NUREG-1110

Comparison of Licensing Activities for Operating Plants Designed by Babcock & Wilcox

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

J. O. Thoma

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Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ABSTRACT

This report provides a comparison of a number of licensing activities for the operating Babcock & Wilcox (B&W) plants with emphasis on Rancho Seco. The factors selected were a comparison of staff resources expended in FY84, active licensing action reviews, implementation of NUREG-0737 modifications, exemptions to regulations, SALP reports, enforcement actions, and Licensee Event Reports (LERs). The eight licensed operating plants examined are as follows: Arkansas Nuclear One Unit 1 (ANO-1), Crystal River Unit 3, Davis Besse, Oconee Units 1, 2, and 3, Rancho Seco, and Three Mile Island Unit 1 (TMI-1).

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Executive Summary

This report provides a comparison of a number of licensing activities for the operating Babcock & Wilcox (B&W) plants with emphasis on Rancho Seco. The factors selected were a comparison of staff resources expended in FY84, active licensing action reviews, implementation of NUREG-0737 modifications, exemptions to regulations, SALP reports, enforcement actions, and Licensee Event Reports (LERs). Information used in this report was primarily obtained from the most recent SALP report for each B&W licensee and NUREG-0748, Vol. 4, Nos. 6 and 7, "Operating Reactors Licensing Actions Summary" (ORLAS). ORLAS is published monthly.

It is not the intent of this report to rank the licensees in any fashion. Rather the objective is to review basic licensing information and determine if generalized conclusions can be reached. Plants are listed in order of the date of their operating license. This procedure was chosen to determine if an age correlation existed for any data. However, no significant differences were noted based on plant age.

The conclusion of the report is that the eight operating B&W plants, as a class, require above average NRC staff attention. It takes longer to complete a review on these plants and they have more open licensing issues on the average than the other operating plants.

Because of the relatively small number and unique design of the B&W reactors, they do not experience fully the benefits of "generic resolution" that can be spread over large numbers of plants as can be done with General Electric or Westinghouse designs. Also, the B&W operating plants, with the exception of Oconee, are single unit sites. It is not directly appropriate to compare a single Oconee unit with the other plants. Neither is it appropriate to simply add the three Oconee units and call it one site and use that for comparison. This statistical variation will explain to some degree, but not fully, the higher than average staff resource expenditure on these B&W plants. Other factors which must be considered include the difficulty of individual reviews or the quality (or lack thereof) of the licensee's submittals or responses to staff questions.

TMI-1 has required significant staff resources. However, in reviewing the seven remaining B&W plants, Rancho Seco also is high-lighted in that it was number one or two in five of the categories reviewed. Specifically, Rancho Seco has the most active licensing issues overall, requires a long time on the average to complete an issue with the staff, has required a significant amount of staff resources to conduct reviews, has eight NUREG-0737 items remaining to be physically implemented, and was the only operating B&W plant to receive a Category "3" SALP rating for both Plant Operations and Licensing Activities.

OPERATING PLANTS DESIGNED BY B&W

1.0 INTRODUCTION

The following is a comparison of ten licensing activity factors for the eight operating plants designed by B&W. The tables and charts, on which the following discussion is based, were derived from readily obtainable data as of August 22, 1984. The data base includes the status of active multi-plant, NUREG-0737, and plant specific issues as well as inputs from SALP reports, other plant records, and discussions with the assigned Project Manager. The primary sources of information were NUREG-0748, Vol. 4, Nos. 6 and 7, "Operating Reactors Licensing Actions Summary" (ORLAS) and the most recent SALP report for each B&W licensee. Particular emphasis has been placed on Rancho Seco in each section. However, it is not the intent of this report to rank the licensees in any fashion. Rather the objective is to review basic licensing information and determine if generalized conclusions can be reached.

The eight plants received their operating license in a four year time frame starting in 1973. Therefore they are, on the average, seven to eleven years old. Throughout the report, the plants are listed in accordance with their relative age as follows: Oconee-1 (O-1), Oconee-2 (O-2), Three Mile Island-1 (TMI-1), Arkansas Nuclear One Unit 1 (ANO-1), Oconee-3 (O-3), Rancho Seco (RS), Crystal River 3 (CR-3), and Davis Besse (DB). This procedure was chosen to determine if an age correlation factor existed for any data. However, no significant differences were noted based on plant age.

2.0 STATUS AND COMPARISONS

Staff Resources

Figure 1 provides the NRR staff hours expended in FY84 per plant through June 30, 1984. As expected, the staff has spent considerable time reviewing TMI-1 (9014.9 staff hours). However, the staff has also devoted more time to Rancho Seco (2786.3 staff hours) compared to the average of approximately 1700 staff hours expended per licensee for the remaining B&W plants. Although the numbers are different, the relative positions are the same (i.e., TMI number one and Rancho Seco definitely number 2) for NRR staff hours expended on the respective plants in FY83.

Another indication of licensee/staff inter-relations is the average number of NRR staff hours necessary to complete a review in FY84, which is provided in Figure 2. The average time for all operating plants is 70.2 hours, but the B&W plants as a class average 103 hours expended per completion. TMI-1 averaging 306 hours/completion, Rancho Seco averaging 147.6 hours/completion, and ANO-1 averaging 121.2 hours/completion are significantly above average even for the B&W units. Excluding TMI-1, the average staff hours expended per completed action for the B&W units would be 74.2 and the overall average for all plants would be 67.5.

Because of the relatively small number and unique design of B&W reactors, they do not experience fully the benefits of "generic resolution" that can be spread over larger numbers of plants as can be done with General Electric or Westinghouse designs. Also, the B&W operating plants, with the exception of Oconee, are single unit sites. It is not directly appropriate to compare a single Oconee unit with the other plants. Neither is it appropriate to simply add the three Oconee units and call it one site and use that for comparison. This statistical variation will explain to some degree, but not fully, the higher than average staff resource expenditure on these B&W plants. Other factors which must be considered include the difficulty of individual reviews or the quality (or lack thereof) of the licensee's submittals or responses to staff questions.

Licensing Action Backlog

Figure 3 provides the total number of active licensing issues on each B&W plant. The overall average for all operating plants is 43 items per plant; but the B&W units average 52 open items per plant. Rancho Seco, with 60 issues, has the largest number of active licensing reviews among the eight B&W plants and TMI-1 is second with 56 issues. This is consistent with Figure 2 which reveals that it takes longer or more staff effort to complete a review on TMI-1 and Rancho Seco. This indicates that TMI-1 and Rancho Seco will require a significant portion of the limited NRC staff resources in the future.

MPA Review Status

Multiplant Activities (MPAs) are licensing actions which are common to a given class of reactors (i.e., Control of Heavy Loads). There are 25 MPAs which are still under review on at least one B&W plant. Of these 25 issues, ten are open on all eight B&W units and two are open on only one plant each. Figure 4 provides the number of active MPA issues per plant. The B&W units with an average of 16 open MPAs per plant are above the overall average of 13 open MPAs per plant. However, the B&W units as a class are reasonably close to each other for total number of active MPAs. Davis Besse has the highest number of active MPAs with a total of 19. Rancho Seco has 17 open MPAs.

NUREG-0737 Review Status (TMI Action Plan)

There are 16 NUREG-0737 issues which are still active on at least one B&W plant. Of these 16 issues, eight are active on all eight plants. Figure 5 provides the number of active NUREG-0737 issues per plant. The B&W units with 12 issues open per plant are slightly above the overall average of 10 issues per plant. But again the B&W plants are very close to each other as a class. Rancho Seco has 12 open issues.

Plant Specific Review Status

Figure 6 provides the total number of plant specific active issues for each plant. The B&W units with an average of 24 issues per plant are above the overall average of 20 open issues per plant. So in all three licensing action categories, the B&W plants average more open issues than the average of all plants combined. Rancho Seco with 31 open plant specific items and TMI-1 with 29 issues are significantly above average even for the B&W units.

Implementation of NUREG-0737 Modifications

Figure 7 provides the number of NUREG-0737 items per plant where physical modifications are still required. It is based on updating information from NUREG-1066. Oconee with nine items per plant and Rancho Seco with eight items have more modifications than the remaining B&W units which have six or less items to complete per plant.

Exemptions to Regulations

Figure 8 lists exemptions approved and still effective on each plant. The older plants have almost twice as many exemptions still active as the newer plants with the maximum number for a single plant being six exemptions. Rancho Seco has active exemptions on four regulations.

Figure 9 provides a breakdown of two major regulations, fire protection and equipment qualification. As far as technical exemptions to the fire protection rule are concerned, TMI-1 has 13 technical exemptions approved, ANO-1 has 12, and Rancho Seco has six. All the remaining licensees average one technical exemption to the fire protection rule per unit. However, the licensees for Rancho Seco and Davis Besse have indicated that they will shortly request more technical exemptions to the fire protection rule. To date, no B&W licensee has requested a time extension to the Equipment Qualification rule to correct known deficiencies. The Crystal River 3 licensee on July 6, 1983 requested a time extension for any unspecified new items identified in meeting the requirements of Regulatory Guide 1.97. This was just a precautionary request in case they identified any new items requiring environmental qualification.

SALP Reports

Figure 10 contains data obtained from the most recent SALP for each plant. Ten functional areas used in the SALP rating were common to a majority of the plants and are listed in the attachment. Occasionally there were some unique plant specific ratings listed in the individual SALPs but they are not provided in this chart. The SALP reports evaluate each plant for a given period of time ranging from 11 to 16 months. A category 3 rating in an individual area indicates that more emphasis is needed in this area by both the licensee and the staff. Rancho Seco and ANO-1 were rated in category 3 or 2 in more functional areas than any of the other B&W units. Rancho Seco was the only B&W licensee to receive a category 3 under Licensing Activities and Plant Operations. Based on ratings in the ten functional areas of the SALP report, Rancho Seco and ANO-1 require more future emphasis by the staff than the other plants.

Enforcement Actions

Figure 11 provides a summary of the violations issued on each plant in the last SALP period. Davis Besse with 26, Crystal River 3 with 26, and TMI-1 with 22 had significantly more violations during their respective SALP periods than the other B&W licensees. Rancho Seco had 17 violations.

LERs

Figure 12 provides a summary of LERs issued per plant during the last SALP period. The dominant classification of cause for each plant is component failure. However, a larger percentage of Rancho Seco's LERs are classified as personnel errors (13 out of 43 or 30%) than for any other B&W unit. This may be significant as Rancho Seco is the only B&W plant experiencing staffing problems.

3.0 CONCLUSIONS

The eight operating B&W plants, as a class, require above average NRC staff attention. It takes longer to complete a review on these plants and they have more open licensing issues than other operating plants. To some degree, this can be explained due to the unique design of the plants and the fact that they are generally single unit sites. However, there are other factors involved.

TMI-1 has required significant staff resources. However, in reviewing the seven remaining B&W plants, Rancho Seco also is high-lighted in that it was number one or two in five of the categories reviewed. Specifically, Rancho Seco has the most active licensing issues overall, requires a long time on the average to complete an issue with the staff, has required a significant amount of staff resources to conduct reviews, has eight NUREG-0737 items remaining to be physically implemented, and was the only operating B&W plant to receive a Category "3" SALP rating for both Plant Operations and Licensing Activities.

4.0 FIGURES

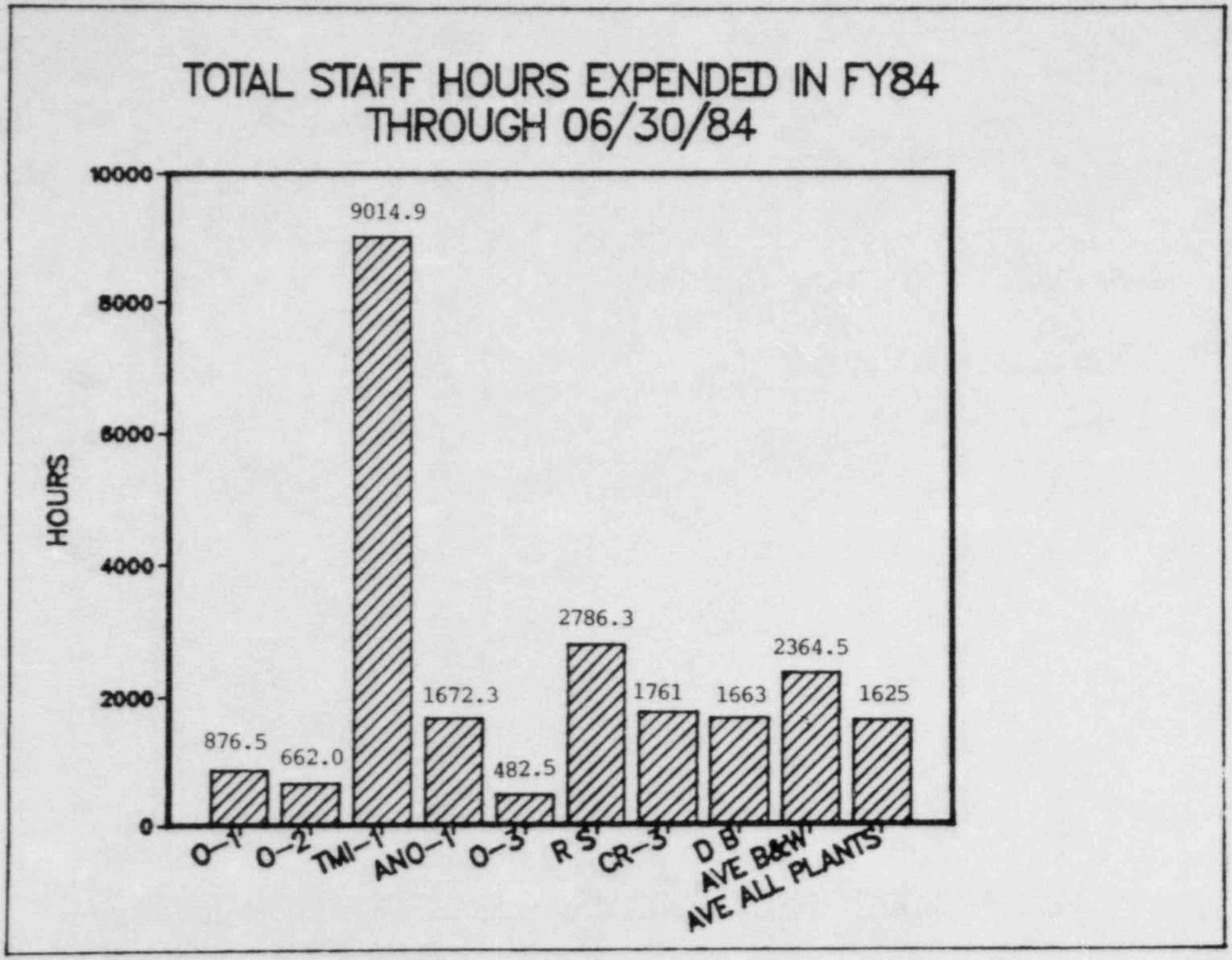
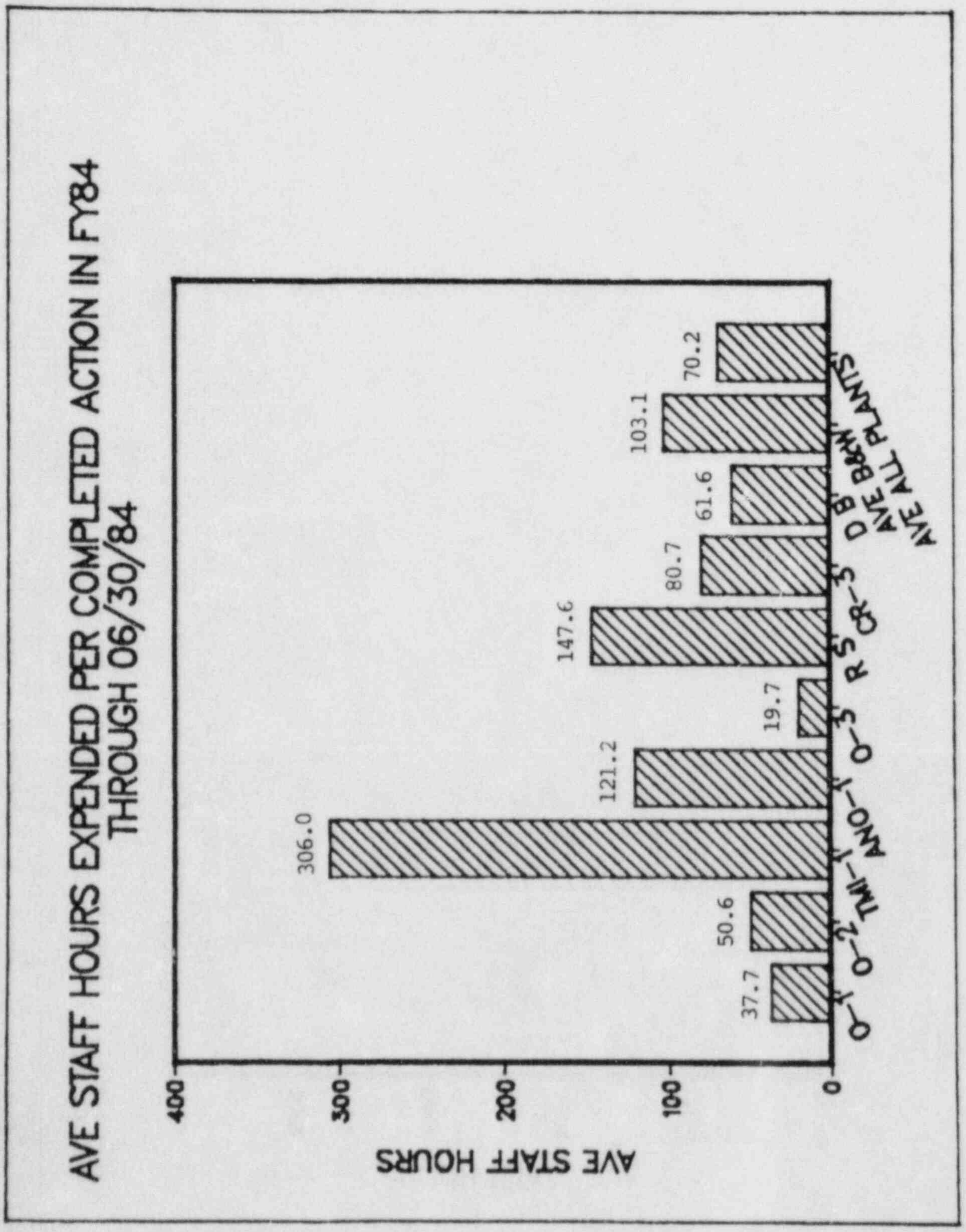

TOTAL STAFF HOURS EXPENDED IN FY84
THROUGH 06/30/84
HOURS
10000
8000
6000
4000
2000
0
876.5
662.0
9014.9
1672.3
482.5
2786.3
1761
1663
2364.5
1625
O-1'
O-2'
TMI-1'
ANO-1'
O-3'
R S'
CR-3'
D B'
AVE B&W'
AVE ALL PLANTS'

FIGURE 1

FIGURE 2


AVE STAFF HOURS EXPENDED PER COMPLETED ACTION IN FY84
THROUGH 06/30/84
AVE STAFF HOURS
0
100
200
300
400
37.7
50.6
306.0
121.2
19.7
147.6
80.7
61.6
103.1
70.2
O-1
O-2
TMI-1
ANO-1
O-3
R S
CR-3
D B
AVE B&W
AVE ALL PLANTS

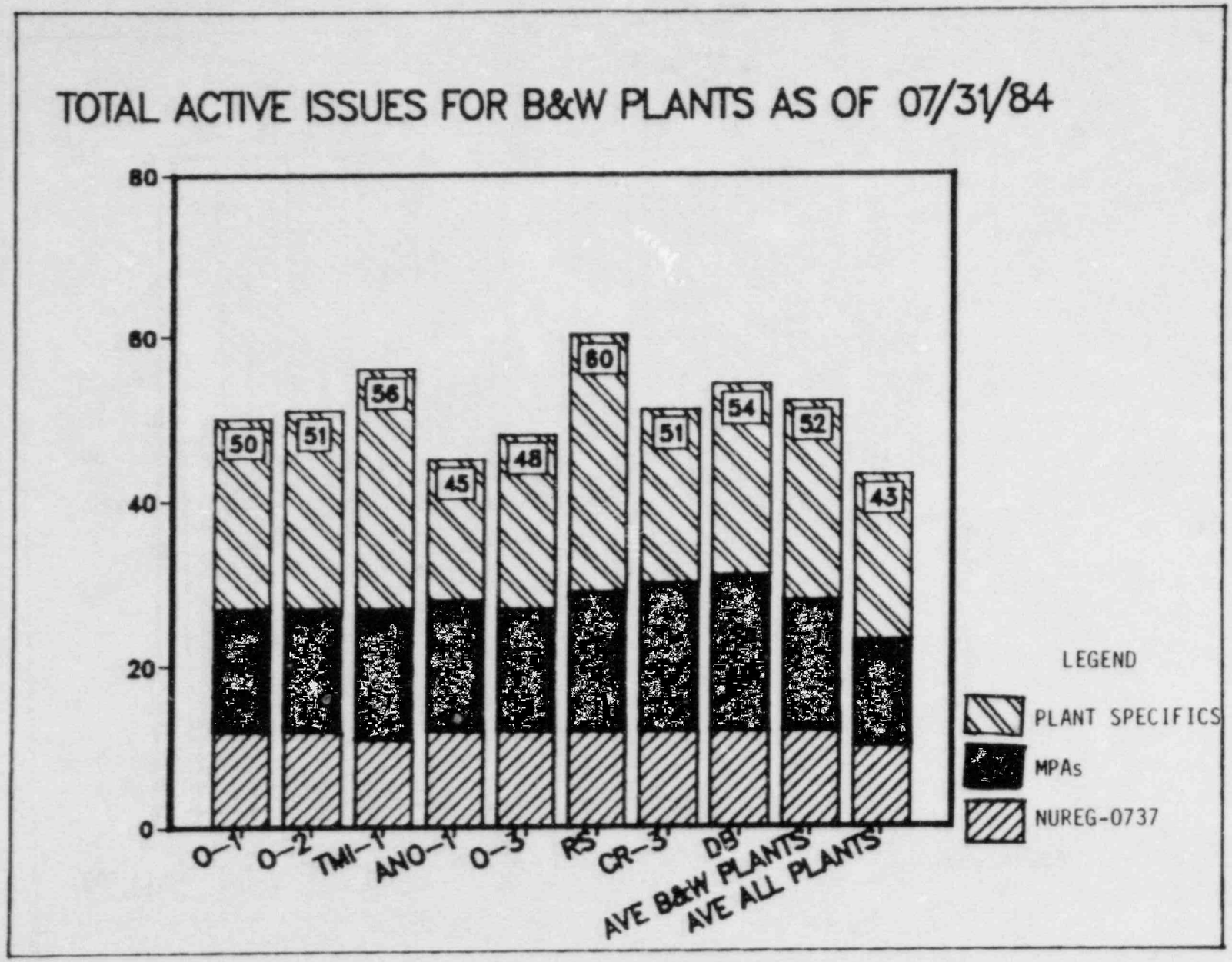

TOTAL ACTIVE ISSUES FOR B&W PLANTS AS OF 07/31/84
80
80
40
20
0
50
51
56
45
48
60
51
54
52
43
O-1'
O-2'
TMI-1'
ANO-1'
O-3'
RS'
CR-3'
D9'
AVE B&W PLANTS'
AVE ALL PLANTS'
LEGEND
PLANT SPECIFICS
MPAs
NUREG-0737

FIGURE 3

FIGURE 4

ACTIVE MPA ISSUES FOR B&W PLANTS AS OF 07/31/84
25
20
15
10
5
0
15
15
16
16
15
17
18
19
16
13
O-1, O-2, O-3
TMI-1, TMI-2
ANO-1, ANO-2
O-1, O-2, O-3
RP, CR-3
DB PLANTS
AVE B&W PLANTS
AVE ALL PLANTS

FIGURE 5

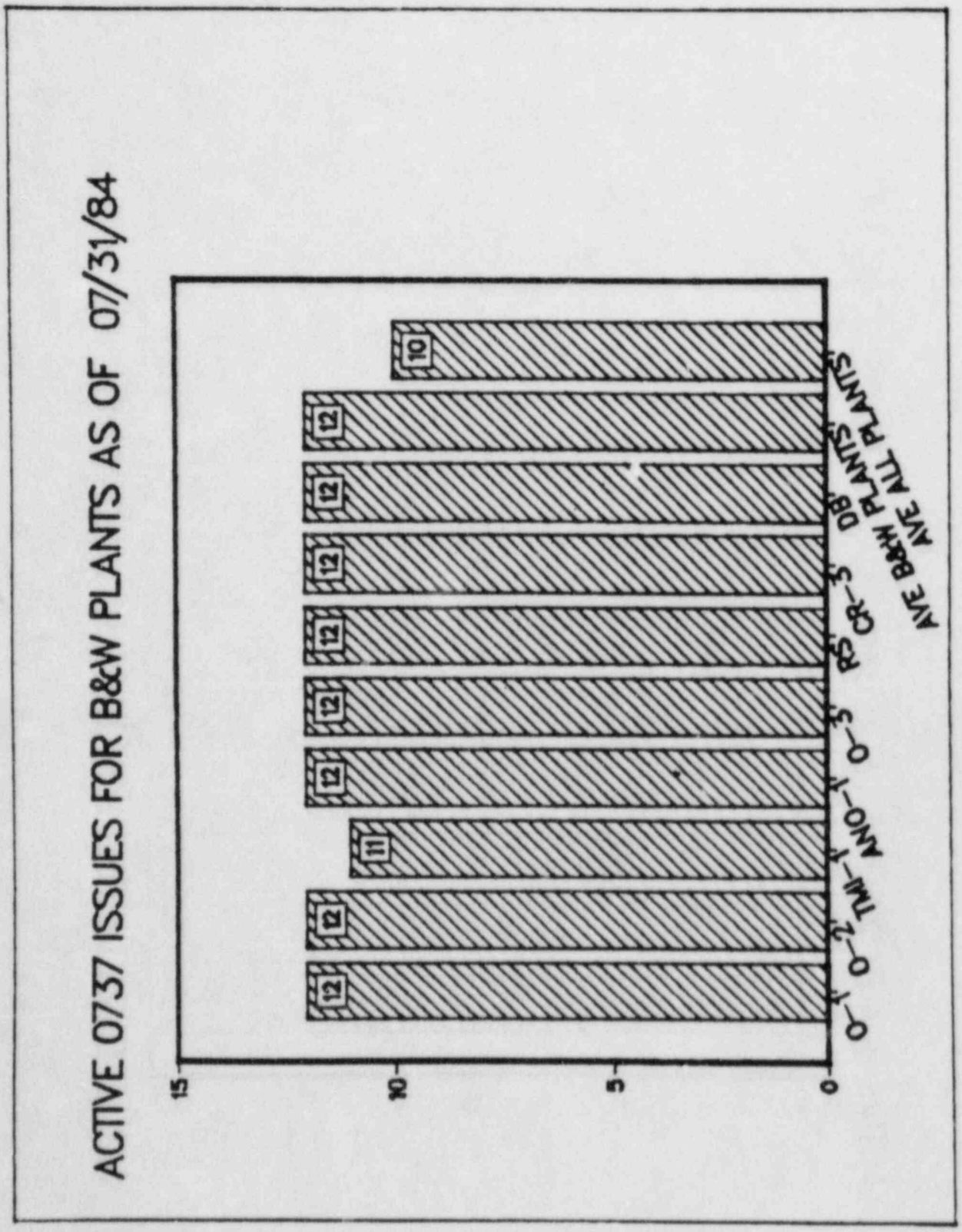
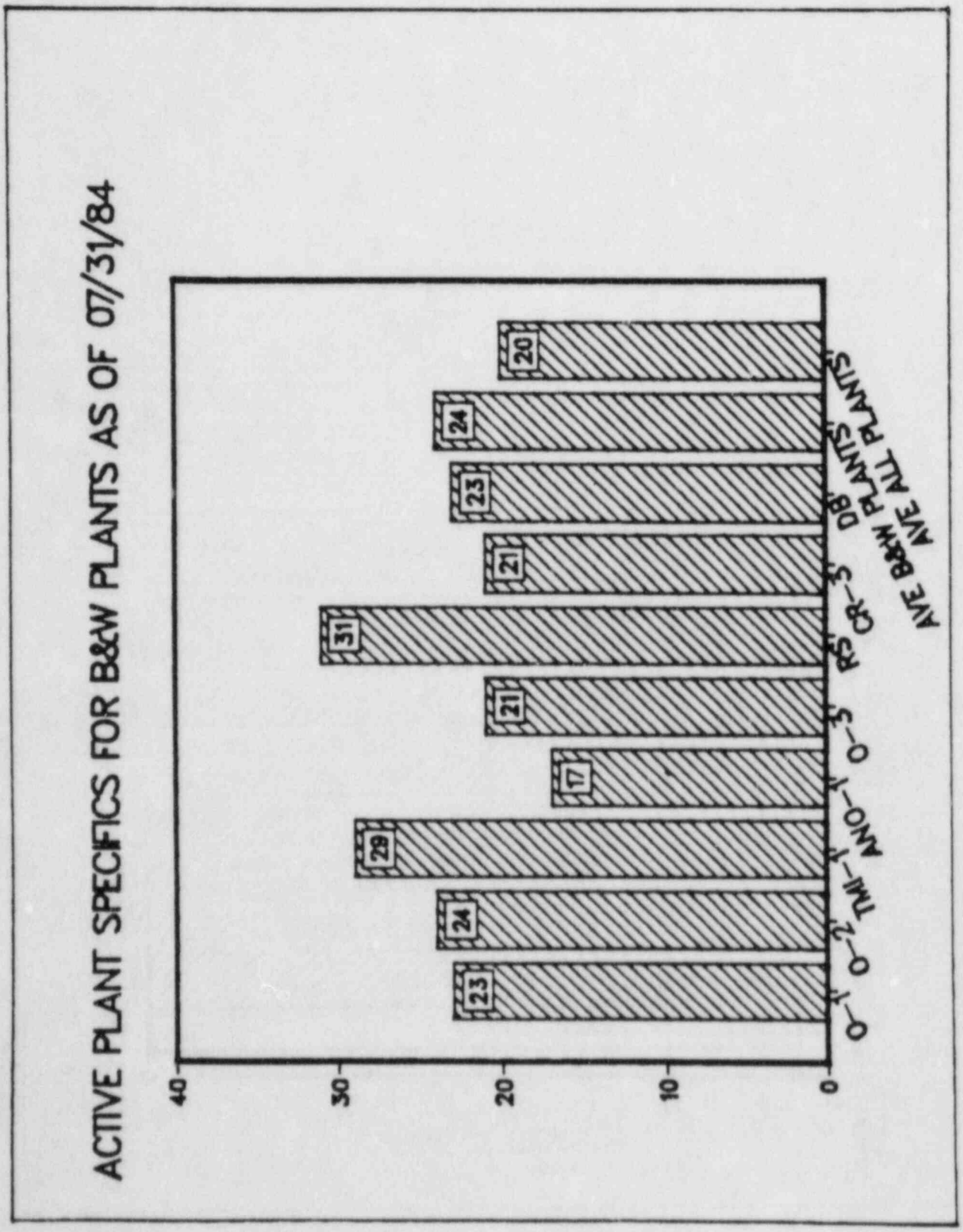

ACTIVE 0737 ISSUES FOR B&W PLANTS AS OF 07/31/84
15
10
5
0
12
12
11
12
12
12
12
12
10
O-1
O-2
TMI-1
ANO-1
O-3
RS
CR-3
DB
AVE B&W PLANTS
AVE ALL PLANTS

FIGURE 6


ACTIVE PLANT SPECIFICS FOR B&W PLANTS AS OF 07/31/84
40
30
20
10
0
23
24
29
17
21
31
21
24
23
20
O-1
O-2
TMI-1
ANO-1
O-3
CR-3
RS
DB PLANTS
AVE B&W PLANTS
AVE ALL PLANTS

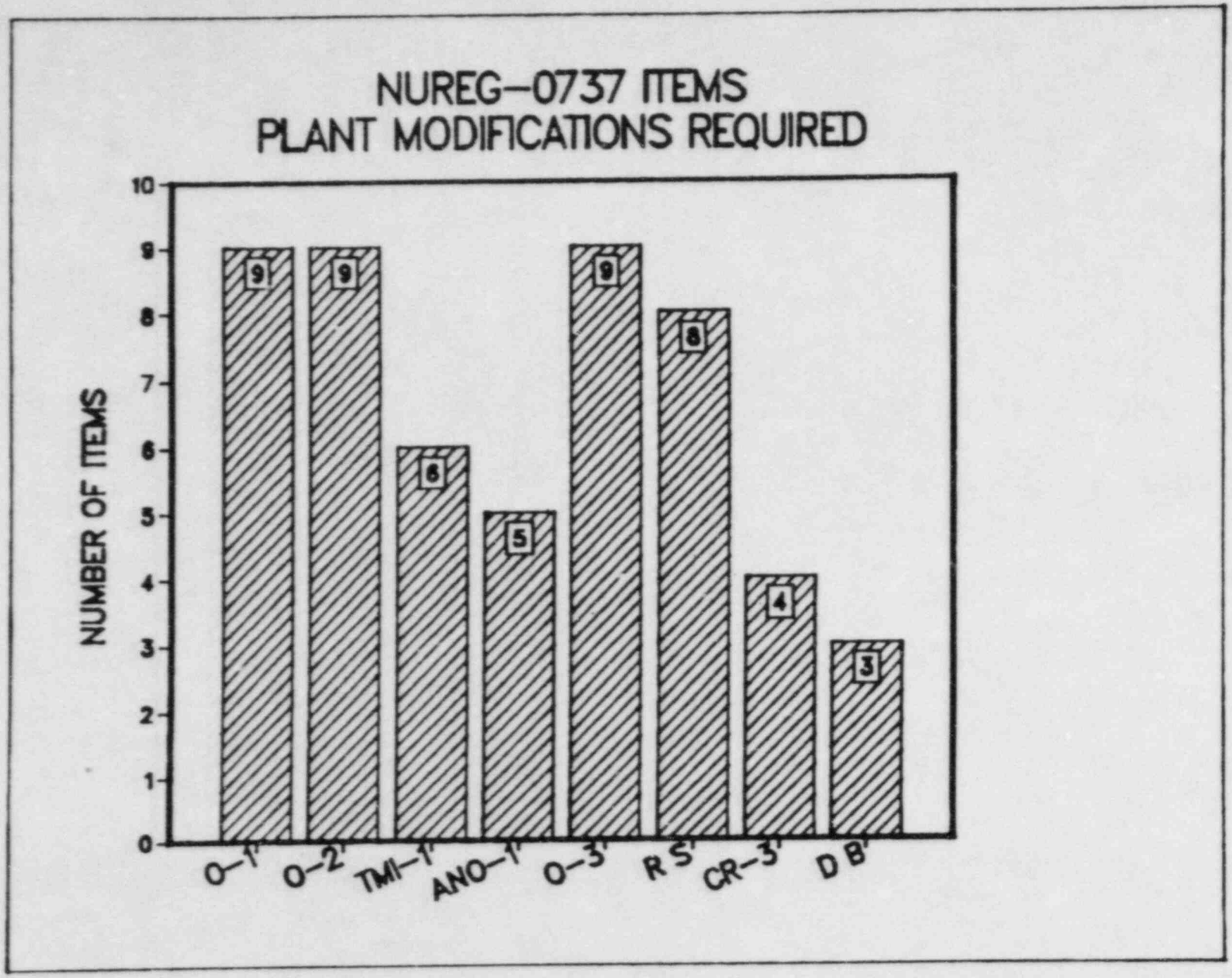

NUREG–0737 ITEMS
PLANT MODIFICATIONS REQUIRED
NUMBER OF ITEMS
0
1
2
3
4
5
6
7
8
9
10
9
9
6
5
9
8
4
3
O–1'
O–2'
TMI–1'
ANO–1'
O–3'
RS'
CR–3'
DB'

FIGURE 7

FIGURE 8

Exemptions Issued and Still Effective

Plant	Date	S/T	Topic	Rule
Oconee 1/2/3	07/14/77	T	Operation for 5 Years with Reactor Vessel Surveillance Specimens at CR-3	Appendix H
Oconee 1/2/3	10/23/78	T	ECCS Small Breaks	10 CFR 50.46
Oconee 1/2/3	02/02/82	T/S	Fire Protection	10 CFR 50 App. R
Oconee 1/2/3	06/16/82	S	Extension of 07/14/77 Exemption	Appendix H
Oconee 1/2/3	08/31/83	T	Fire Protection	Appendix R
Oconee 1/2/3	01/06/84	T	Emergency Exercises	Appendix E
TMI-1	04/27/78	T	ECCS Performance	10 CFR 50.46 and Appendix K
TMI-1	05/18/78	T	ECCS Performance (modification of 04/27/78 Exemption)	10 CFR 50.46 and Appendix K
TMI-1	03/16/79	T	ECCS Performance (modification of 04/27/78 exemption)	10 CFR 50.46 and Appendix K
TMI-1	05/10/82	S	Fire Protection	10 CFR 50 and Appendix R
TMI-1	09/14/82	T	Emergency Exercises	Appendix E
TMI-1	06/04/84	T	Fire Protection	10 CFR 50 App. R
ANO-1	04/01/77	T	Operation for 5 years with Reactor Vessel Surveillance Specimens at DB	Appendix H
ANO-1	04/30/82	S	Extension of 4/1/77 Exemption	Appendix H
ANO-1	05/10/82	S	Fire Protection	10 CFR 50
ANO-1	03/22/83	T	Fire Protection	Appendix R

Plant	Date	S/T	Topic	Rule
ANO-1	05/11/83	T	Fire Protection	Appendix R
ANO-1	03/22/84	T	Emergency Exercise	Appendix E
RS	07/13/77	S	Air Lock Doors	Appendix J
RS	01/10/83	T	Fire Protection	Appendix R
RS	01/10/83	T	Allows Reactor Vessel Surveillance Specimens to be irradiated at DB	Appendix H
RS	07/25/83	S	Reactor Vessel Head Vents	10 CFR 50.44
CR-3	09/01/78	T	ECCS	10 CFR 50.46
CR-3	05/04/82	S	Fire Protection	Appendix R
CR-3	02/07/83	T	Fire Protection	Appendix R
CR-3	07/21/83	S	Reactor Vessel Head Vents	10 CFR 50.44
DB	01/23/82	T	Fire Protection	Appendix R
DB	08/20/84	T	Fire Protection	Appendix R
DB	09/07/83	S	Reactor Vessel Head Vents	10 CFR 50.46

FIGURE 9

SPECIFIC MAJOR REGULATIONS

FIRE PROTECTION EXEMPTION REQUESTS

	Oconee 1/2/3	TMI-1	ANO-1	RS	CR-3	DB
TECHNICAL						
Requested	9	18	13	9	1	2
Approved	3	13	12	6	1	2
Denied	0	0	0	2	0	0
Withdrawn	0	2	0	1	0	0
Not Needed	6	3	1	0	0	0
SCHEDULAR						
Requested	0	9	7	0	6	0
Approved	0	6	6	0	5	0
Denied	0	1	0	0	0	0
Withdrawn	0	0	0	0	0	0
Not Needed	0	2	1	0	1	0
TOTAL						
Requested	9	27	20	9	7	2
Approved	3	19	18	6	6	2

AVERAGE FOR THE 8 PLANTS

Technical Requested	7
Technical Approved	5
Schedular Requested	3
Schedular Approved	2
Total Requested	9
Total Approved	7

EQ RULE

Schedular Exemptions

Oconee - None as of yet

TMI-1 - None as of yet

ANO-1 - None as of yet

RS - None as of yet

CR-3 - On July 6, 1983 the licensee for CR-3 requested a schedular exemption from the EQ rule for any new items identified during the review for requirements of Regulatory Guide 1.97. The schedule to meet Regulatory Guide 1.97 is a separate issue from the EQ rule.

DB - None as of yet

LAST SALP RATINGS FOR B&W PLANTS

FIGURE 10

Functional Area**	O-1/2/3	TMI-1	ANO-1	RS	CR-3	DB
Plant Operations	2	2	2	3	2	2
Radiological Controls	2	1	2	2	1	1
Maintenance	1	1	3	2	2	3
Surveillance	3	1	3	3	2	3
Fire Protection	*	1	2	2	2	2
Emergency Preparedness	2	1	2	2	2	2
Security & Safeguards	1	1	1	1	2	2
Refueling/Design	1	2	1	1	1	1
Licensing	2	2	1	3	2	2
QA	2	1	3	*	2	*

*Not rated in the SALP

**These ten functional areas were selected as they were common to a majority of the plants reviewed. There were other plant specific functional areas listed in individual SALPs for (example, ANO-1 was also rated for training and management controls). However, these ratings were unique to a particular plant and are not listed.

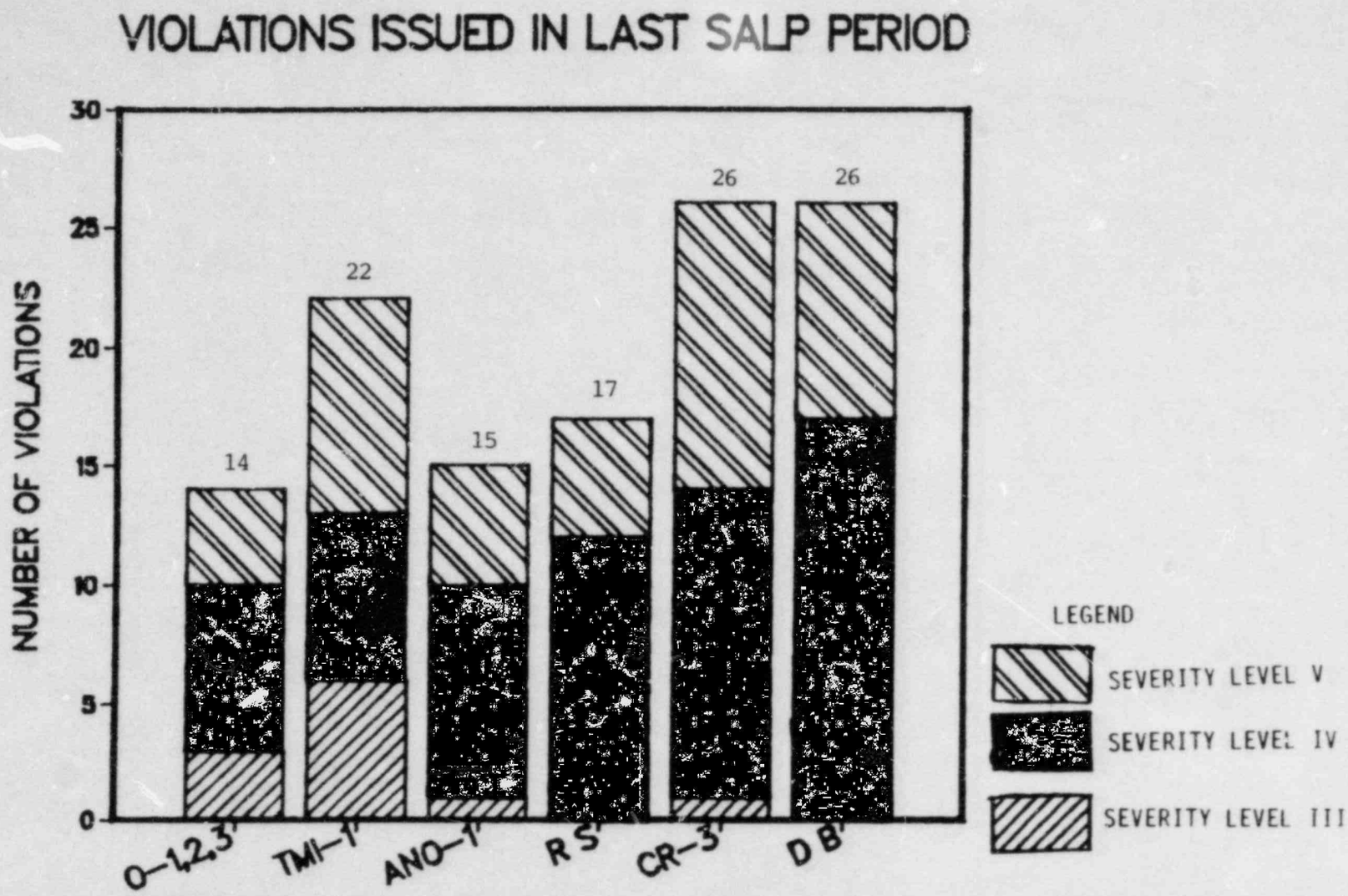

VIOLATIONS ISSUED IN LAST SALP PERIOD
NUMBER OF VIOLATIONS
30
25
20
15
10
5
0
14
22
15
17
26
26
O-1,2,3'
TMI-1'
ANO-1'
RS'
CR-3'
DB'
LEGEND
SEVERITY LEVEL V
SEVERITY LEVEL IV
SEVERITY LEVEL III

FIGURE 11

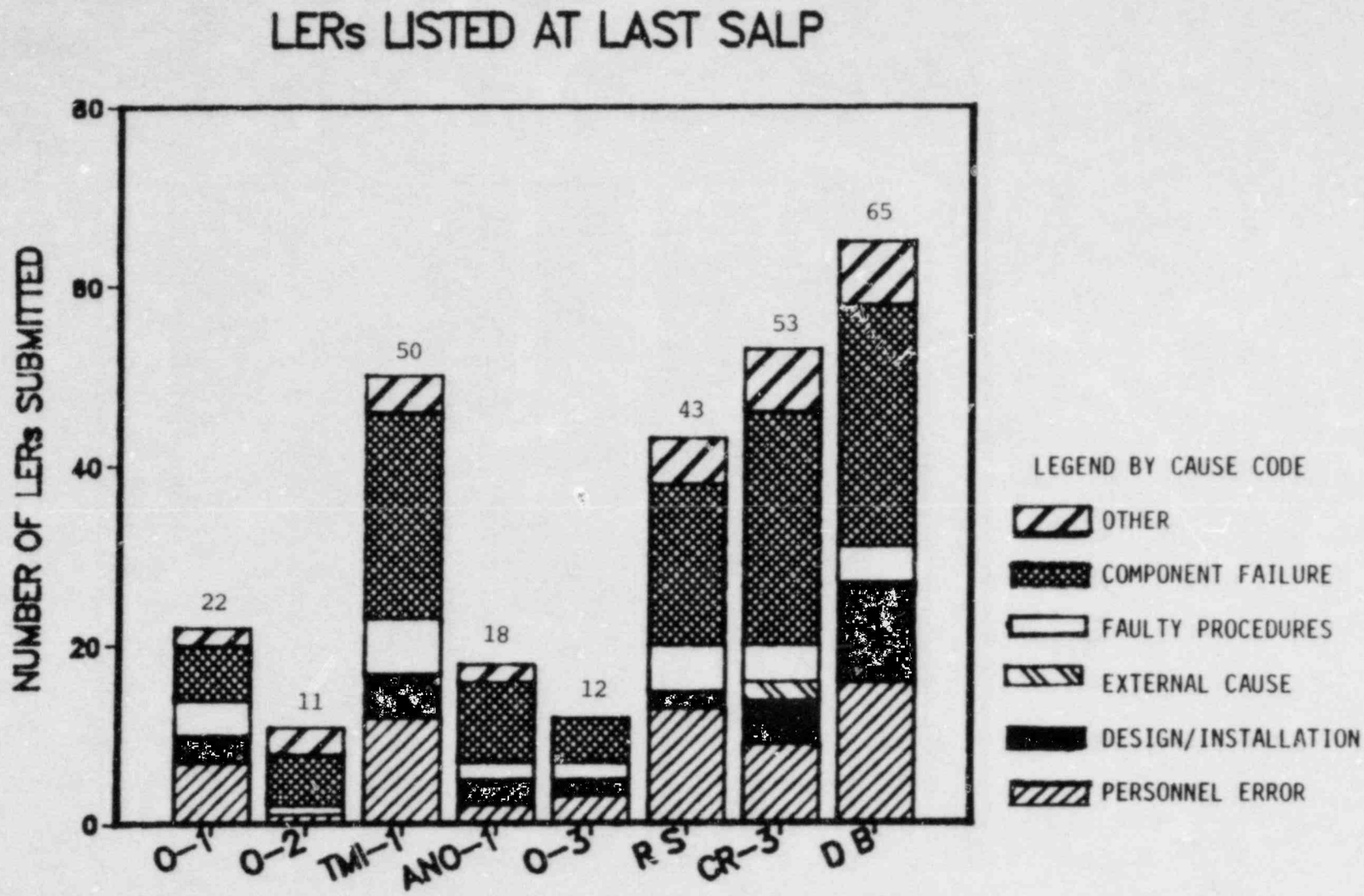

LERs LISTED AT LAST SALP
NUMBER OF LERs SUBMITTED
0
20
40
60
80
22
11
50
18
12
43
53
65
O-1'
O-2'
TMI-1'
ANO-1'
O-3'
RS'
CR-3'
DB'
LEGEND BY CAUSE CODE
OTHER
COMPONENT FAILURE
FAULTY PROCEDURES
EXTERNAL CAUSE
DESIGN/INSTALLATION
PERSONNEL ERROR

FIGURE 12

NRC FORM 335 (2-84) NRCM 1102, 3201, 3202

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Technical Report

b. PERIOD COVERED (Inclusive dates)

12. SUPPLEMENTARY NOTES

13. ABSTRACT (200 words or less)

This report provides a comparison of a number of licensing activities for the operating Babcock & Wilcox (B&W) plants with emphasis on Rancho Seco. The factors selected were a comparison of staff resources expended in FY84, active licensing action reviews, implementation of NUREG-0737 modifications, exemptions to regulations, SALP reports, enforcement actions, and Licensee Event Reports (LERs). The eight licensed operating plants examined are as follows: Arkansas Nuclear One Unit 1 (ANO-1), Crystal River Unit 3, Davis Besse, Oconee Units 1, 2, and 3, Rancho Seco, and Three Mile Island Unit 1 (TMI-1).

14. DOCUMENT ANALYSIS - a. KEYWORDS/DESCRIPTORS

Babcock & Wilcox (B&W)
ANO-1
Crystal River 3
Davis Besse
Oconee 1, 2, 3
Rancho Seco
TMI-1
Licensing Actions

b. IDENTIFIERS/OPEN-ENDED TERMS

15. AVAILABILITY STATEMENT

Unlimited

16. SECURITY CLASSIFICATION

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