Distribution, "Steam Generator Level Taps," All 205's, May 3, 1978.

8) E. W. Swanson to Distribution, "Steam Generator Level Taps," WPPSS and Others, May 11, 1978.

9) E. W. Swanson to Distribution, "Small Break Auxiliary Feedwater," 205 Plants, June 27, 1978.

10) CI/A No. 88-4616-00, NSS032.

11) L. H. Bohn to C. D. Thompson, "Steam Generator Level Taps," 21R11, May 31, 1978.

12) J. H. Taylor's letter to S. A. Varga of the NRC, dated May 26, 1978.

13) J. H. Taylor to Distribution, "Preliminary Report of Safety Concern PSC 10-78," April 12, 1978.

14) B. A. Karrasch to Distribution, "Plant Integration Activites on ECCS Small Break Analysis," June 20, 1978.

T2379.1

15) E. W. Swanson to Distribution, "Auxiliary Feedwater Level Control," Standard, October 11, 1977.

16) L. R. Cartin to S. H. Duerson, "Small Break - Auxiliary Feedwater," All 205FA Plants, June 26, 1978.

Presently, B&W has an NRC approved Small Break Analysis for the 205FA plants (BAW-10074, Rev. 1). Analysis work to support the development of BAW-10074 was performed primarily in 1972, and this topical has served as the licensing basis for BSAR-205 and all backlog 205FA plants under both the so-called interim and final (10CFR50.46 and Appendix K) acceptance criteria. This analysis assumed credit for filling the steam generators to approximately 40 feet with auxiliary feedwater (AFW) to aid in condensing steam in the hot leg; condensation permits depressurization of the loop resulting in increased HPI flow and serves to increase the total system liquid inventory.

Since the issuance of BAW-10074, systems to actuate and control the addition of AFW have evolved. Steam line breaks (SLB), loss of feedwater transients (LOFW), feedwater line breaks (FWLB), and LOCA's have all placed requirements on the C&I associated with the AFW system. FOGG logic to mitigate the SLB and FWLB transients and control of AFW to a six foot level, for anticipated transients (LOFW) and design basis events, to reduce thermal loadings on the steam generators and to eliminate the necessity for operator action (to limit potential overcooling transient and to prevent overfill of the steam generators by AFW) is now part of B&W's Standard Design. These modifications were made to achieve licensability of B&W's product line with the tentative approval of ECCS subject to confirmation by analysis to be performed in the future.

The need to perform a confirmatory analysis was initially sited in March, 1977 (Reference 1). Preliminary plans were then established (Reference 2) in September, 1977 to initiate this analysis and to lay the groundwork in the event design modifications to the AFW C&I are required.

Reference 3 presents the results of the initial analysis by ECCS of small breaks for the 205FA plants. These results indicated that a partial core uncovering would occur for breaks on the order of 0.05 ft^2. The principle changes in the analysis, relative to BAW-10074, which produce this result were:

1. The control of auxiliary feedwater (AFW) addition by the SRCI to maintain a nominal six foot level in the secondary side of the steam generators. (BAW-10074 utilized a forty foot level control setpoint.)

2. A more realistic simulation of primary to secondary system interaction (spacial heat transfer effects due to transient water volume/level changes within the primary-secondary tube bundle region) during the small break LOCA.

3. The Appendix K requirement to incorporate leak models which distinguish between the subcooled and saturated blowdown regimes of the LOCA transients.

The combined effects of the above factors necessitate a need to consider alternate design provisions to enhance mitigation of the small LOCA's. Since Reference 3 was issued, several activities have taken place; principle ones are:

T21-27

1. Alternatives which could provide acceptable small break consequences including discharge models, criteria changes, operator action, larger HPI pump capacity, AFW level setpoint, use of the dump to sump equipment, etc. have been reviewed for potential use. It was concluded that an adjustment (higher) in the AFW level control setpoint is the only viable option in that the remaining remedies are either not very beneficial, not licensable, not backfittable, or disallowed under 10CFR50.46 and Appendix K.

2. An historical overview (Reference 4) was prepared in an attempt to put in perspective the evolution of B&W's present AFW control system (six foot level control setpoint) and the specific problems (maintenance of hot shutdown following non-LOCA transient, overfill and overcooling transients) for which it is designed to solve.

3. The addition and control of AFW to a high level requires a change of monitoring and control instrumentation, including additional high level taps in the steam generator. However, of first priority was the addition of taps since installation is less expensive in the shop prior to stress relief than afterwards and that shop installation is much less expensive than field installation. (Rough estimates were that the new taps would cost $2-3,000 each in the shop versus about $100,000 per NSS in the field.) Because of the installation cost difference, it was deemed beneficial (References 5 and 6) to add new taps to those generators in the shop now to avoid the complication of field installation. References 7-9 provide a summary of the specific design activities and decisions that have taken place. Level taps have been added on the WPPSS contract (see Reference 8), and a CI/A proposing additional taps on PASNY has been prepared. Action on other contracts has not been initiated since fabrication schedules do not call for final stress relief for at least one year; design changes on these plants will be made following firm decisions on C&I requirements.

4. The addition of level taps on steam generators in the field has been studied; it was determined to be feasible using flange connections. Cost estimates from the B&W Construction Company (Reference 11) have been formally requested based on preliminary design concepts.

5. A re-analysis was performed of the 0.5 ft^2 break by ECCS utilizing an improved small break, modeling techniques (Reference 12) developed during the resolution of PSC 10-78 (Reference 13). This evaluation utilized all three model changes described in Reference 12. The results, however, merely confirm the conclusion drawn in Reference 3 that equipment changes are necessary to mitigate the consequences of a small LOCA. A presentation of the analytical findings has been given to the Section Manager of Plant Design, and Dr. Roy does concur that sufficient work has been performed to demonstrate that the six foot auxiliary feedwater control setpoint in conjunction with the ECCS is unacceptable for small break mitigation. A formal summary of the calculation is being prepared now.

With completion of Item 5 above, efforts to establish and implement an acceptable AFW control system must be initiated. To achieve this end, a five-phase program

T22?20

is described below. This program is structured to include work which has taken place to date and future activites that are required.

Phase I. - Problem Identification

The analysis efforts (ECCS) to show that system design changes are necessary to enhance the mitgation of small breaks form the bulk of this phase of the program. These efforts will be essentially complete following documentation of the most recent analyses. Funding to date has been provided by TVA (Charge No. 04212A15). To cover past and anticipated efforts of Phase I, 450 manhours and 6 CDC hours will be required in addition to the 1000 manhours and 25 CDC hours provided in 0412A15.

Phase I has identified two principle factors which created the small LOCA problem. The first was the loss of a high (forty foot) AFW level control setpoint. The second was a previously unexpected result of the FAC. To meet the FAC, B&W Evaluation Models incorporated the use of leak correlations to distinguish between the subcooled and saturated blowdown periods of a LOCA. However, no specific analyses were performed then (1974) to identify the specific consequence of this model change. Based on the work performed to resolve PSC 10-78, it is suspected that the six foot AFW level control setpoint could be shown to be acceptable under pre-FAC guidelines. Confirmation of this fact could form the basis for partial cost recovery of analysis cost. Your assistance in evaluating the feasibility of this cost recovery path is requested. Further analysis cost to confirm that the FAC contributed to creation of the small break concern is anticipated to be approximately 100 manhours and 8 CDC hours.

Phase II. AFW Level Determination

An acceptable AFW level control setpoint is believed to be one which provides the following:

1. Small LOCA mitigation.

2. Acceptable long-term consequences during all Chapter 15 events which utilize AFW (SLB, FWLB, etc.).

3. Thermal stresses within the design capability of the IEOTSG during overcooling events (tube to shell ΔT is the primary concern).

To meet the above, the control setpoint must be minimized (as low as possible) to meet items 2 and 3, but high enough to provide LOCA mitigation.

To establish an acceptable AFW level, it is proposed that ECCS, Control Analysis (CA), and Safety Analysis (SA) perform investigative analyses simultaneously. These efforts (graphically displayed in Figure 1), are aimed at identifying:

1. The sensitivity of AFW level on the small break transient.

2. The potential impact of a high AFW level on design overcooling event and the 1092 spec.

3. Maximum AFW level control setpoint requirements (based on Engineering

T21[illegible]

judgement) from an accident analysis standpoint (Chapter 15 event).

With the above information and some preliminary feedback from Mt. Vernon of the acceptability of higher AFW levels on select overcooling event (hand calculations to be performed by CA), a preliminary AFW level control setpoint can be chosen. From a LOCA standpoint, sufficient analyses will be performed to demonstrate the adequacy of the selected level across the full small break spectrum; licensing submittals (updates to small break topical report) can then be deferred with good assurance of acceptable results.

Phase III. AFW Level Confirmation

Phase II analysis efforts will provide an acceptable AFW level setpoint and possibly a range depending on the sensitivity shown in LOCA calculations. Insight gained by the initial evaluations by CA, SA and Mt. Vernon will also provide a better understanding of additional analyses that will be required to confirm that the AFW level setpoint is acceptable from a steam generator integrity standpoint and for other accident analyses. Anticipated Phase II activites and costs are shownon Figure 1. It is not possible to identify the scope of work required by Mt. Vernon at this time because the impact of a higher AFW control setpoint on overcooling transients, tube to shell ΔT, etc., is not known. The preliminary review by Mt. Vernon of select overcooling events (hand calculations to be performed by Control Analysis) with a high AFW level should provide sufficient guidance during the AFW level control setpoint selection process to limit the amount of actual stress analyses which must be performed.

Phase IV. Equipment Changes

In addition to determination of an acceptable AFW level control setpoint, C&I equipment changes will be required. Questions which must be resolved are:

1. How many level taps must be added to the steam generators?

2. When must new equipment be ordered for plants approaching the OL stage of licensing?

3. What are the instrument error requirements with AFW controlled with full range level instrumentation?

4. When and how are equipment changes to be implemented on steam generators already in the field?

Per Reference 14, Plant Integration will proceed to determine the most economical (minimum hardware change), licensable approach utilizing a higher SRCI level control for steam generators in the field. A major output of this effort will be the number of taps to be installed in the field. A basis for selling an upgrade of the present two-channel SRCI steam generator level control system to a four-channel ESFAS system will also be developed. This activity will serve as a possible vehicle for partial cost recovery since an upgraded system will improve plant availability/reliability, provide protection from AFW overfill

(see Reference 15 for discussion of the problem) and aid in prevention of main feedwater overfill. The principle stimulus for this activity is the belief that the use of a four-channel (ESFAS) control scheme may be more desirable than upgrading the two-channel, SRCI to a protection-grade system. General instrumentation requirements (range, accuracy, etc.) will also be developed based on Phase II and III analysis results. The above level of effort will be required to establish the necessary groundrules to proceed with equipment change CI/A's and procurement activities. Actual C&I change cost will be identified per the issuance of CI/A's.

Lastly, level taps must be installed on the steam generators in the shop and possibly on units already in the field. If field installation is required, an FOAK level tap must be designed; installation techniques and costs must be developed; and appropriate CI/A's processed once the actual number of taps to be installed are known. Figure 1 also presents the potential cost identified for this activity.

Phase V. Licensing - Small Break Submittal

Following design confirmation of a AFW control system, a revision to the ECCS small break evaluation model will be required to incorporate analytical techniques to accurately predict steam generator performance during the small break transient. A spectrum analysis will eventually be required followed by an update to BAW-10074. TVA or WPPSS licensing schedules will ultimately control when this work is performed. At this time, however, it is anticipated to begin no later than fourth quarter of 1979. Anticipated costs are shown in Figure 1.

Summary

The five-phase program described above and in Figure 1, incorporates all known aspects of the AFW level problem known today. Changes in the scope of the program are extremely likely as additional problems are identified. The costs shown in Figure 1 are essentially a "best guess" based on our knowledge today, and they are consistent with those previously supplied per Reference 16. Costs associated with equipment changes (design plus hardware costs) are not identified in Figure 1 since requirements for the hardware are not known. These type costs will be identified as the program proceeds.

Attached also, is a non-CPR work request and WA's to cover Phases I, II and parts of Phase IV for the 205 FA plants. These activities are essential for the program to proceed. Your assistance in securing the necessary funding to support these work activities is requested.

Lastly, the above program has been prepared specifically for the 205FA plants. B&W 145FA plants do possess the same problems and similar activities will be required. As per our discussions previously, the anticipated funding levels (analysis) which may be required for the 145FA plants are:

approximately 3000 manhours/100 CDC	ECCS
approximately 700 manhours/ 5 CDC	Others

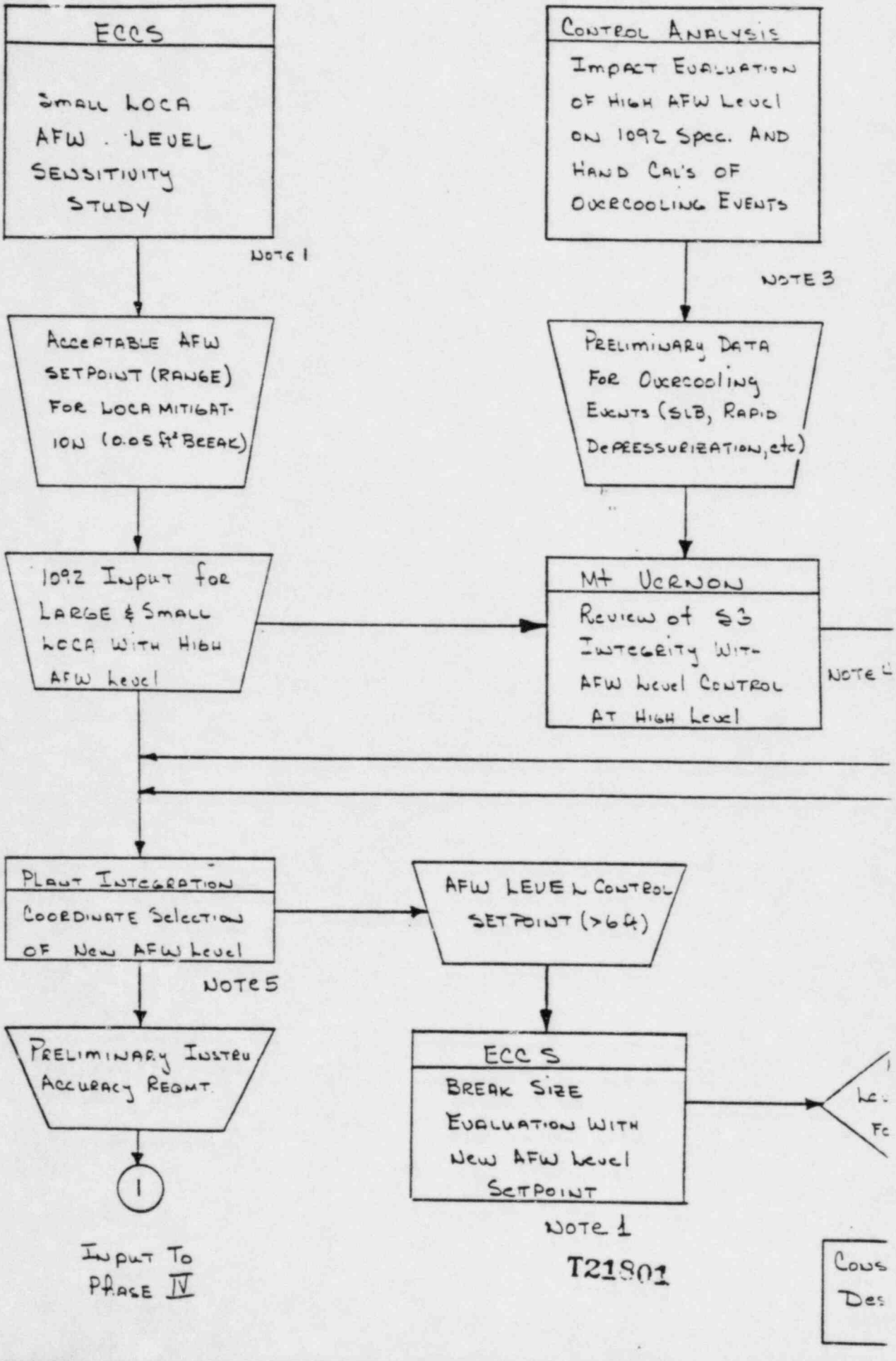
No work is anticipated for this plant type for at least one year. Input from the 205FA plant resolution program will tend to minimize analysis and hardware development costs.

LRC:dh
Attach
cc: w/o attachment

H. A. Bailey
G. J. Brazill

B. L. Brooks
J. R. Burris
W. A. Cobb
J. F. Cuvilier
B. M. Dunn
J. J. Happell
G. M. Jacks
R. C. Jones
B. A. Karrasch
D. E. Leinhart
A. F. McBride
C. E. Parks
D. H. Roy
J. S. Shivey
E. W. Swanson
J. H. Taylor
R. O. Vosburg
E. A. Womack
H. S. Muir

PHASE II.


ECCS
Small LOCA AFW Level Sensitivity Study
Note 1
Control Analysis
Impact Evaluation of High AFW Level on 1092 Spec. And Hand Cal's of Overcooling Events
Note 3
Acceptable AFW Setpoint (Range) For LOCA Mitigation (0.05 ft² Break)
Preliminary Data For Overcooling Events (SLB, Rapid Depressurization, etc)
1092 Input for Large & Small LOCA With High AFW Level
Mt Vernon
Review of S3 Integrity With AFW Level Control At High Level
Note 4
Plant Integration
Coordinate Selection of New AFW Level
Note 5
AFW Level Control Setpoint (>64)
Preliminary Instru Accuracy Reqmt
ECCS
Break Size Evaluation With New AFW Level Setpoint
Note 1
1
Input To Phase IV
T21801

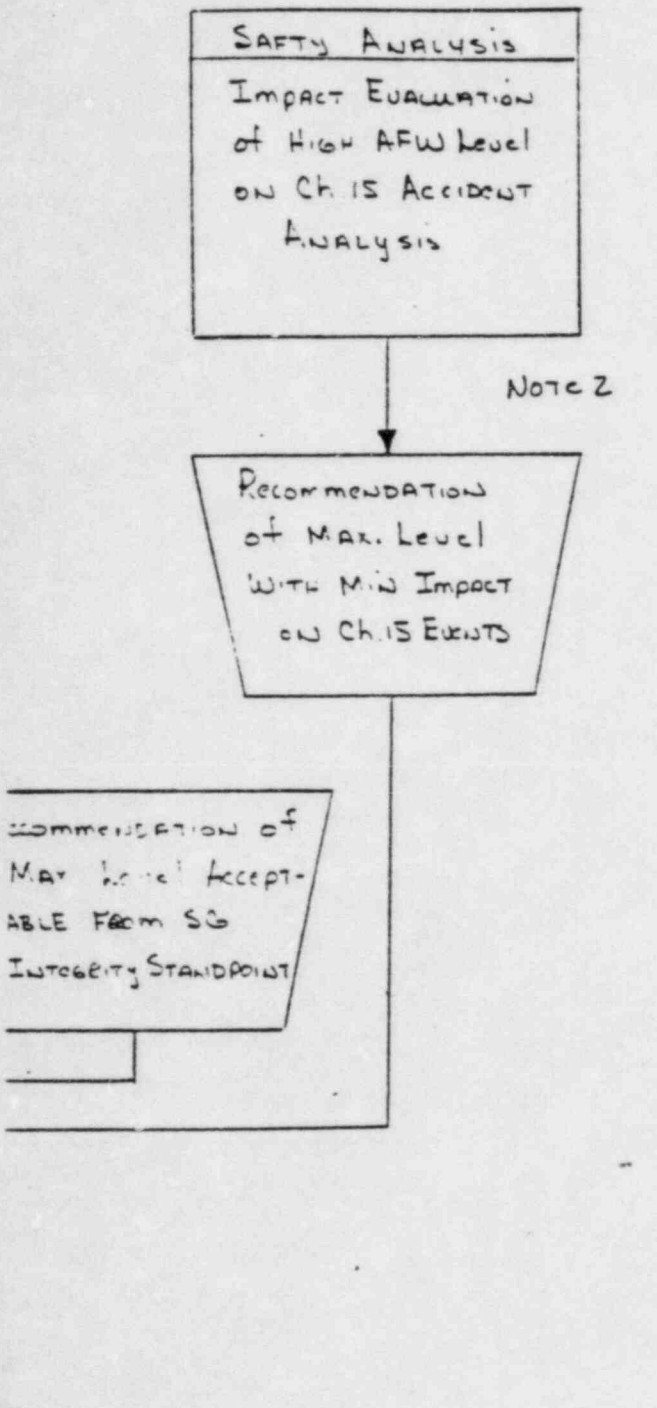


Figure. 1: SMALL BREAK - AFW RESOLUTION PROGRAM

PHASE III

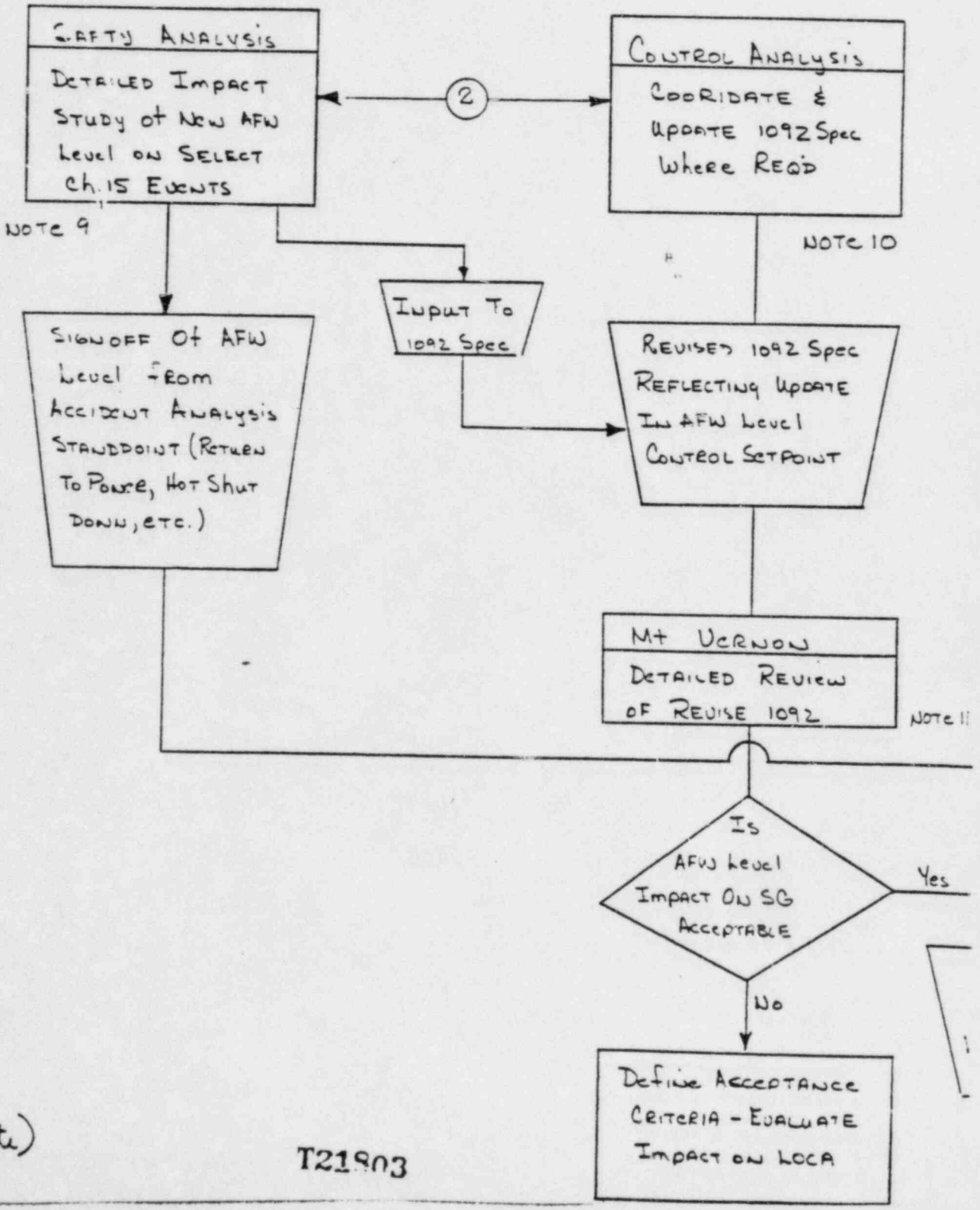
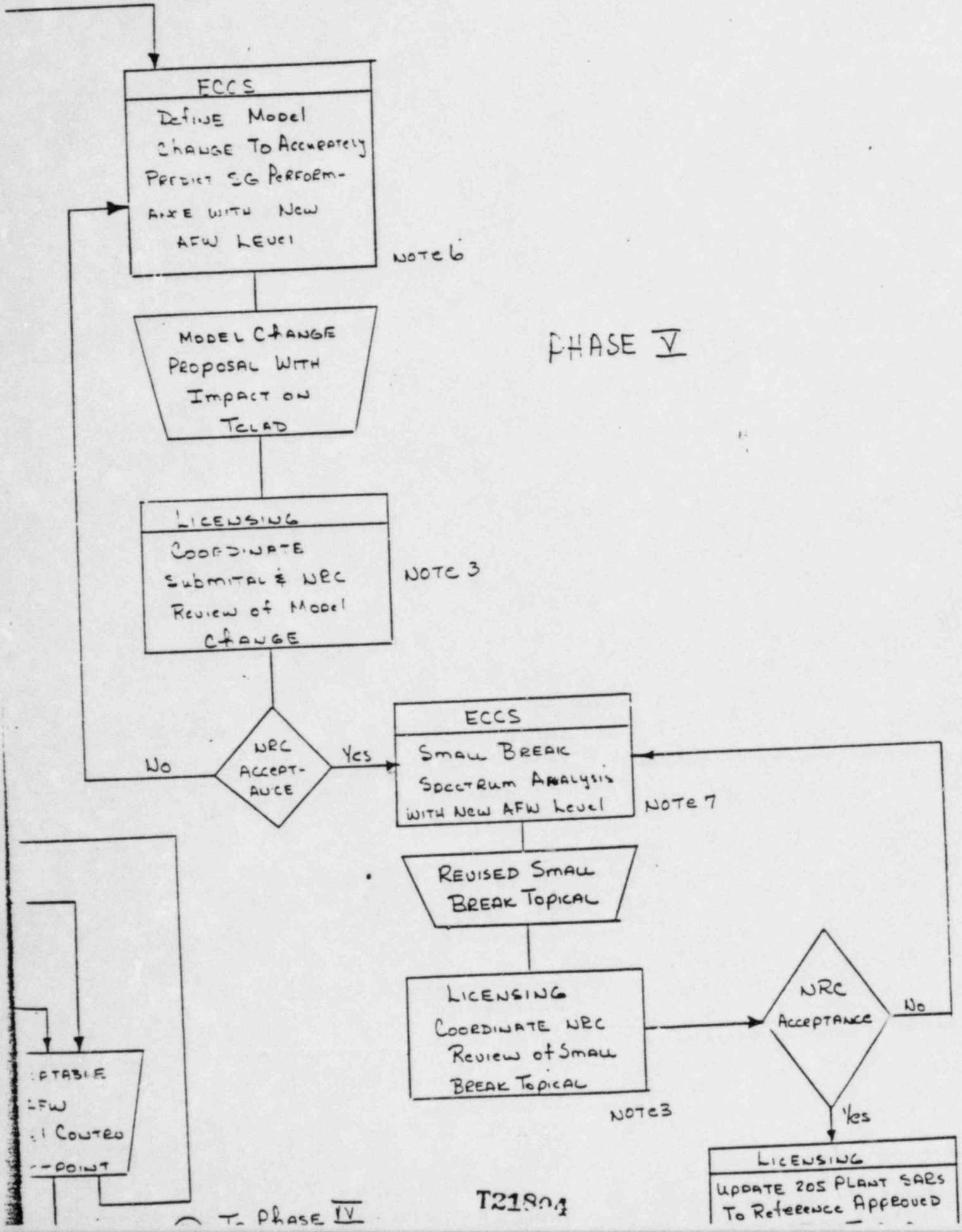
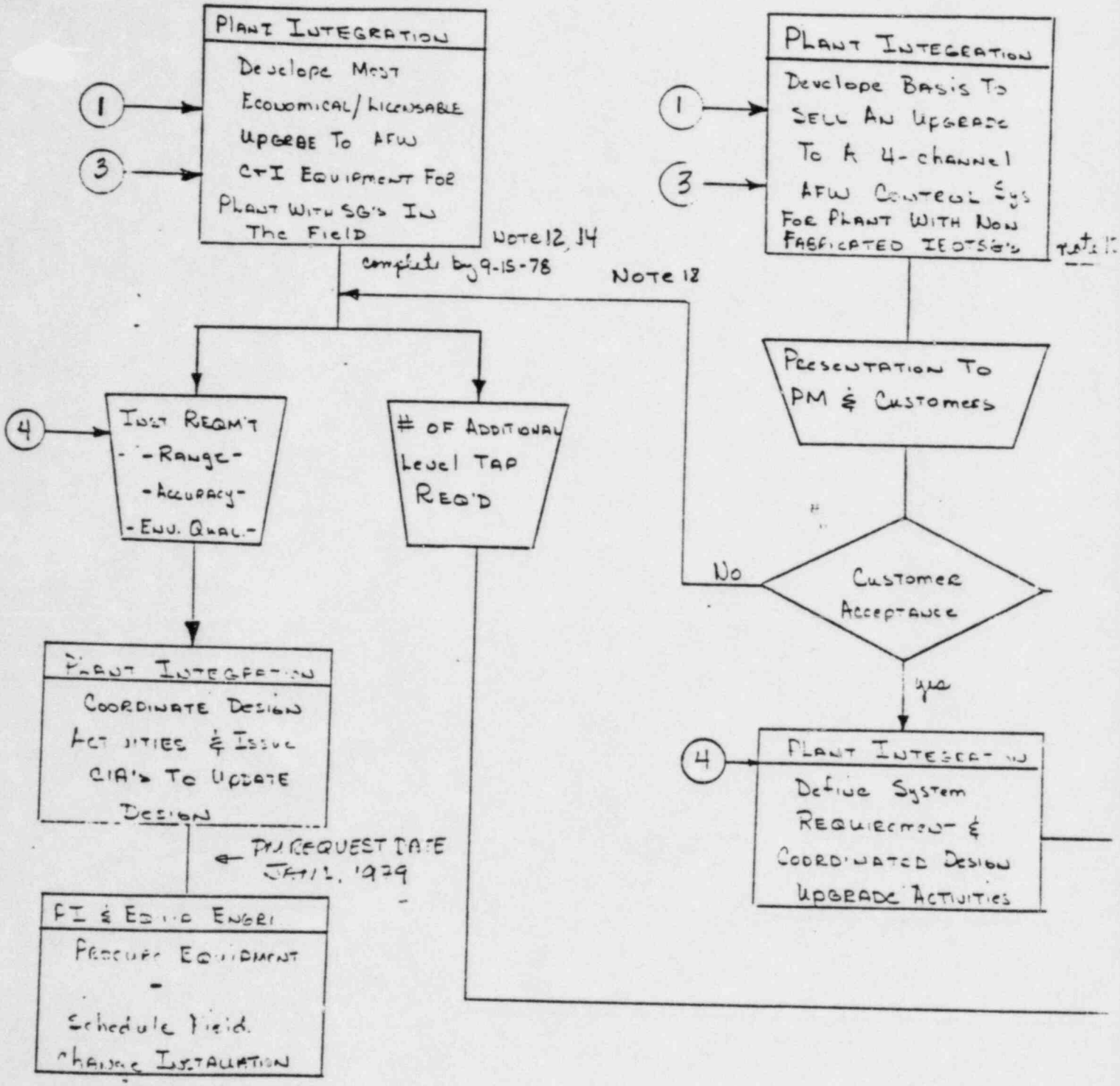


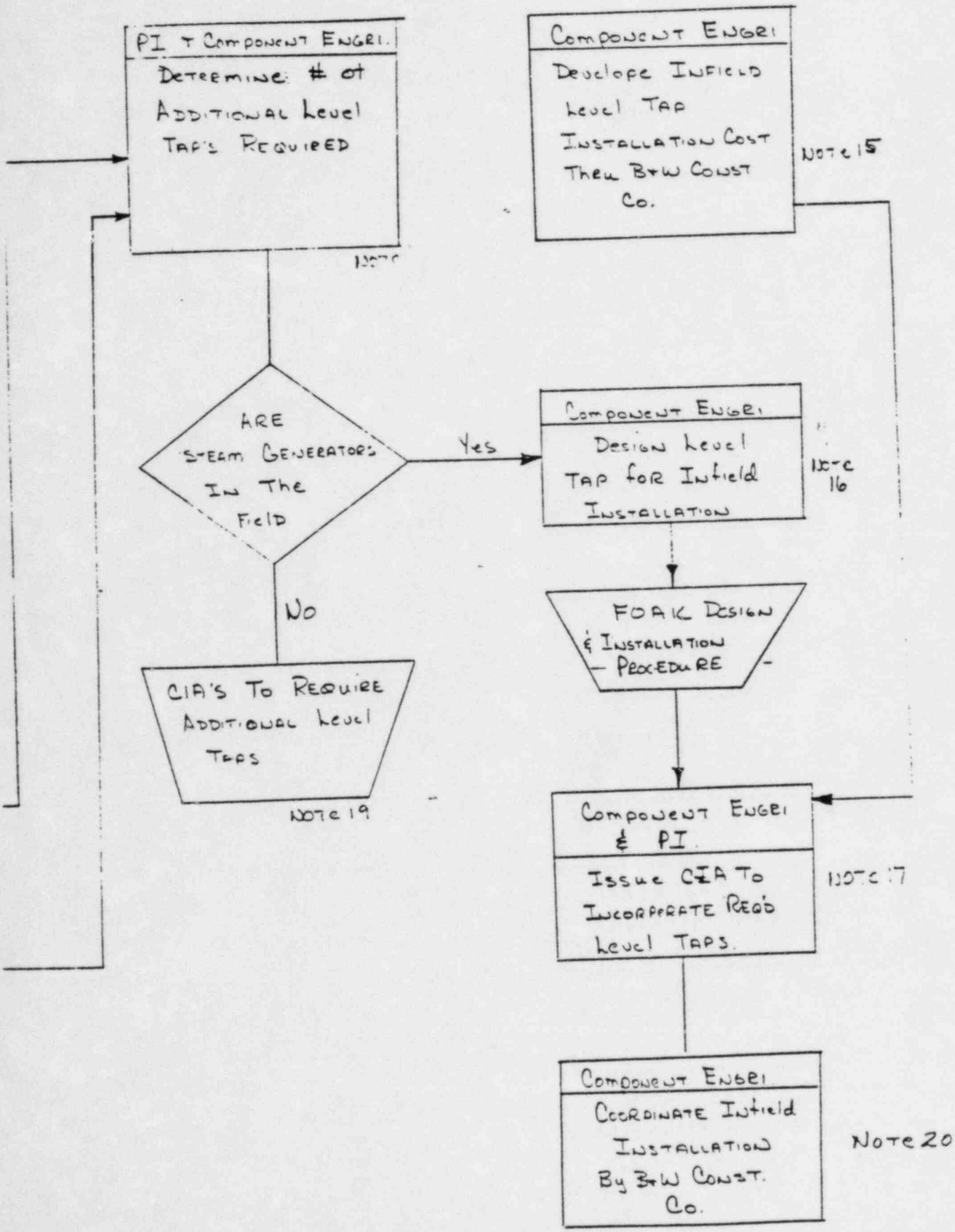
Figure 1 (cont'd)

T21803


ECCS
Define Model Change To Accurately Predict SG Performance With New AFW Level
NOTE 6
Model Change Proposal With Impact on TCLAD
PHASE V
LICENSING
Coordinate Submital & NRC Review of Model Change
NOTE 3
NRC Acceptance
No
Yes
ECCS
Small Break Spectrum Analysis With New AFW Level
NOTE 7
Revised Small Break Topical
LICENSING
Coordinate NRC Review of Small Break Topical
NOTE 3
NRC Acceptance
No
Yes
LICENSING
Update 205 Plant SARs To Reference Approved
T. PHASE IV
T21804

PHASE


PLANT INTEGRATION
Develope Most Economical/Licensable Upgrade To AFW CTI Equipment For Plant With SG's In The Field
1
3
Note 12, 14 complete by 9-15-78
Note 18
PLANT INTEGRATION
Develope Basis To Sell An Upgrade To A 4-channel AFW Control Sys For Plant With Non Fabricated IE OTSG's
1
3
Note 17
PRESENTATION TO PM & CUSTOMERS
CUSTOMER ACCEPTANCE
No
Yes
4
INST REQM'T
- -Range-
-Accuracy-
-Env. Qual.-
OF ADDITIONAL Level TAP REQ'D
PLANT INTEGRATION
COORDINATE DESIGN ACTIVITIES & ISSUE CIA's TO UPDATE DESIGN
PM REQUEST DATE JAN 1, 1979
PLANT INTEGRATION
Define System Requirements & Coordinated Design Upgrade Activities
FI & EDISON ENGR
PROCURE EQUIPMENT
-
Schedule Field Change Installation


PI + Component Engr.
Determine # of Additional Level Tap's Required
Note
Component Engr
Develope Infield Level Tap Installation Cost Thru B+W Const Co.
Note 15
Are Steam Generators In The Field
Yes
No
Component Engr
Design Level Tap for Infield Installation
Note 16
FOAK Design & Installation Procedure
CIA's To Require Additional Level Taps
Note 19
Component Engr & PI
Issue CIA To Incorporate Req'd Level Taps.
Note 17
Component Engr
Coordinate Infield Installation By B+W Const. Co.
Note 20

FOOTNOTES To Figure 1.

Note #	Unit	MAN Hours	CDC Hours			Discussion
1	ECCS	(1180)	(49)			AFW level sensor (>6-feet) required to establish level dependency
2.	SAFETY ANALYSIS	(80)	-			Preliminary impact on select Chapter maximum level impact on non-maintance of hot
3	CONTROL ANALYSIS	(200)	-			Preliminary impa on the 1092 spec to estimate effo to be utilized
4.	Mt VERNON	(200)	-			Provide feedba on steam gene This effort is selection of a
5.	Plant Integration	(300)				Overall program
6.	ECCS	400	16			SG Model Changes assure NRC acce

T21807

study to establish minimum AFW level control set point small LOCA mitigation. Cost reflect 4 cases: 2 cases nativity and 2 cases to confirm break size

sessment of the effect of a high AFW control set point vents; development of a recommendation of a AFW control which would minimize the afty analysis. Considerations include return to power, overcooling on, etc.

sessment of the effect of a high AFW control set point and calculations of several overcooling transients x tube to shell ΔT with high AFW level - output Mt Vernon

of the effect of a high AFW control set point integrity for worst case overcooling events. ed to provide preliminary guidance on the FW control set point for future analyses.

duration.

rmulation of S6 heat transfer model changes necessary to e of a new 205 FA small break analysis

FOOTNOTES To Figure 1

Note #	Unit	Man Hours	COC Hours	Discussion
7.	ECCS	2200	80	Small break spectrum the ECCS Topical report,
8.	LICENSING	(200)		Licensing support to in changes and ECCS =
9.	SAFETY Analysis	830	25	Detailed impact study level setpoint required results for accident a and to provide 1092 in to be re-evaluated based on
10	Control Analysis	500	5 (no hybrid hours)	Detailed operational eval as a result of a hu activity is to be re-evalu selected in Phase II.
11.	Mt. Vernon	?	?	Signoff of AFW level co Funding allocation req data is reviewed.

T21909

nalysis (5-7 breaks) leading to an update to
FW-10074.

ite and obtain NRC approval of model
ll break topical report.

of Chapter 15 events (SLB, FWLB, etc) utilizing AFW
D LOCA mitigation. Studies to assure acceptable
lysis (return to power, maintance of hot shutdown, etc)
f data for select accidents. Cost of this activity is
rate 2 activities and the AFW level selected in Phase II.

tion and updates to the 1092 spec if required
AFW level control set point. Cost of this
l based on rate 3 activies and the AFW level

d set point from a SG integrity set point.
'l ments to be defined once preliminary

FOOTNOTES TO FIGURE 1

DTE #	UNIT	MAN HOURS	DISCUSSION
12.	C+I INTEGRATION	200	Determine the most SRCI level contr determine minimu SG's in the fiel
13.	C+I Integratio	(Covered by item 12)	Develope strata system to our recovery a port small break p quanity to acco be required for
14.	Plant Integratio	200	Overall coordina
15.	Component Engineering	100	Develope cost a (Lyle Bohn) thi
16.	Component Engineering	300	FOAK Design of is not yet def

nomical, licensable approach to utilize a higher
e steam generators in the field. Output will
number of level taps to be added to the
(Brent Brooks – to be completed by 9-15-78)

(4 channel - ESFAS)
will an upgrade on the AFW control
ms. Work could provide a means to
the C+I cost as a result of the
. If successful, level taps of sufficient
te a 4-channel control system would
S-31 and on. (Brent Brooks)

equipment modification (LR Coletin)

Id installation of additional SG level taps
B+W construction Co.

tap for field installation. (Lyle Bohn – schedule

T21912

FOOTNOTES TO FIGURE 1

NOTE #	UNIT	MAN HOURS	DISCUSSION
17.	Component Engineering	80/NSS	Man hour cost installation of a
18.	-	-	Front-end work this time Cost and the hardwa the program pro are the best to
19	-	-	Shop installation to be approx
20	-	-	INFIELD INSTALLATIO To Be 40-60 K

cover paper work and follow thru for infield
'itional SG level taps.

Levelope C+I requirements are provided at
ociated with equipment design and procurement
cost in general will be developed as
ds. (Costs developed to prepare risk forcast
known at this time.)

costs of additional level taps are anticipated
'ly $2000-3000 per tap.

COST FOR ADDITION LEVEL TAPS ARE ESTIMATED
E NSS.

T21814

DS-21206-4 (7-76)

WORK AUTHORIZATION (WA)

ID-200

NOTE: SIGNATURE REQUIREMENTS ON REVERSE SIDE

TC = WA. WB. WG. WD

WA NO.	WA REV.	WA DATE	TASK NO.	COST CENTER
15	25	827	833	837

CONTRACT NO.	CUSTOMER	WA TITLE	WPD NO.	WPD REV.	WPD DATE	ORGANIZATION
			A74		8-1-78	840

BUDGET DATA

INITIAL BUDGET (REVISION 00 ONLY)				
MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS
A27	A12	A37		

CURRENT BUDGET				
MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

PROPOSED BUDGET CHANGE									
±	MANHOURS	±	COMP HR	±	MATL	±	HYB HRS	±	SIM. HRS
A44		A10		A36					

PROPOSED BUDGET				
MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

NEGOTIATED OVERRUN/UNDERRUN				
MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

-USE OF FORM-

- ○ PROPOSAL ESTIMATE
- (X) AUTHORIZE WORK
- ○ REVISE STANDARD WBS
- ○ R & D BUDGET ALLOCATION
- (X) PARTIAL ALLOCATION FROM 8-1-78 (Date) TO 12-15-78 (Date)
- ○ OTHER (DESCRIBE)

- (X) OVERRUN/UNDERRUN

BUDGET CHANGE

- ○ BUDGET TRADE
- ○ LICENSING
- ○ SCOPE

- ○ ABNORMAL ORDER (Enter Letter Type)

RECAP NO		
CPR NO.	REF. C/A #	REV #
A64	845	830

RESPONSIBILITY	COMP	GP
	A70	A72

CHARGE NO.

	CP	GP
EHCS		
CHRS		
CHG NO. OPEN DATE		

SCHEDULE DATA

ACT. SPAN (WKS)	SET PT CODE
A67	827
± F/B SPAN (WKS)	F/B CODE
827 8-1-78	841 12-15-78
START DATE	COMP DATE

OPT NO.	C/A/D
852	80

Perform AFW level sensitivity study for 0.05 ft² Break. Establish minimum AFW level required for LOCA mitigation. Confirm minimum AFW level is acceptable for full small break spectrum.

Budget is based on 2 level sensitivity CRAFT cases for a 0.05 ft² break and 2 additional CRAFT runs for different size breaks. Budget will be revised if scope of study changes. Formal Engr. documentation to be submitted 11/15/78

APPROVAL/ACCEPTANCE

K. Gross — ORIGINATOR — 8/2/78 DATE

/ — REVIEWER — DATE

REVIEWER — S. Wilson Jr. — DATE 8/3/78

BUDGET DATA AND AUTHORIZATION

- ○ CPR
- ○ CONTINGENCY
- ○ NO OFFSET
- ○ OTHER T21815

APPROVER — DATE

FDS-21207-3 (8-74)

ID-199

TC = P1

WORK PACKAGE DESCRIPTION (WPD)

WPD REV.	DATE	WPD NO.
43	47 6-2	53

CONTRACT NO.	CUSTOMER	TASK TITLE	WPD TITLE	TASK NO.	STD CODE
3		SAFTY ANALYSIS	13 205 FA- Aux. FEEDWATER Level	63 14	

DESCRIPTION OF WORK

1. To review Ch. 15 transients which utilize AFW for accident mitigation and/or long term cooling leading to a recommendation of a max. level setpoint which will minimize the impact on Ch. 15 events (SLB/FWLB) Phase II
2. Document Analysis concerns that are effected by a high AFW level control. Phase II
3. Plan and perform limited analyses (SLB, FWLB, etc) to verify acceptability of AFW level (required for small LOCA mitigation) on Chapter 15 transients. Phase III

INTERMEDIATE INPUTS

INTERMEDIATE OUTPUTS

SCOPE OF SUPPLY

C/A/D 80

EQUIPMENT

MARK NO.	DESCRIPTION	QTY

DOCUMENTS

DOCUMENT NO.	DESCRIPTIONS

SERVICES

DESCRIPTION

START CRITERIA

Now

FINISH CRITERIA

T21816

c1206-4 (7-76)

WORK AUTHORIZATION (WA)

ID-200

NOTE: SIGNATURE REQUIREMENTS ON REVERSE SIDE

TC = WA, WB, WG, WD

WA NO.	WA REV.	WA DATE	TASK NO.	COST CENTER
15	23	027 6-22-78	033 14	027 325

CONTRACT NO.	CUSTOMER	WA TITLE	WPD NO.	WPD REV.	WPD DATE	ORGANIZATION
3		031 20FA - Max. Feedwater Level	014		6-22-78	040 SAFETY ANALYSIS

BUDGET DATA

INITIAL BUDGET (REVISION 00 ONLY)

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS
22				

CURRENT BUDGET

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

PROPOSED BUDGET CHANGE

± MANHOURS	± COMP HR	± MATL	± HYB HRS	± SIM. HRS
24				

PROPOSED BUDGET

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS
80				

NEGOTIATED OVERRUN/UNDERRUN

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

-USE OF FORM-

- ○ PROPOSAL ESTIMATE
- ⊗ AUTHORIZE WORK
- ○ REVISE STANDARD WBS
- ○ R & D BUDGET ALLOCATION
- ⊗ PARTIAL ALLOCATION FROM 6-22-78 (Date) TO 12-15-78 (Date)
- ○ OTHER (DESCRIBE) _____

- ⊗ OVERRUN/UNDERRUN

BUDGET CHANGE

- ○ BUDGET TRADE
- ○ LICENSING
- ○ SCOPE

- ○ ABNORMAL ORDER (Enter Letter Type)

RECAP NO			
CPR NO.	REF. C/A #	REV #	
065	045	30	

RESPONSIBILITY	COMP	GP
	A70	072

CHARGE NO.

	CP	GP
EMCS		
CHRS		
CHG NO. OPEN DATE		

SCHEDULE DATA

ACT. SPAN (WKS)	SET PT CODE
047	027

± F/B SPAN (WKS)	F/B CODE
037	041

START DATE	COMP DATE
6-22-78	12-15-78

OPT NO.	C/A/D
357	86

This IS A PARTIAL BUDGET ESTIMATION To COVER Items 1 & 2 OF The WPD.

Item 3 (if REQUIRED) Is ESTIMATED To REQUIRED AN ADDITIONAL 850mhR AND 25 CDC hrsAT This Time. This ESTIMATE MAY be REVISED BASED ON The FINAL Level REQUIREMENT OF The SMALL LOCA. AND The ANALYSIS Scope REQUIRED To VERIFY ACCEPTABLE RESULTS ON NON-LOCA TRANSIENTS.

APPROVAL/ACCEPTANCE

LL Carter — 6-22-78
ORIGINATOR — DATE

D W Rebello — 6/23/78
REVIEWER — DATE

_____ — _____
REVIEWER — DATE

Tim Dickinson
_____ — _____
REVIEWER — DATE

BUDGET DATA AND AUTHORIZATION

- ○ CPR
- ○ CONTINGENCY
- ○ NO OFFSET
- ○ OTHER T21977

_____ — _____
APPROVER — DATE

PDS-21207-3 (8-74)

ID-199

/IC = P1/

WORK PACKAGE DESCRIPTION (WPD)

WPD REV.	DATE	WPD NO.
45	47 6-22-78	33

CONTRACT NO.	CUSTOMER	TASK TITLE	WPD TITLE	TASK NO.	STD CODE
3		Control Analysis	13 205FA- Aux Feed Level	63 09	

DESCRIPTION OF WORK

1. To evaluate the effect of a high AFW level control on select overcooling transients to enable a preliminary review of thermal stresses on the steam generators.
2. Formulate a recommendation for a high AFW level which will result in a minimal impact on the 1092 Spec and Chapter 15 transients.
3. Perform a detailed operational evaluation and analyses (if required) to update the Functional Spec (1092) on the 205FA plants with a high AFW Level control.

INTERMEDIATE INPUTS

INTERMEDIATE OUTPUTS

SCOPE OF SUPPLY

C/A/D 80

EQUIPMENT

MARK NO.	DESCRIPTION	QTY

DOCUMENTS

DOCUMENT NO.	DESCRIPTIONS

SERVICES

DESCRIPTION

Evaluate Overcooling transients with high AFW level and update 1092 Spec if required.

START CRITERIA

Now

FINISH CRITERIA

Updated to 1092 Spec. T219:9

1206-4 (7-76)

WORK AUTHORIZATION (WA)

ID-200

NOTE: SIGNATURE REQUIREMENTS ON REVERSE SIDE

TC = WA, WB, WG, WD

WA NO.	WA REV.	WA DATE	TASK NO.	COST CENTER
15	23	6/22/78	09	273

CONTRACT NO.	CUSTOMER	WA TITLE	WPD NO.	WPD REV.	WPD DATE	ORGANIZATION
3		205FA - AUX. FEED LEVEL			6/22/78	Control Analysis

BUDGET DATA

INITIAL BUDGET (REVISION 00 ONLY)

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

CURRENT BUDGET

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

PROPOSED BUDGET CHANGE

MANHOURS	COMP HR	MATL	HYB HRS	SIM. HRS

PROPOSED BUDGET

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS
200				

NEGOTIATED OVERRUN/UNDERRUN

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

-USE OF FORM-

- ○ PROPOSAL ESTIMATE
- ⊗ AUTHORIZE WORK
- ○ REVISE STANDARD WBS
- ○ R & D BUDGET ALLOCATION
- ⊗ PARTIAL ALLOCATION FROM 6-22-78 (Date) TO 11-15-78 (Date)
- ○ OTHER (DESCRIBE)

- ⊗ OVERRUN/UNDERRUN

BUDGET CHANGE

- ○ BUDGET TRADE
- ○ LICENSING
- ○ SCOPE

- ○ ABNORMAL ORDER (Enter Letter Type)

RECAP NO

CPR NO.	REF. C/A #	REV #	RESPONSIBILITY	COMP	GP

CHARGE NO.

	CP	GP
EHCS		
CHRS		
CHG NO. OPEN DATE		

SCHEDULE DATA

ACT. SPAN (WKS)	SET PT CODE

± F/B SPAN (WKS)	F/B CODE

START DATE	COMP DATE
6-22-78	11-15-78

OPT NO.	C/A/D

This IS A PARTIAL BUDGET ESTIMATION TO COVER Items 1 AND 2 OF The WPD. PHASE II. PROVIDE APPROPRIATE DOCUMENTATION.

Item 3 (IF REQUIRED) Is ESTIMATED To REQUIRE AN ⅋ ADDITIONAL 500 mhr, 5 CDC hrs, AND 100 hybred hours. This estimate may Be REVISED BASED Upon Item 1 EVALUATIONS AND The FINAL, SMALL LOCA Level REQUIREMENTS.

APPROVAL/ACCEPTANCE

L R Carter — ORIGINATOR — 6-22-78 DATE

J R Burris — REVIEWER — 6/22/78 DATE

_____ — REVIEWER — DATE

_____ — 8/2/78

BUDGET DATA AND AUTHORIZATION

- ○ CPR
- ○ CONTINGENCY
- ○ NO OFFSET
- ○ OTHER

T21[illegible]

APPROVER — DATE

PDS-21206-4 (7-76)

WORK AUTHORIZATION (WA)

ID-200

NOTE: SIGNATURE REQUIREMENTS ON REVERSE SIDE

TC = WA, WB, WG, WD

WA NO.	WA REV.	WA DATE	TASK NO.	COST CENTER
15	23	827 6-22-78	833 07	837 352

CONTRACT NO.	CUSTOMER	WA TITLE	WPD NO.	WPD REV.	WPD DATE	ORGANIZATION
3		32 3551 - Aux. Feedwater Level	731		6-22-78	840 PLANT INTEGRATION

BUDGET DATA

INITIAL BUDGET (REVISION 00 ONLY)

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

CURRENT BUDGET

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

PROPOSED BUDGET CHANGE

± MANHOURS	± COMP HR	± MATL	± HYB HRS	± SIM. HRS
844				

PROPOSED BUDGET

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS
5.00				

NEGOTIATED OVERRUN/UNDERRUN

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

-USE OF FORM-

- ○ PROPOSAL ESTIMATE
- ⊗ AUTHORIZE WORK
- ○ REVISE STANDARD WBS
- ○ R & D PUDGET ALLOCATION
- ⊗ PARTIAL ALLOCATION FROM 6-22-78 (Date) TO 12-15-78 (Date)
- ○ OTHER (DESCRIBE)

- ⊗ OVERRUN/UNDERRUN

BUDGET CHANGE

- ○ BUDGET TRADE
- ○ LICENSING
- ○ SCOPE

- ○ ABNORMAL ORDER (Enter Letter Type)

RECAP NO		
CPR NO.	REF. CI/A #	REV #
A44	845	30

RESPONSIBILITY	COMP	GP	CPT NO.	C/L/D
	A70	827	833	80

CHARGE NO.

	CP	GP
EHCS		
CHRS		
CHG NO. OPEN DATE		

SCHEDULE DATA

ACT. SPAN (WKS)	SET PT CODE
847	837
± F/B SPAN (WKS)	F/B CODE
837	841
START DATE	COMP DATE
6-22-78	12-16-78

PROVIDE COORDINATION OF THE 205/145 SMALL BREAK PROBLEM IN THE ANALYSIS AREA & INSTIGATED THE DEVELOPEMENT OF HARHWARE RELATED CHANGES IF REQUIRED.

APPROVAL/ACCEPTANCE

Lewis R. Carteri — 6-22-78
ORIGINATOR — DATE

Ed Wenzinger BAK — 6/23/78
REVIEWER — DATE

REVIEWER — DATE

Tom Dimmon Jr.

BUDGET DATA AND AUTHORIZATION

- ○ CPR
- ○ CONTINGENCY
- ○ NO OFFSET
- ○ OTHER

T21820
APPROVER — DATE

=P1/

WORK PACKAGE DESCRIPTION (WPD)

WPD REV.	DATE	WPD NO.
43	46-22-78	53

CONTRACT NO.	CUSTOMER	TASK TITLE	WPD TITLE	TASK NO.	STD CODE
		RCS/SS Design	13 205FA- Aux. Feedwater Level	63 07	

SCOPE OF SUPPLY — C/A/D 80

DESCRIPTION OF WORK

1. Provide coordination of program to resolve 205/145 small break problem
2. Provide interface contact between analysis groups and hardware design units in evaluating design modification (higher AFW level control).
3. Determine most economical & licensable approach to control AFW to a high level (>6') for steam generators in the field.

EQUIPMENT

MARK NO.	DESCRIPTION	QTY

DOCUMENTS

DOCUMENT NO.	DESCRIPTIONS

SERVICES

DESCRIPTION

INTERMEDIATE INPUTS

INTERMEDIATE OUTPUTS

START CRITERIA

FINISH CRITERIA

T21821

PDS-21206-4 (7-76)

WORK AUTHORIZATION (WA)

ID-200

NOTE: SIGNATURE REQUIREMENTS ON REVERSE SIDE

TC = WA, WB, WG, WD

WA NO.	WA REV.	WA DATE	TASK NO.	COST CENTER
				344
WPD NO.	WPD REV.	WPD DATE	ORGANIZATION	
			Licensing	

CONTRACT NO.	CUSTOMER	WA TITLE
		305 Fix - Aux. Feedwater Level

BUDGET DATA

INITIAL BUDGET (REVISION 00 ONLY)

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

CURRENT BUDGET

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

PROPOSED BUDGET CHANGE

± MANHOURS	± COMP HRS	± MATL	± HYB HRS	± SIM. HRS

PROPOSED BUDGET

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

NEGOTIATED OVERRUN/UNDERRUN

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

-USE OF FORM-

- ◯ PROPOSAL ESTIMATE
- ⊗ AUTHORIZE WORK
- ◯ REVISE STANDARD WBS
- ◯ R & D BUDGET ALLOCATION
- ◯ PARTIAL ALLOCATION FROM ______ TO ______ (Date, Date)
- ◯ OTHER (DESCRIBE)
- ⊗ OVERRUN/UNDERRUN

BUDGET CHANGE

- ◯ BUDGET TRADE
- ◯ LICENSING
- ◯ SCOPE

◯ ABNORMAL ORDER (Enter Letter Type)

RECAP NO					
CPR NO.	REF. CI/A	REV #	RESPONSIBILITY	COMP	GP

CHARGE NO.

	CP	GP
EHCS		
CHRS		
CHG NO. OPEN DATE		

SCHEDULE DATA

ACT. SPAN (WKS)	SET PT CODE
± F/B SPAN (WKS)	F/B CODE
START DATE	COMP DATE
6/23/78	6/79
OPT NO.	C/A/D

Provide licensing review and coordination of ECCS/NRC interface in resolving small break - aux. feedwater provider problem.

Initiate NRC review of revised ECCS - small break topicals (if required) and coordinate review process.

APPROVAL/ACCEPTANCE

	DATE
L.R. Cartin (ORIGINATOR)	6-23-78
[signature] (REVIEWER)	6/26/78
REVIEWER	
[signature]	8/2/78

BUDGET DATA AND AUTHORIZATION

- ◯ CPR
- ◯ CONTINGENCY
- ◯ NO OFFSET
- ◯ OTHER

T21822

APPROVER ______ DATE ______

PDS-21206-4 (7-76)

WORK AUTHORIZATION (WA)

ID-200

NOTE: SIGNATURE REQUIREMENTS ON REVERSE SIDE

TC = WA. WB. WG. WD

WA NO.	WA REV.	WA DATE	TASK NO.	COST CENTER
15	25	027 6/23/78	033 20	037 352

CONTRACT NO.	CUSTOMER	WA TITLE	WPD NO.	WPD REV.	WPD DATE	ORGANIZATION
020-0015	TVA	027 205 FA - Max. Fill Level	024			040 C+I INTEGRATION

BUDGET DATA

INITIAL BUDGET (REVISION 00 ONLY)

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS
2120		027		

CURRENT BUDGET

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

PROPOSED BUDGET CHANGE

± MANHOURS	± COMP HR	± MATL	± HYB HRS	± SIM. HRS
044	045	046		

PROPOSED BUDGET

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

NEGOTIATED OVERRUN/UNDERRUN

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

-USE OF FORM-

- ○ PROPOSAL ESTIMATE
- ⊗ AUTHORIZE WORK
- ○ REVISE STANDARD WBS
- ○ R & D BUDGET ALLOCATION
- ⊗ PARTIAL ALLOCATION FROM 6/23/78 (Date) TO 12/31/78 (Date)
- ○ OTHER (DESCRIBE)

- ⊗ OVERRUN/UNDERRUN

BUDGET CHANGE

- ○ BUDGET TRADE
- ○ LICENSING
- ○ SCOPE

- ○ ABNORMAL ORDER (Enter Letter Type)

RECAP NO

CPR NO.	REF. C/A #	REV #
034	043	50

RESPONSIBILITY	COMP	GP
	070	072

CHARGE NO.

	CP	GP
EHCS		
CHRS		
CHG NO. OPEN DATE		

SCHEDULE DATA

ACT. SPAN (WKS)	SET PT CODE
067	037
± F/B SPAN (WKS)	F/B CODE
039	041
START DATE	COMP DATE
6-23-78	12-1-78
OPT NO.	C/A/D
052	80

1. Develop a cost-effective, licensable design for maintaining a high post-LOCA steam generator level for 1-175FA and 205FA plants.
2. Documents pertinent design features and estimated costs for implementation in memo to L.P. Carlin

APPROVAL/ACCEPTANCE — 6/23/78 DATE

ORIGINATOR — 6/23/78 DATE

REVIEWER — DATE

REVIEWER — DATE

6/26/78 DATE

BUDGET DATA AND AUTHORIZATION

- ○ CPR
- ○ CONTINGENCY
- ○ NO OFFSET
- ○ OTHER T23923

APPROVER — DATE

S-21206-4 (7-76)

WORK AUTHORIZATION (WA)

ID-200

NOTE: SIGNATURE REQUIREMENTS ON REVERSE SIDE

TC = WA, WB, WG, WD

WA NO.	WA REV.	WA DATE	TASK NO.	COST CENTER
		6-22-78	55	8155

WPD NO.	WPD REV.	WPD DATE	ORGANIZATION
		6-22-78	STEAM GEN. UNIT

CONTRACT NO.	CUSTOMER	WA TITLE
		205FA - SG Level Taps

BUDGET DATA

INITIAL BUDGET (REVISION 00 ONLY)

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

CURRENT BUDGET

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

PROPOSED BUDGET CHANGE

± MANHOURS	± COMP HR	± MATL	± HYB HRS	± SIM. HRS

PROPOSED BUDGET

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS
100				

NEGOTIATED OVERRUN/UNDERRUN

MANHOURS	COMP HRS	MATL	HYB HRS	SIM. HRS

-USE OF FORM-

- ○ PROPOSAL ESTIMATE
- ⊗ AUTHORIZE WORK
- ○ REVISE STANDARD WBS
- ○ R & D BUDGET ALLOCATION
- ⊗ PARTIAL ALLOCATION FROM 7/1/78 (Date) TO 9/15/78 (Date)
- ○ OTHER (DESCRIBE)

- ⊗ OVERRUN/UNDERRUN

BUDGET CHANGE

- ○ BUDGET TRADE
- ○ LICENSING
- ○ SCOPE

- ○ ABNORMAL ORDER (Enter Letter Type)

RECAP NO			
CPR NO.	REF. C/A #	REV #	
		30	

RESPONSIBILITY	COMP	GP

CHARGE NO.

	CP	GP
EHCS		
CHRS		
CHG NO. OPEN DATE		

SCHEDULE DATA

ACT. SPAN (WKS)	SET PT CODE

± F/B SPAN (WKS)	F/B CODE

START DATE	COMP DATE
7/1/78	9/15/78

OPT NO.	C/A/D

To Recommend Techniques And Provide Cost Estimates For Field Installation of Additional Level Sensing Taps In The 205 FA Steam Generators.

APPROVAL/ACCEPTANCE
L.R. Carter — 6-22-78
ORIGINATOR — DATE

J.W. Bash — 6-22-78
REVIEWER — DATE

REVIEWER — DATE

Don Swanson — 8/4/78

BUDGET DATA AND AUTHORIZATION

- ○ CPR
- ○ CONTINGENCY
- ○ NO OFFSET
- ○ OTHER

T21804

APPROVER — DATE

. ON-CPR WORK REQUEST FORM

Phase I = 1450/31 = $56K

Top Rate WA #0412A15

NCFR # 7-78

Contract or Risk Program No. _____

Contract or Risk Program Name R-39-ECCS/R42 ECCS Hdwe

Manhours 2560 X _____ =$ 52,480

CDC Hours 49 X _____ =$ 41,650

Analog Hours - X _____ =$ _____

Total/Affected Contract =$ 94,130 Phase II

205 ECCS Small Break, Auxiliary Feedwater Level

Total Min. Impact $598,000

WA Nos. _____ See Attached Risk Assessment Total Max. Impact $1,435,000

Unit(s) Steam Generator (529) Control Analysis (393) ECCS (394) Plant Integration (352) Safety Analysis (325) Mt. Vernon Mech. Design Licensing (346) Cost Center _____

Organization requesting work: WRF originator Plant Design

Note: WA for Mt. Vernon is not attached. Manhours requested include 200 manhours for their activities.

PM Risk (Hardy Duerson)

Other _____

Cause: ECCS Analysis assumes a high steam generator level to assist small break mitigation; this program will: (1) Add high level measuring taps, (2) Determine the ECCS level needed, (3) Define upper limits for level per Safety Analysis and Stress Units.

Nature of Work:

See Attached WA's and WPD's.

Work is result of:

_____ Inadequate WBS Cost Base Line Without Contingency

_____ Inadequate WBS Scope Base Line Without Contingency

_____ Error or Change which Invalidates Previously Completed Work

xx Other New information: Recent ECCS analysis indicates the as-designed six foot level is not sufficient; the previous forty foot level assumption is not compatible with other design needs.

Has PM reviewed and concurred with need and non-CPR status? xx Yes ___ No

Should Standard Plant WBS be revised? ___ Yes xx No

List WA No(s). and dollar value for each WA which has been identified as offset:

B Kanack
Unit Manager

8/7/78
Date

E W Thomas Jr.
Section Manager (Phase II)

HELP STAMP OUT PROFIT DEGRADATION!

T23825