

SEVENTH
SEMIANNUAL STAFF EVALUATION
OF
THE STATUS OF NPRDS

July 1985

Prepared by:

Office for Analysis and Evaluation
of Operational Data

NOTE - The NRC has agreed not to release plant specific NPRDS data.
Thus removal of Attachment A is necessary prior to release of
this document outside the NRC.

Enclosure 1

INTRODUCTION

The present NPRD System is a voluntary program for the reporting of reliability data associated with selected components and systems in nuclear power plants. Since January 1, 1982, the NPRD System has been managed and operated by the Institute of Nuclear Power Operations.

BACKGROUND

Former President Carter's 1977 National Energy Plan recommended that the NRC make mandatory the voluntary reporting of minor mishaps and component failures (i.e., NPRDS). The plan suggested that mandatory participation would enable the industry and the NRC to develop a more reliable data base which is needed to improve the reactor design, construction, operation, safety, and reliability.

Coincident with the NRC's activities directed toward implementing the President's recommendation, the General Accounting Office (GAO) reviewed the NRC's data-gathering activities concerning unscheduled events at commercial nuclear facilities. In a report issued in late January 1979, the GAO concluded that it was unlikely that the NRC could justify mandatory NPRDS participation when factors such as additional industry costs, limited expected safety benefits, and duplication of the NRC's LER system were considered. However, the GAO believed that a full examination of the issue was warranted and suggested that the issue be decided using rulemaking procedures.

Following an April 19, 1979 Commission briefing on the collection and analysis of operational safety data, the Commission concurred with the January 1979 GAO recommendation that rulemaking be used to decide the question of whether to make NPRDS reporting mandatory. Accordingly, an Advance Notice of Proposed Rulemaking (ANPRM) was approved by the Commission, and published in the Federal Register on January 30, 1980 (45 FR 6793). Numerous public comment letters were received in response to the ANPRM. The predominant message in the comments was overwhelming opposition to making participation in NPRDS mandatory.

Despite the opposition to a mandatory system, the staff identified a strong need for failure rate data and engineering data. The requirements for such data indicated a need to revise and reorient the system, in combination with the existing LER system, and to assure its effective implementation through NRC rulemaking. In order to obtain the necessary improvements in the LER and NPRDS reporting programs, the staff developed conceptually a revised reporting system. This Integrated Operational Experience Reporting System (IOERS) would have combined and restructured the NRC LER system and the voluntary NPRD System. The IOERS concept included two principal features: (1) the collection of detailed technical description of significant events, and (2) the collection of component reliability data.

While the staff still believes that both types of data are essential to the NRC mission, the possibility arose that the NRC could obtain the needed reliability data without assuming direct responsibility for its collection. On June 8, 1981, the INPO Board of Directors decided that because of its role as an active user of NPRDS data, INPO would assume responsibility for

management of NPRDS. Further, INPO proposed developing criteria to be used in their management audits of member utilities to assess the adequacy of NPRDS participation. Therefore, rather than preempt the INPO activities by proceeding with the IOERS rulemaking, the staff recommended and the Commission approved (SECY-81-494) proceeding to modify and codify the existing LER reporting requirements as a separate rulemaking while holding the IOERS rulemaking in abeyance.

In approving SECY-81-494, the Commission directed that the staff closely monitor the status and rate of improvement of the NPRD System and provide the Commission with semiannual status reports on the effectiveness of INPO management of the NPRD System.

In order to monitor the completeness and quality of NPRDS data, AEOD established an evaluation program at the Reliability and Statistics Branch, EG&G Idaho. The initial purpose of this program was to provide a baseline of information concerning the completeness and quality of the NPRDS failure reporting and engineering data files as they existed prior to INPO's assumption of responsibility for the management of NPRDS. Subsequent analyses of the completeness and quality of the files are being conducted periodically in order to provide a measure of the improvements in the NPRD System under INPO management and technical direction.

The scope and results of this evaluation program have been discussed in reports to the Commission dated July 1, 1982 (SECY-82-279), January 4, 1983 (SECY-83-4), July 5, 1983 (SECY-83-4A), January 27, 1984 (SECY-84-44), August 1, 1984 (SECY 84-44A), and February 8, 1985 (SECY-85-56).

In the past, each semiannual report has included analysis of NPRDS data from two calendar quarters. However, in the third quarter of CY 1984, INPO, working with individual plants, began an extensive quality assurance review of all of the engineering data records (approximately 226,000 records) in the data base. The effort, called "rescoping", was necessary to conform the information in the NPRDS data base to revisions to the NPRDS Reportable System and Component Scope Manual and the NPRDS Reporting Procedure Manual.

The rescoping involved reviewing approximately 4,000 engineering records per plant, and identifying plant components and systems covered by NPRDS. In addition, the rescoping added a new retrieval feature, i.e., application codes for key plant components. Users will be able to retrieve rapidly, for example, all reports on reactor trip breakers with just one command using these new application codes. The rescoping was completed in April 1985.

Although, in the long-term, the rescoping will result in major improvements in the accuracy and consistency of the NPRDS engineering data, it produced a major short-term disruption to the NPRD System. Thus, measures of NPRDS performance (e.g., participation) for the third quarter of CY 1984 through the first quarter of CY 1985 (i.e., the most recent quarters considered in this report) may be distorted due to the extensive effort devoted to rescoping by some utilities and by INPO.

COMPARISON OF NPRDS FAILURE REPORTS AND LERs

The initial evaluation of the NPRDS data consisted of sampling approximately 100 LERs and attempting to find corresponding NPRDS failure reports for the failures described in the LERs.

Task A

The first sample (Sample A) involved failures that occurred in January through August 1981 (before INPO assumed responsibility for the management of NPRDS). Based on the description of the failures contained in the LERs, the analysts identified 97 failures that they believed should have been reported to NPRDS.

The analysts then attempted to find corresponding NPRDS failure reports for the 97 reportable failures. In the NPRDS data base as it existed in October 1981 (i.e., Tape A), only 11 failure reports that matched the failures described in the LERs were found. Therefore, less than 12% (i.e., 11 of 97) of the failures that should have been reported to NPRDS had actually been reported as of October 1981.

The analysts also reviewed the entry in Block 24 of the LER where the licensee is requested to enter a "Y" if an NPRDS failure report had been or would be submitted for one or more of the failures described in the LER. Of the 100 LERs in the sample, 50 LERs (representing 55 failures) indicated that an NPRDS failure report had been submitted. However, only ten matching NPRDS failure reports were found [the eleventh report referred to above was for an LER coded as not being reportable to NPRDS, (i.e., an "N" in Block 24)].

Table 1: Results of Task A

Event Dates: January 1981-August 1981

NPRDS Data Base as of: October 31, 1981 (Tape A)

LERs Sampled (Sample A): 100

Failures Identified: 121

Failures Reportable to NPRDS: 97

Failure Reports Found in NPRDS File (Tape A): 11

LERs That Indicated an NPRDS Failure Report Submitted: 50 (55 failures)

Sample B and Beyond

Subsequent samples of LERs have been analyzed using LERs from the first quarter of CY 1982 (Sample B) through the first quarter of CY 1985 (Sample N). These samples have been compared to the NPRDS data base. NPRDS data for more recent quarters will continue to be evaluated quarterly and the results described in subsequent reports.

In addition to comparing each sample of LER reported failures to the associated NPRDS tape (e.g., Sample C to Tape C), each version (i.e., data tape) of the data base was used to analyze preceding samples (e.g., Tape C was searched to find reports of failures in Samples B and A). For tapes G through K, only the preceding three quarters were analyzed in this way. For tape N, the analysis included the preceding six quarters in order to determine if substantial numbers of failures were being reported as much as 18 months after the event.

The results of these analyses are summarized in Tables 2, 3, and 4. Table 2 identifies the sample period and the number of failures reportable to NPRDS from each sample [e.g., the sample from the period October-December 1982 (Sample E) described a total of 110 component failures that should have been reported to NPRDS]. Table 3 identifies when NPRDS evaluation tapes were produced. Prior to the the fourth quarter of CY 1983, each tape reflected the NPRDS data file as it existed one month after the close of the quarter to account for the permissible 30 day delay in submitting NPRDS reports (e.g., Tape E contains the NPRDS data base as it existed on January 31, 1983). In order to be consistent with the analysis procedures used by INPO, the tapes beginning in the fourth quarter of CY 1983 (Tape I) contain the data base as it existed on the last day of the subject quarter (e.g., Tape K contains the NPRDS data base as it existed on June 30, 1984).

Table 2: Samples

<u>Sample</u>	<u>Sample Period</u>	<u>NPRDS Reportable Failures in Sample</u>
A	Jan-Aug 1981	97
B	Jan-Mar 1982	104
C	Apr-Jun 1982	99
D	Jul-Sep 1982	107
E	Oct-Dec 1982	110
F	Jan-Mar 1983	112
G	Apr-Jun 1983	99
H	Jul-Sep 1983	101
I	Oct-Dec 1983	100
J	Jan-Mar 1984	100
K	Apr-Jun 1984	100
L	Jul-Sep 1984	100
M	Oct-Dec 1984	100
N	Jan-Mar 1985	100

Table 3: Versions of the NPRDS Data Base

<u>Version</u>	<u>Date of Version</u>
A	Oct 1981
B	Apr 1982
C	Jul 1982
D	Oct 1982
E	Jan 1983
F	Apr 1983
G	Jul 1983
H	Oct 1983
I	Dec 1983
J	Mar 1984
K	Jun 1984
L	Sep 1984 *
M	Dec 1984 *
N	Mar 1985

*Data for the third quarter and fourth quarter of CY 1984 were included in Tape N. Transaction dates were used to reconstuct the data base as it existed at the end of each quarter.

Finally, Table 4 contains the results of efforts to find corresponding NPRDS failure reports for failures described in the sample LERs (e.g., Tape D contained NPRDS failure reports for 25 of the 97 NPRDS-reportable failures in LER Sample A).

It is interesting to note that new NPRDS failure reports are still being added to the data base many months after the failure actually occurred. For example, Tape N (March 1985) contains six new reports of failures that occurred in the final quarter of CY 1983 (Sample I).

Table 4: Summary of Matching NPRDS Failure Reports and LER-Reported Failures

[illegible]

Conclusions

The NPRDS data for the first quarter of CY 1985 shows that: (1) The percentage of NPRDS-reportable failures that have ultimately reached the data base has remained constant at approximately 45%, and (2) the percentage of NPRDS-reportable failures reported during the quarter in which they occurred has declined from approximately 20% to approximately 5%. This stagnation may be due, however, to the extensive effort required for the major rescoping of the NPRDS data base during the period from the third quarter of CY 1984 (Sample L) through the first quarter of CY 1985 (Sample N).

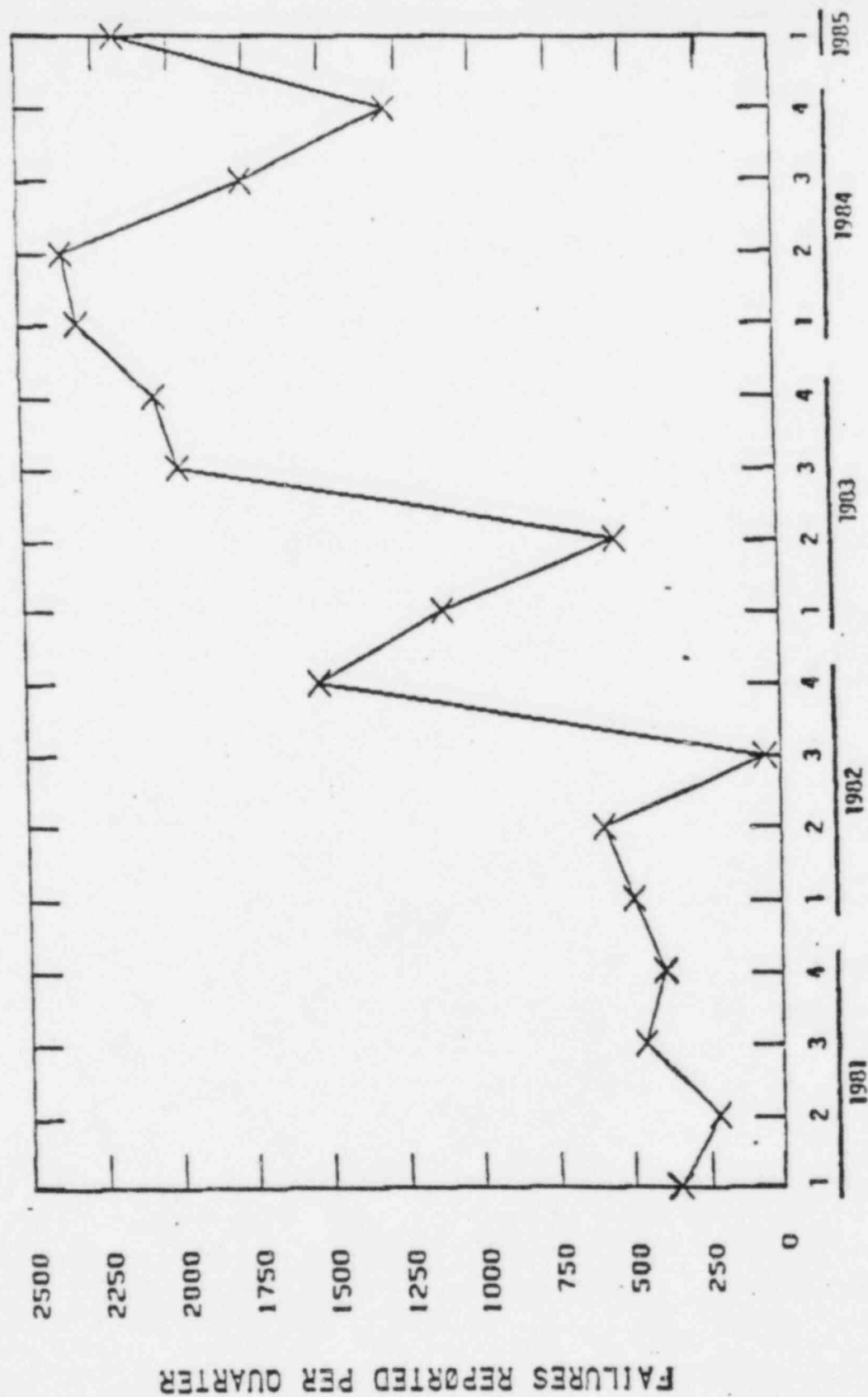
MEASURES OF NPRDS PARTICIPATION

Table 5 indicates that the quantity of reporting has declined slightly in recent quarters. In the first quarter of CY 1985, a total of 2178 reports were received; a 7% decline compared to the first or second quarters of CY 1984. Figure 1 is a plot of component failure transactions for the NPRD System as a function of calendar quarter. While these numbers do not reflect the level of timely reporting, they do in a sense measure NPRDS activity or effort. The figures show an unevenness and a leveling off in NPRDS reporting in recent quarters. This reporting pattern may again be due to the effort devoted to the rescoping activities.

Table 5: Timeliness of NPRDS Failure Reports

Year in which the failure occurred	Transaction Quarter (Quarter in which the report was added to the data base)								
	83-1	83-2	83-3	83-4	84-1	84-2	84-3	84-4	85-1
1985									193
1984	-	-	-	-	371	1072	1323	1188	1266
1983	72	191	1088	1304	1019	602	230	70	322
1982	604	260	639	454	222	185	59	10	153
1981	201	34	146	132	159	139	37	1	66
1980	90	28	77	54	223	168	51	3	135
1979	75	6	19	43	74	113	14	0	5
1978	58	5	6	29	35	32	12	4	17
1977	13	1	3	14	50	25	14	5	9
1976	0	7	4	3	39	6	10	0	2
1975	3	4	3	8	37	8	7	0	7
1974	0	2	1	16	71	6	4	0	3
1973	1	0	0	0	7	0	0	0	0
	1117	538	1985	2057	2307	2356	1761	1281	2178

Figure 1



One is tempted to divide the quarterly figures by the number of eligible plants and use this figure for tracking NPRDS completeness. Unfortunately, such an average is not always representative since the total number of reports often reflects the contribution of only a small group of plants reporting to the system. For example, in the fourth quarter of CY 1982 a total of 1,528 component failure reports were entered into the file. However, two units accounted for 783 (51%) of the total entries for the quarter, and there were no entries for 44 plants. Thus, summary statistics (e.g., average number of failure reports per plant per year) continue not to be good measures of NPRDS participation.

Figures 2 through 6 plot the number of plants vs. the number of reports for each plant for the quarter (e.g., from Figure 2, in the first quarter of 1984, 37 plants submitted between 1 and 20 reports). Clearly a key figure to watch is the number of plants that did not submit any reports in a given quarter. By comparing Figures 2 and 6, it can be seen that between the first quarter of CY 1984 and the first quarter of CY 1985 the number of plants that did not submit any failure reports during the quarter increased from 7 to 11.

In addition, it must be recognized that one report from each plant for a period of three months would result in 100% of all plants "participating", but would not constitute acceptable participation. For the first quarter of CY 1985, 28 plants submitted more than 20 reports. Thus, these plants were participating at approximately the rate projected by INPO (approximately 100 reports per year) for plants that are fully participating in NPRDS. However, the participation of the majority of plants [49 of 77 plants (64%)] fell short of this goal.

The staff also considered the level of participation of individual units from a somewhat different perspective. Figures 7 and 8* indicate the number of failures from CY 1983 and CY 1984, respectively, reported by the units eligible to participate in the NPRD System. INPO has estimated that a plant that is actively participating in the NPRD System would submit approximately 100 failure reports each year. To allow for uncertainties, the staff has expanded this estimate to a range of 80 to 120 failure reports. On this basis, a plant that is actively participating in the NPRD System should submit more than 80 failure reports each year.

From Figures 7 and 8, it would appear that only 14 units were active participants in the NPRD System in 1983. This number increased to 26 units in 1984. Conversely, and perhaps more importantly, 63 units in 1983 and 53 units in 1984 do not appear to have submitted sufficient reports to be

*The underlying data to support these summary tables are provided in Attachment A. The NRC has agreed not to publicly release plant - specific NPRDS data (e.g., Attachment A) pending the results of an on-going NRC review of an INPO request that plant-specific NPRDS data be held in confidence.

Figure 2

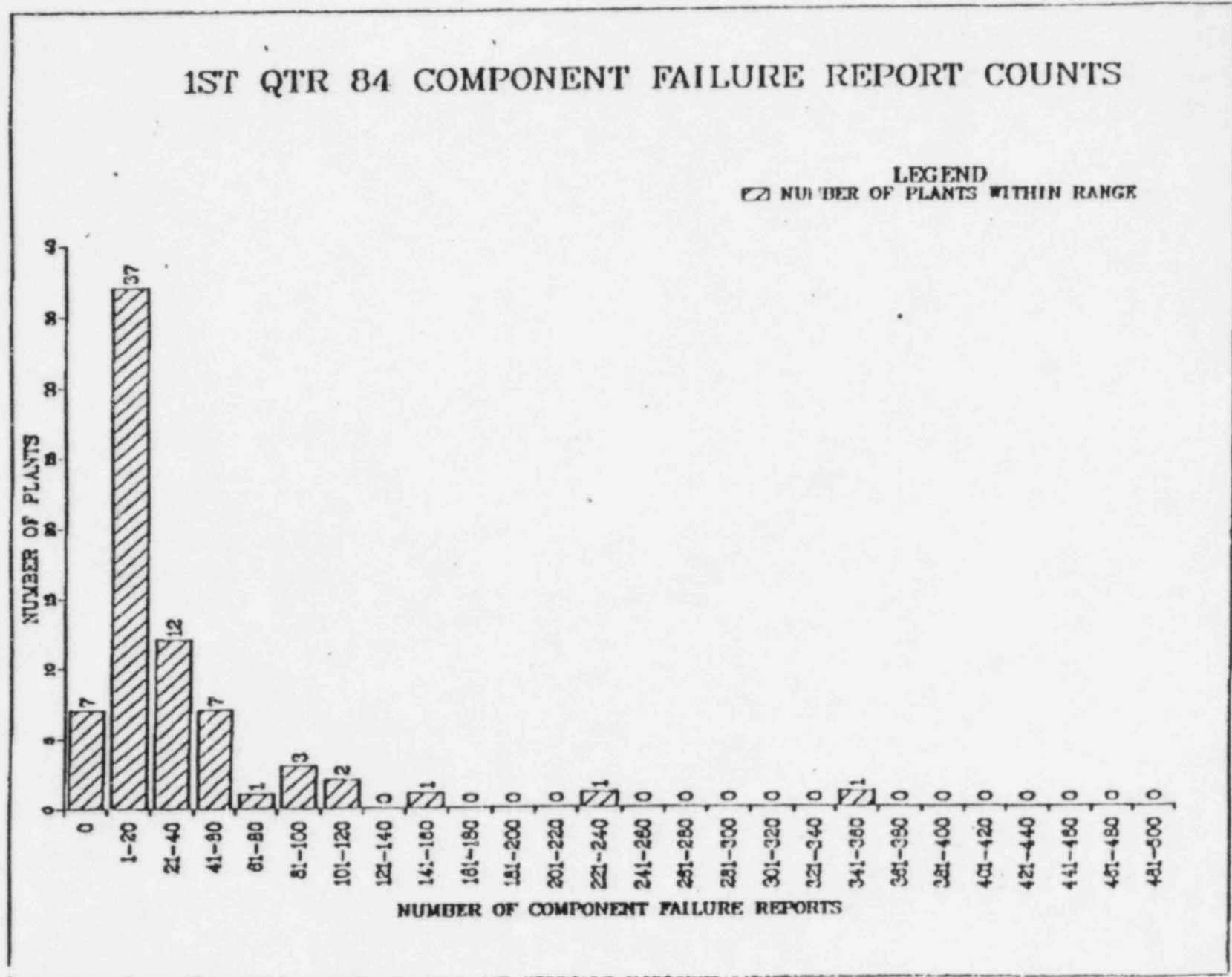


Figure 3

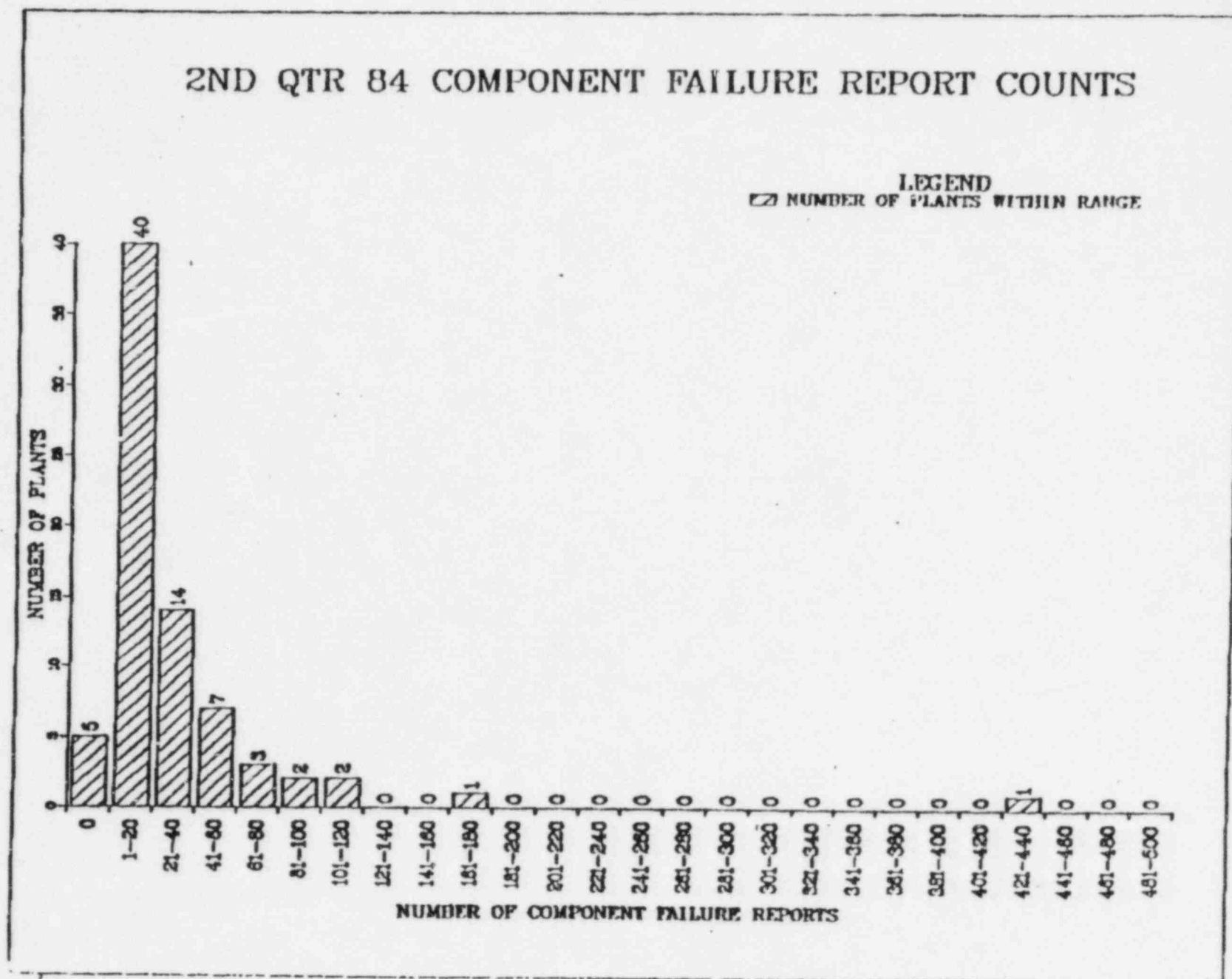


Figure 4

3RD QTR 84 COMPONENT FAILURE REPORT COUNTS

LEGEND
 ▨ NUMBER OF PLANTS WITHIN RANGE

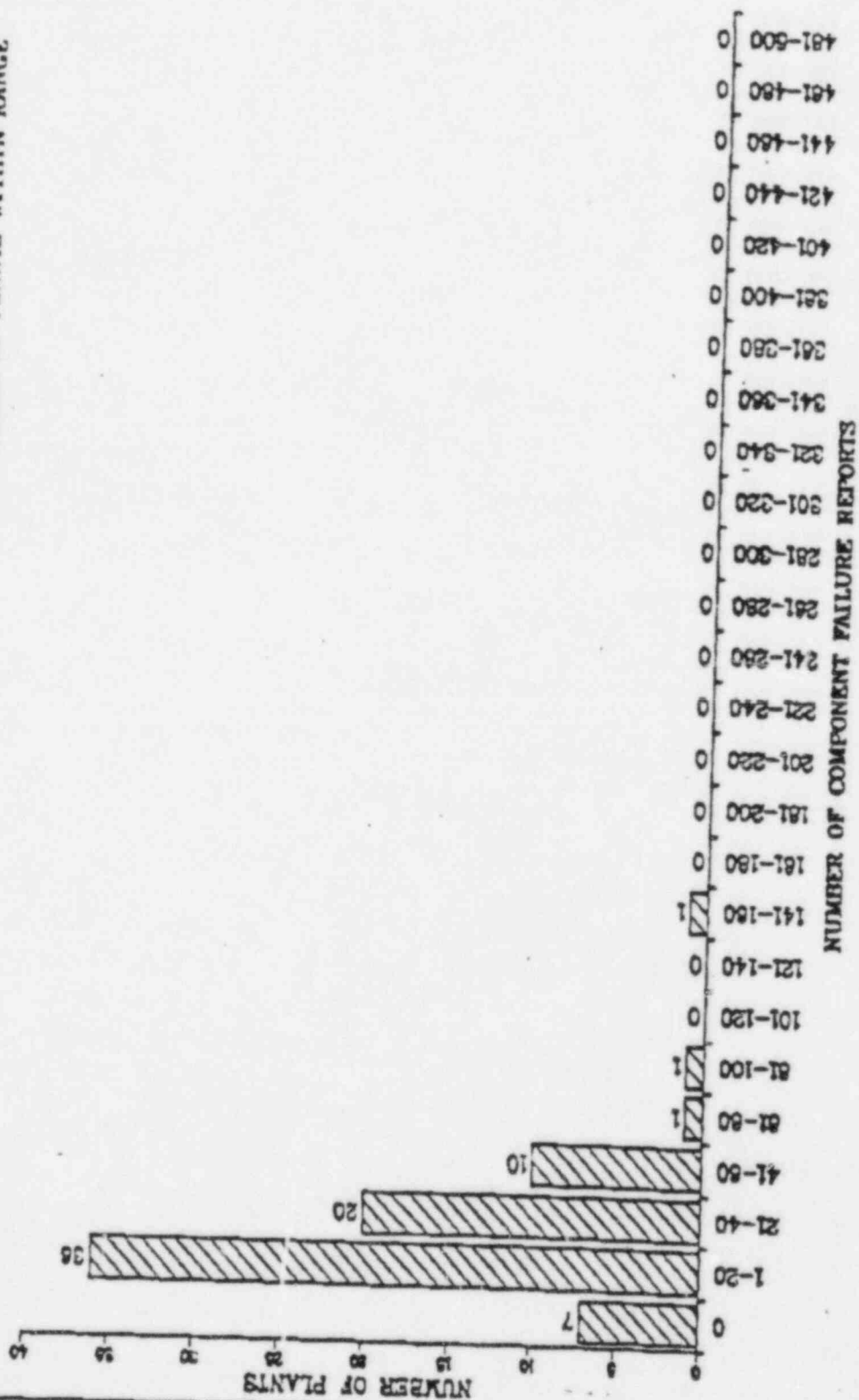


Figure 5

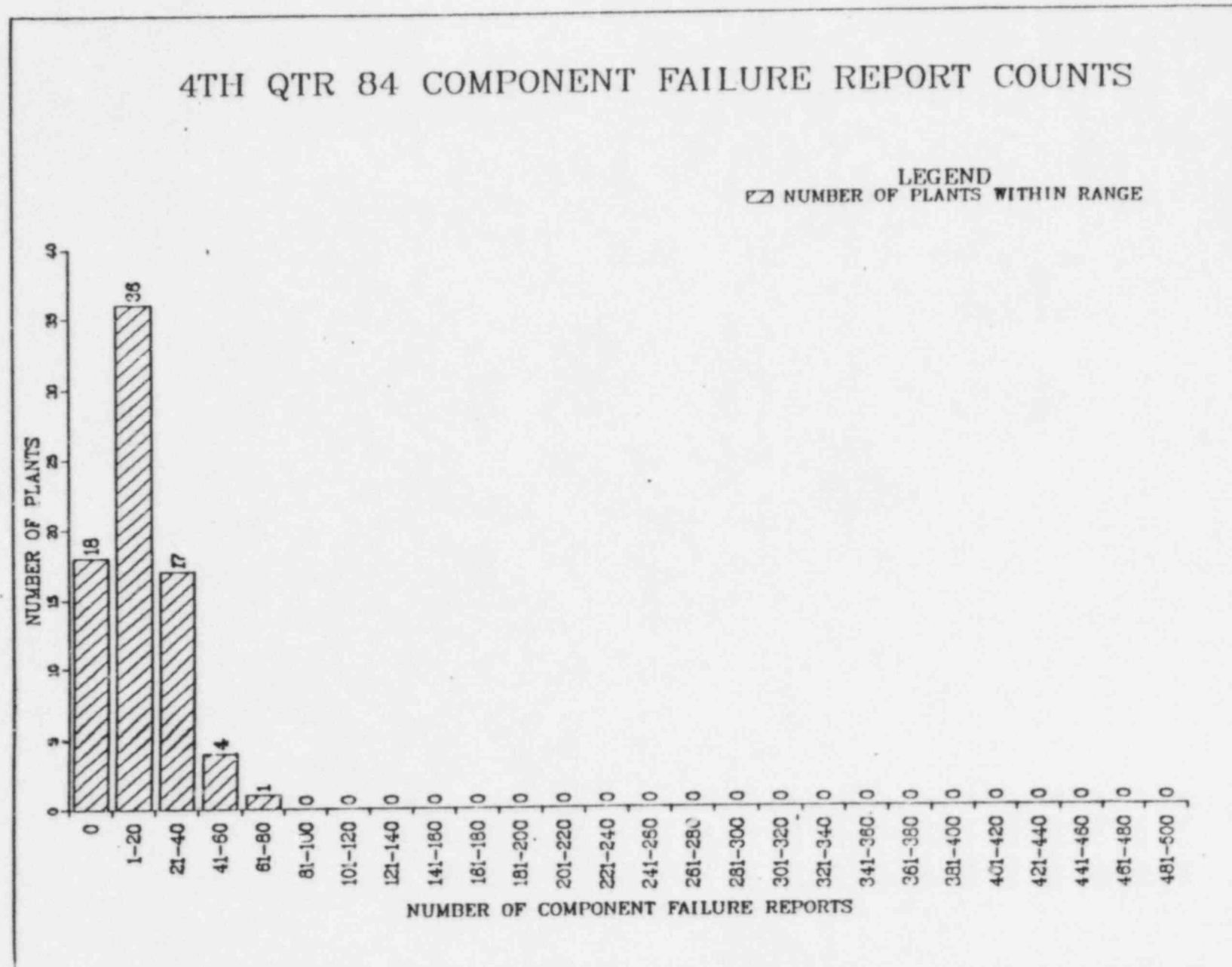
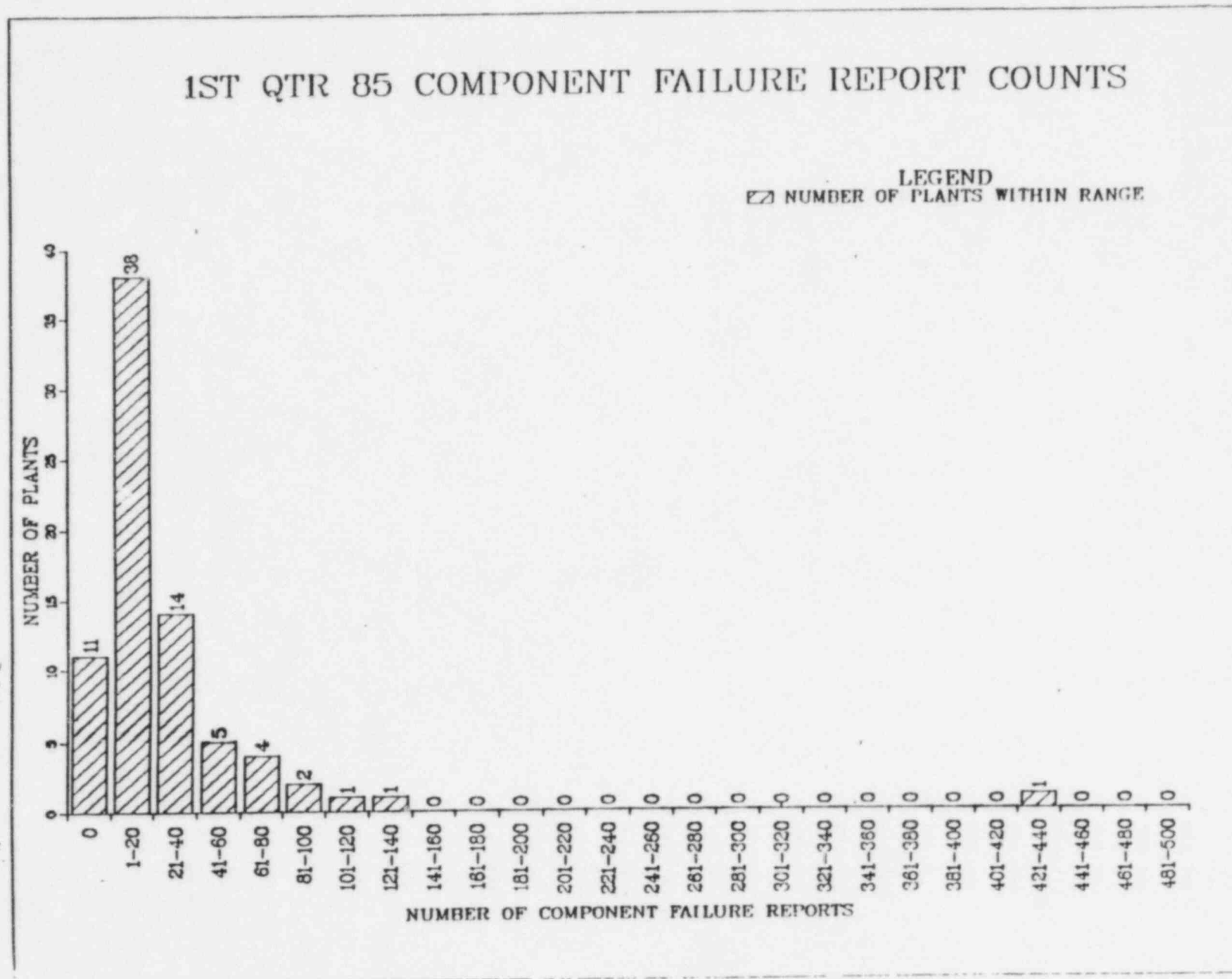


Figure 6



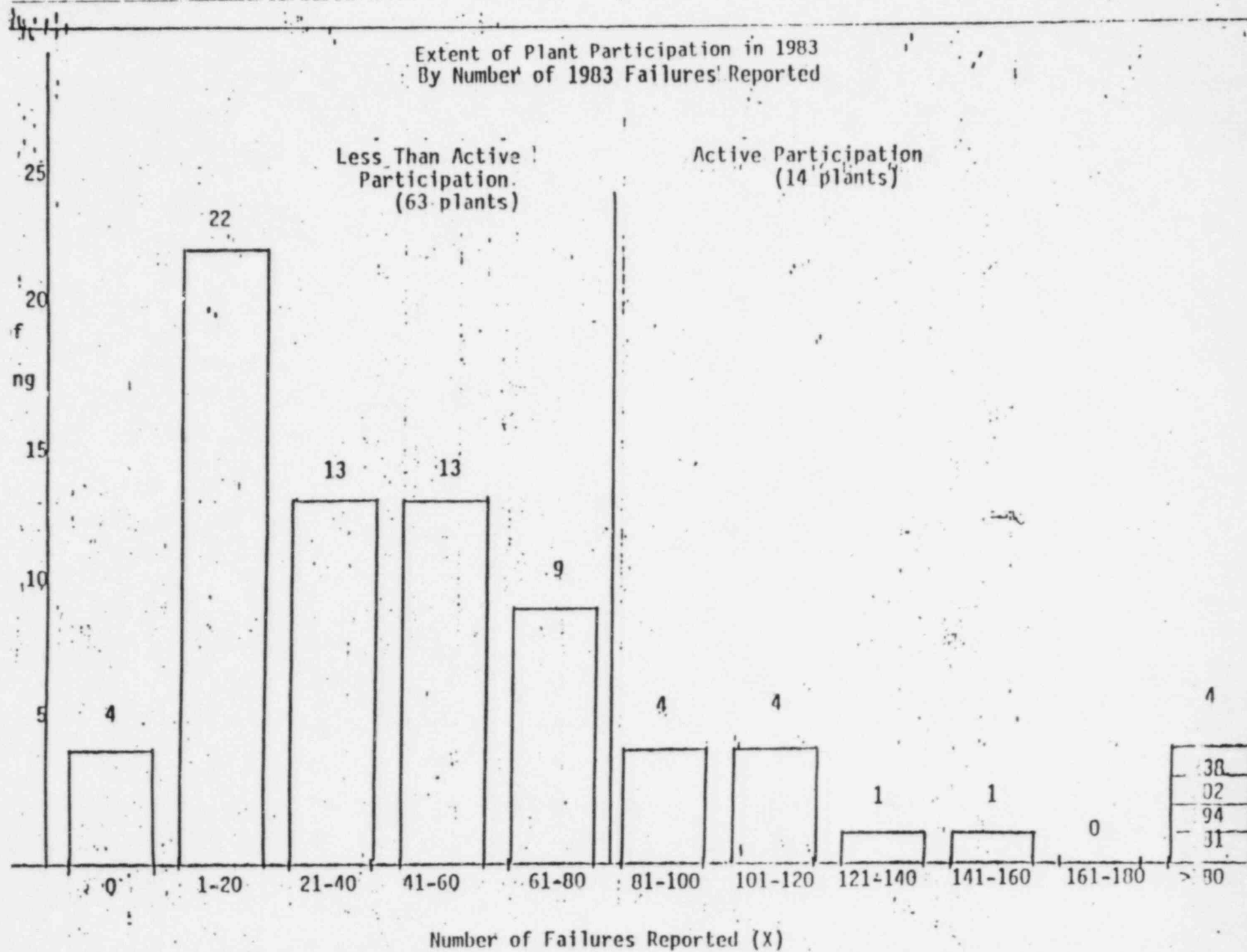


Figure 7

Extent of Plant Participation in 1984
By Number of 1984 Failures Reported

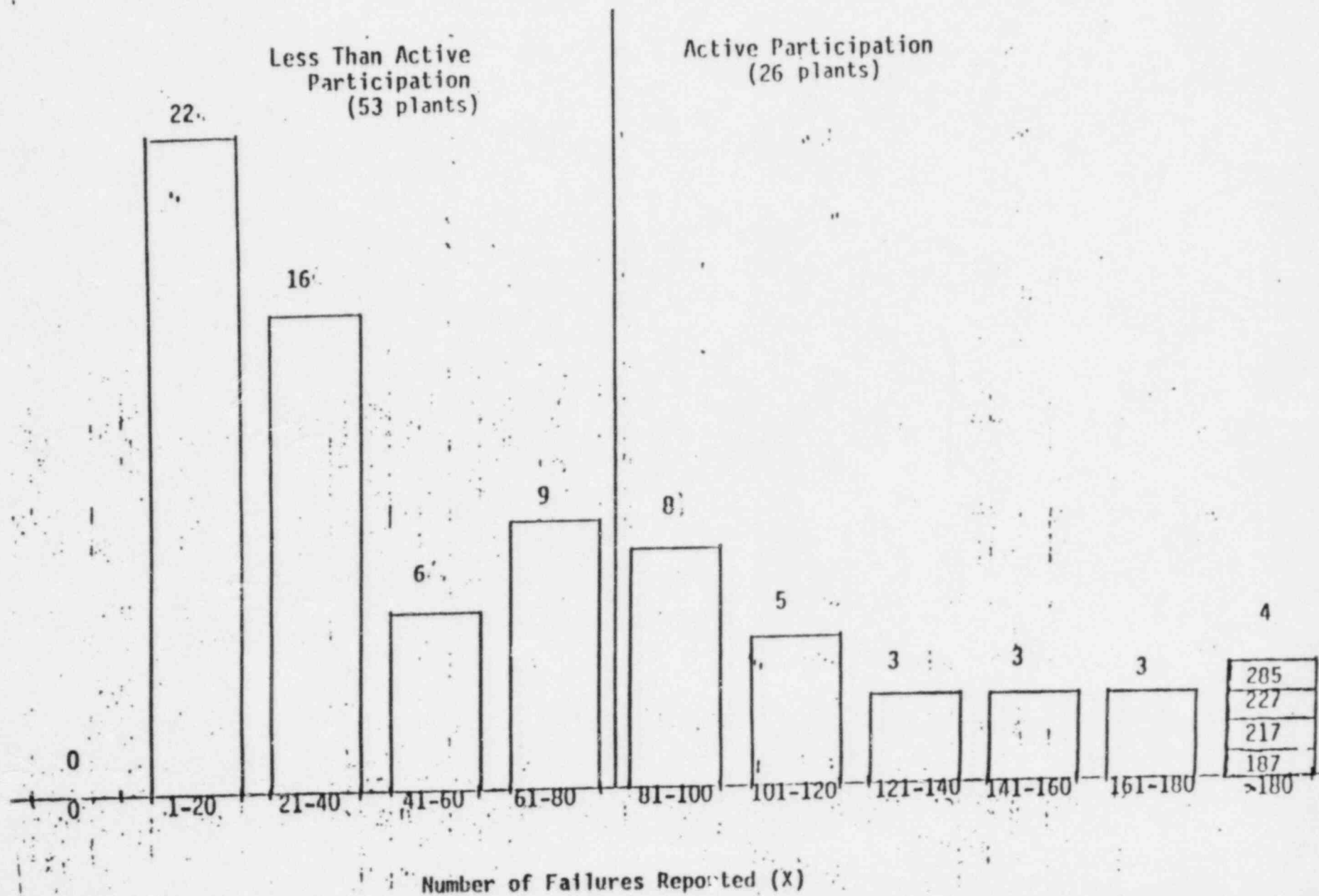


Figure 8

classified as active participants. Thus, in 1983 approximately 80% of the plants were not participating at a level thought to represent active participation. In 1984, the extent of participation increased; however, about 65% of the plants still were below the threshold assumed for an active participant in this system which includes 4000-6000 components per unit.

Additionally, it should be noted that 41 plants or about one-half of the eligible plants did not submit sufficient reports in either 1983 or 1984 to be classified as an "active participant" (See Table A-2 in Attachment A). In addition, 26 units submitted 20 or fewer reports of failures that occurred in 1983. This number decreased to 22 units in 1984. The staff believes that participation at this level is indicative of only token participation and is clearly indicative of units that are not actively participating in the NPRD System.

While there is obviously considerable uncertainty in this analysis, it clearly indicates that while there are an increasing number of units that are actively participating in the NPRD System, there are still many units that are not yet actively participating in the system and there are a number of units that are still providing only token participation in the system.

INPO has indicated that the extent of unit participation has substantially increased in the second quarter of 1985, and that participation is expected to further increase now that the rescoping activity has been completed. The next semiannual report will analyze the second and third quarters of 1985.

Conclusions

A large percentage of eligible plants submitted failure reports to the NPRD System in the first quarter of CY 1985. For this quarter, 66 plants submitted at least one failure report. However, 11 plants did not submit any failure reports during the quarter. In addition, there are still many plants that have submitted a rather small number of reports (38 plants submitted from 1 to 20 reports each during the most recent evaluation quarter). The majority of plants seem to be providing only limited participation in the NPRD System. The percentage of plants which are actively participating is increasing but at a slow rate. It is hoped that the extent of plant participation will increase, perhaps significantly, following completion of the rescoping work described earlier.

TIMELINESS OF NPRDS DATA

On January 28, 1983, INPO sent a letter to utilities urging that priority in failure reporting be given to recent failures. The staff has examined

the data to determine the degree of response to this letter in terms of quantity and timeliness of the data.

Table 5 shows the component failure records sorted by the transaction quarter (i.e., the quarter that the record was added to the data base) and the year in which the failure occurred.

In terms of the timeliness of reporting, in the first quarter of CY 1985 1459 component failures were reported that occurred in 1984 or 1985. This number is 67% of the total entries for the quarter. By comparison, in the first quarter of CY 1984, only 1390 reports (60%) of the reports described failures that occurred in 1983 or 1984.

Conclusion

The timeliness of NPRDS failure reporting continues at approximately the same level observed in 1984. In the first quarter of 1985, 67% of the reports submitted described failures that occurred in 1984 or 1985. Thus, about one third of the reports submitted in this quarter reflect component failures that occurred more than one year ago, and in fact component failures from 1974 continue to be reported.

QUALITY OF THE NPRDS FAILURE REPORT NARRATIVE

To assess the quality of the NPRDS Failure Reports, a sample of NPRDS Failure Reports was selected and the narrative description of the failures were reviewed to determine if the text described the failure in sufficient detail that system users could understand the failure, its causes, corrective actions, and the implications for similar equipment. The narratives were graded as adequate, probably adequate, and inadequate. The results of this analysis are presented in Table 6.

Table 6: Quality of NPRDS Failure Reports

	Fourth Quarter CY 1983		First Quarter CY 1984		Second Quarter CY 1984		First Quarter CY 1985	
Adequate	71%	95%	63%	97%	46%	92%	80%	97%
Probably Adequate	24%		34%		46%		17%	
Inadequate	5%		3%		8%		3%	
Total Number of NPRDS - 4 Forms Evaluated	62		68		72		106	

The percentage of adequate and probably adequate narratives has remained essentially constant in a range from 92% to 97%.

Conclusions

The quality of the NPRDS reports (particularly the failure reports) has remained essentially constant at a relatively high level. Over 90% of the NPRDS failure reports were judged to contain sufficient information to permit meaningful analysis. This is considered to be fully satisfactory and a strong point in the system's implementation.

OVERALL SUMMARY

The improvement in the NPRD System reporting first seen in the third quarter of CY 1983 has declined somewhat through the first quarter of CY 1985. While the overall improvements continue to be significant, further improvements were expected, but have not occurred. There were still 11 plants (compared to 7 in the first quarter of CY 1984) that did not submit any failure reports during the quarter, and 38 plants (compared to 37 in the first quarter of CY 1984) that submitted 20 or fewer reports in the subject quarter.

While the NPRD System is substantially improved compared to the system as it existed in 1981, it is of continued concern that the majority of plants have not met the threshold considered representative of an "active participant". Thus, the staff is becoming increasingly concerned that the NPRD System may not reflect a consistent and high level of reporting from all units. This objective, however, is a necessary prerequisite for the system to be used as a basis for statistical analysis of component failures, and to be used as a source of component failure data for specific analyses (e.g., in assessing the type and frequency of failures involved with the Davis Besse event). These concerns will heighten if significant improvement in the extent of participation, predicted by INPO, are not confirmed in the next assessment period.