Policy on Factors Causing Fatigue of Operating Personnel at Nuclear Reactors

Dr. David R. Desaulniers, Human Factors Analyst
Operator Licensing, Human Performance and Plant Support Branch

September 14, 2000

Attachment 3

Policy on Factors Causing Fatigue of Operating Personnel at Nuclear Reactors

Policy Elements

- Scope of personnel
- Objective for operating plants
- Overtime guidelines
- Process for deviating from guidelines

Policy on Factors Causing Fatigue of Operating Personnel at Nuclear Reactors

- Plant staff who perform safety-related functions
  - Senior Reactor Operators
  - Reactor Operators
  - Auxiliary operators
  - Health Physicists
  - Key Maintenance Personnel
- Key Maintenance Personnel
  - defined in GL 83-14
  - maintain, repair, modify, or calibrate safety-related SSCs
  - Includes direct supervisors

Policy on Factors Causing Fatigue of Operating Personnel at Nuclear Reactors

Objective for Operating Plants

"Enough plant operating personnel should be employed to maintain adequate shift coverage without routine heavy use of overtime"

"The objective is to have operating personnel work a normal 8-hour day, 40-hour week while the plant is operating."

Policy on Factors Causing Fatigue of Operating Personnel at Nuclear Reactors

Overtime Guidelines

- Pre-conditions
  - Unforseen circumstances
  - Periods of shutdown
  - To be used on a temporary basis
- Limits
  - Individuals should not be permitted to work more than:
    - 16 hours straight
    - 16 hours in any 24-hour period
    - 24 hours in any 48-hour period
    - 72 hours in any 7-day period
  - A break of at least 8 hours should be allowed between shifts

Guideline Deviations

Policy Guidelines and TS Requirements

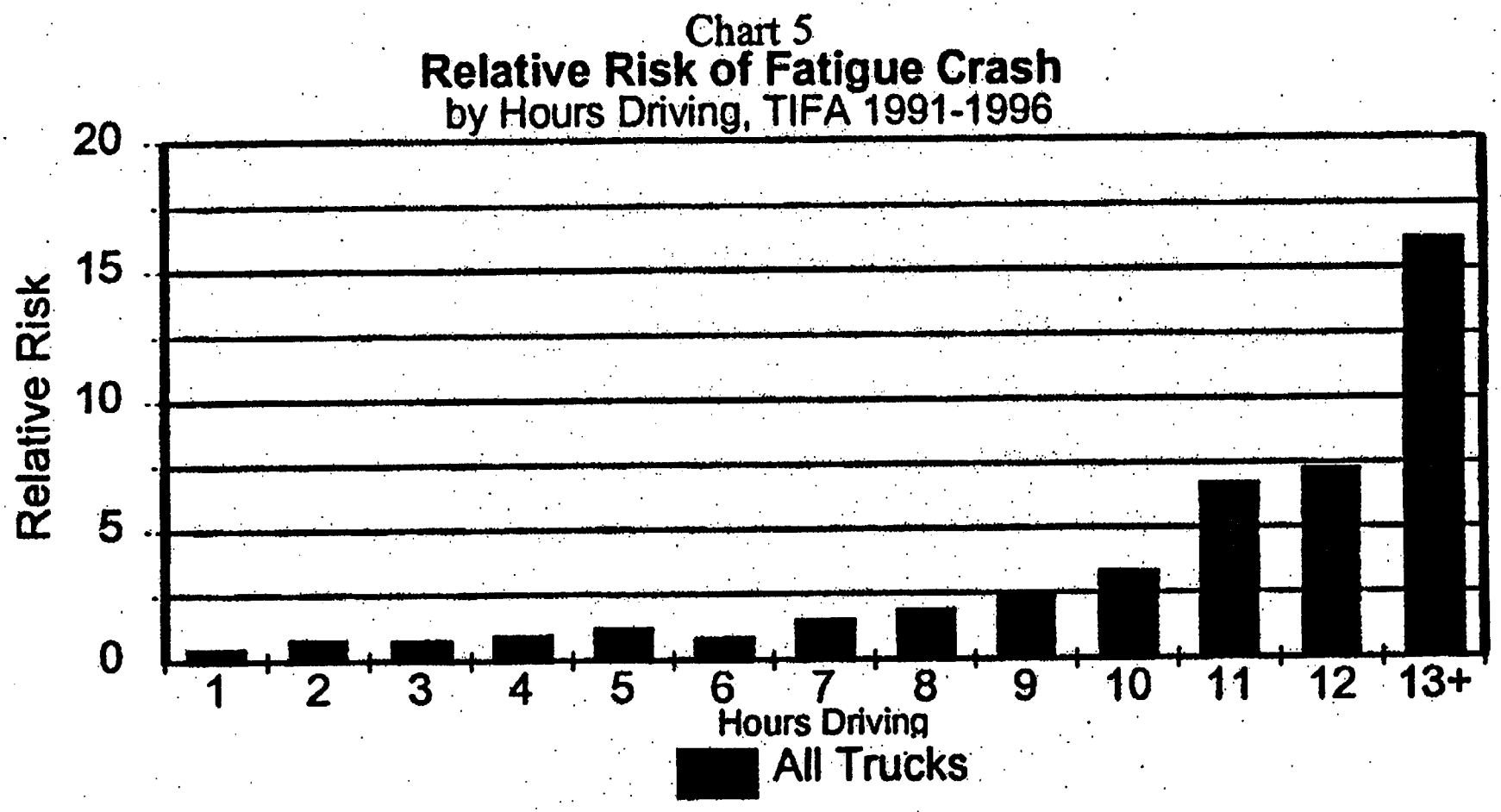
"Recognizing that *very unusual circumstances* may require deviation from the above guidelines, such guidelines shall be authorized by the plant manager or his deputy, or higher levels of management" (GL 82-12)

"*Routine deviation* from the above guidelines is *not authorized*" (GL 82-16 and GL 83-02)

Why Deviations are a Concern

- Fatigue Impairs
  - Attention / divided attention
  - Reasoning
  - Computational skills
  - Oral communications
  - Decision making
- Deviations increase risk of fatigue-induced impairment

Extended Working Hours



Source: 65 FR 25544, Federal Motor Carriers Safety Adminstration, Hours of Service of Drivers; Driver Rest and Sleep for Safe Operations

Extended Working Hours

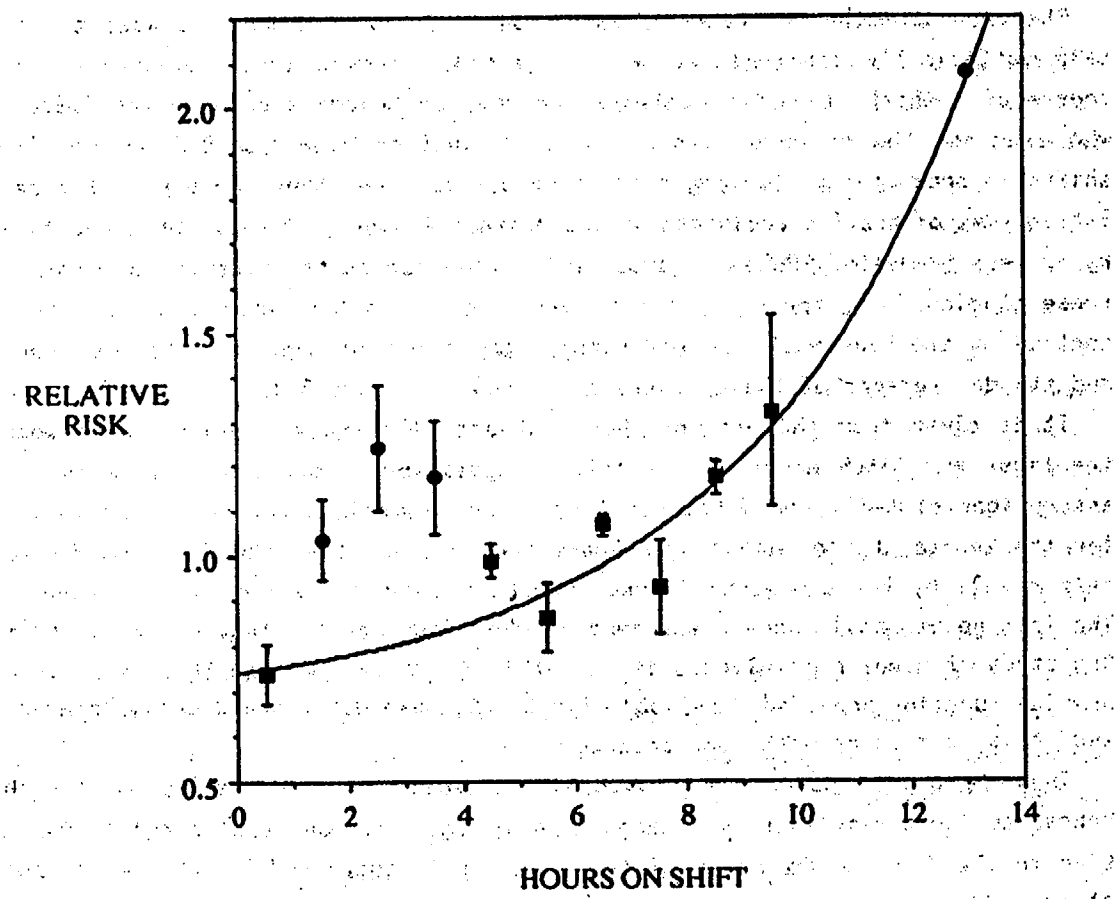
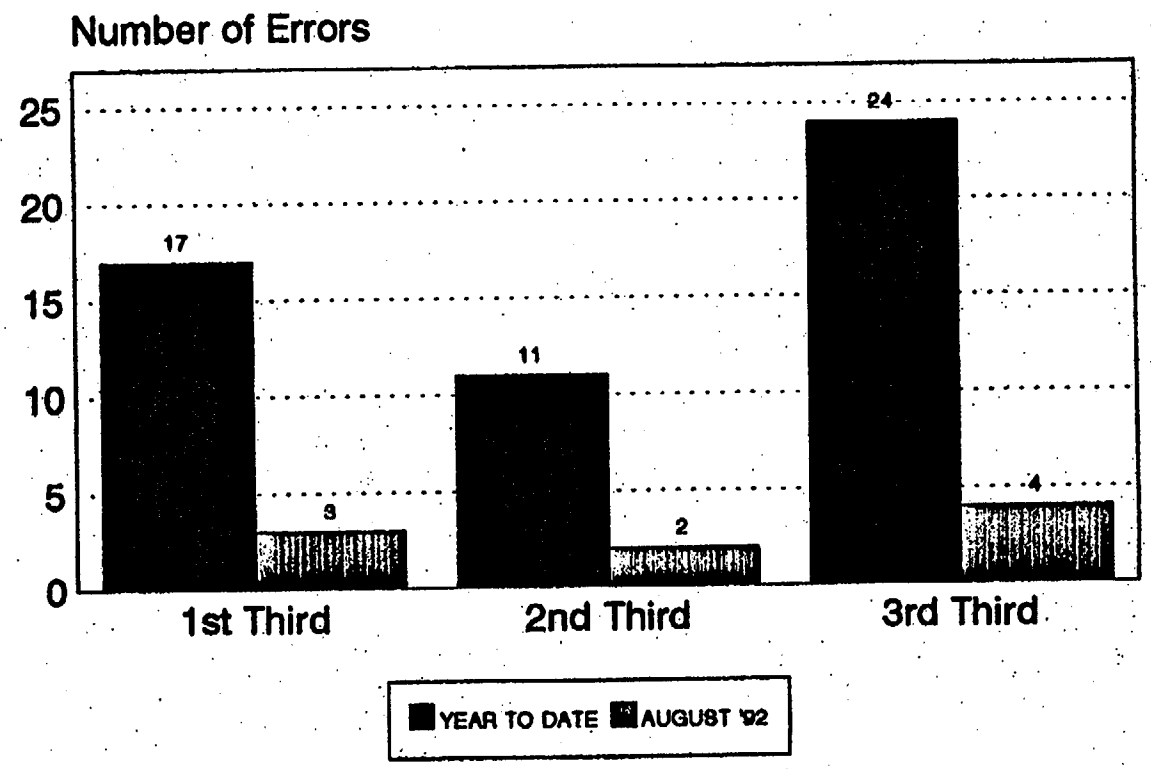


Fig. 3.4 The averaged time on shift trend in accident risk. See text for details of the studies included, and for the fitting of the exponential function.

Source: Colquhoun, W.P., Costa, G., Folkard, S., and Knauth, P., Shiftwork: Problems and Solution, Peter Lang, Frankfurt Germany, 1996

Extended Working Hours

Operations Department Error Tracking
Errors by Third of Shift



August 1992

Extended Working Hours

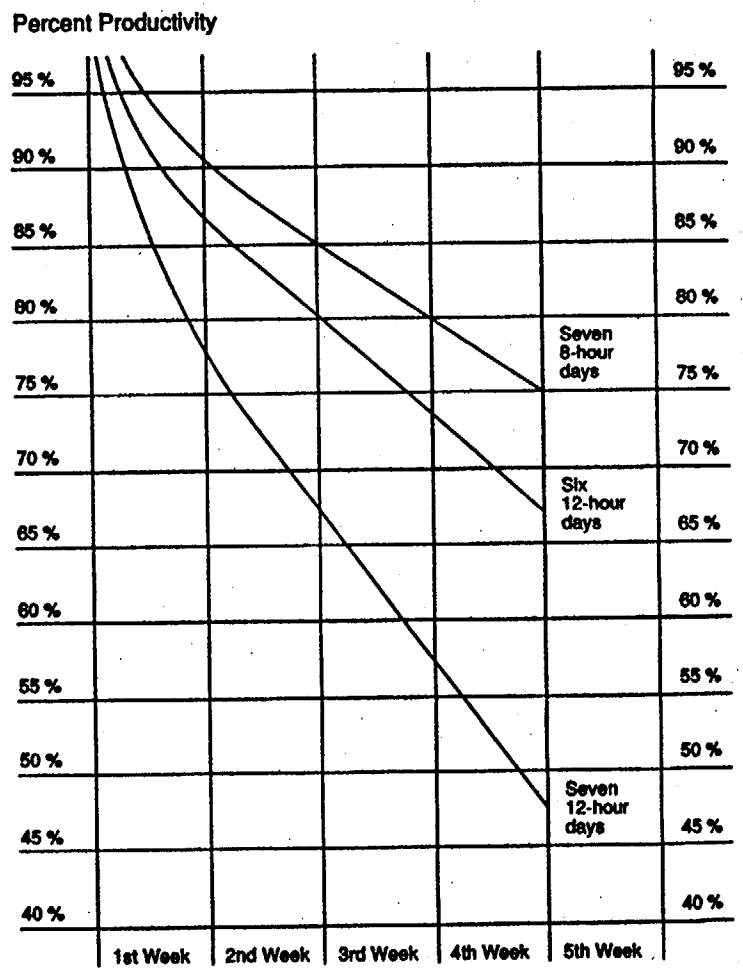


Figure 4.6: Productivity as a function of successive weeks of overtime. Data were obtained from electricians by the National Electrical Contractors Association; productivity rates were based on the amount of wiring installed during a given interval. (Adapted from Electrical Contractors' Union.)

COMPARISON OF HOURS OF SERVICE IN OTHER INDUSTRIES

	GL. 82-12	Petition	Com Pilots*	AF Pilots	ATC	Truck-US	Truck-CAN	Truck-Prop	Rail	Marine	EU-Gen	EU-Sea	Euro NPP
Hrs worked in 24-hr period	16	16		12	10	10**/ 15***	13**/ 15***	12	12	8-15		14	8
Length of break	8	8-16	9-11			8	8	10	10		11	10	
Hrs worked in 48-hr period	24	24											
Hrs worked in 72-hr period										36			
Hrs worked in 7-day period	72	60/72	30-34*			70/ 8days	60	60			48	72	34.5
Hrs rest in 7-day period					24			32-56			24	77	
Hrs worked in 14-day period		108/13 2											
Hrs worked in 30-day period			100-120*	125									
Hrs worked in Quarter				330									
Hrs worked in a year		2496/ 2704	1000-1200*										170-days
Night work											8/24		

*Flight time **Drive time ***Duty time

Why Deviations are a Concern

Convergent Validation

- Study of 1.2M accidents shows an exponentially increasing accident risk after 9th hour of work
- Studies indexing sleep deprivation to BAC show a precipitous drop in performance after 13 hours of wakefulness
- Brain scans of sleep deprived individuals show marked decreases in brain glucose metabolism
- Common experience

Why Deviations are a Concern

- NRC's quantitative working hour guidelines are least restrictive of all work hour regulations reviewed
- Deviation process allows for even more work hours and less rest

NUCLEAR ENERGY INSTITUTE

James W. Davis
DIRECTOR, OPERATIONS
NUCLEAR GENERATION DIVISION

August 29, 2000

Mr. Glenn M. Tracy, Chief
Operator Licensing, Human Performance and
Plant Support Branch
U. S. Nuclear Regulatory Commission
Mail Stop O-6 D17
Washington, DC 20555-0001

Dear Mr. Tracy:

The NRC has received a petition for rulemaking to significantly increase the restrictions on plant staff working hours to address a perceived issue of fatigue. In public meetings, the absence of factual data has made it difficult to address the widely divergent views expressed on the magnitude of fatigue as an issue. NEI has completed a survey of the nuclear power generation industry to collect data on working hours for plant staff performing safety-related functions.

Our review of the survey results show that the guidance in Generic Letter 82-12 and Standard Technical Specifications remains valid and is adequate to provide public protection. Enclosure 1 provides the survey questions for which data was analyzed. Enclosure 2 summarizes the survey in a series of charts. Enclosure 3 is a spreadsheet with the information used in the analysis.

We would like to meet with the NRC staff to discuss the results of this survey in more detail. If you have any questions, please contact me at 202-739-8105.

Sincerely,

James W. Davis

James W. Davis

Enclosures

Attachment 4

1776 I STREET, NW SUITE 400 WASHINGTON, DC 20006-3708 PHONE 202.739.8105 FAX 202.785.1898 jwd@nei.org

ML003746495

Plant Staff Working Hour Limits Survey

1. **Generic Letter 82-12 and Standard Technical Specifications (NUREGS 1430, 1431, 1432, 1433, and 1434) provide restrictions on working hours for personnel performing safety-related functions. This section asks for information on how these requirements are implemented at your facility so results can be compared on an equitable basis.**

		(For 47 sites responding to question 2.)	
1a.	Are all the working hour restrictions of GL 82-12 included in the plant Technical Specifications? (If no, explain differences and provide a copy of implementing instructions that contain the licensee's commitment.)	Yes – 31	No – 16
1b.	Does the facility have administrative procedures that implement the work hour policy? (If yes, provide a copy. If no, explain how the process is controlled.)	Yes – 47	No – 0
1c.	Are procedures different for outage periods? (If yes, explain difference.)	Yes – 5	No – 42
1d.	Is fatigue addressed in the fitness-for-duty program and/or considered as part of the process for authorizing exceeding working hour limits? (If yes please provide a copy of the applicable instructions.)	Yes – 46	No – 1
1e.	Who (titles/responsibilities) may authorize exceeding working hour limits?	In general, Plant Manager or Designee approves as allowed by procedures	

2. **This section determines the number of people, by position, that the facility includes as staff who perform safety-related functions and are subject to the working hour limits discussed above. For multi-reactor sites provide the data on a site-wide basis.**

2a. Please complete the following table based on current positions **<u>for positions to which Section 1 working hour limits apply</u>**. For shift workers, specify the number on one shift, length of the shift, and the number of crews, including all plants on site.

Position	Number per shift (sum for all plants)	Length of shift (8, 12 hours, etc)	Number of crews	Other staff (day)
RO				
SRO				
Non-Licensed Operators				
Shift Technical Advisor				
Health Physics				
I&C				
Chemistry				
Electrical				
Mechanical				
Engineering				
Others (list)				

2b. Do these limits apply to any outside maintenance contractors? Yes – 44 No – 3

3. **This section asks for information on the deviations from the above guidelines for the past three years. Data is collected for two cases: when the plant is operating, in Mode 1 for the full 24 hour period; and when the plant is in outage, any other mode during the 24 hour period. This is simple for single unit sites. For multiple-unit sites it is more difficult to clearly determine what caused the deviation. Thus, for a multi-unit site, if any plant is not in Mode 1 during the 24 hour period, it is considered an outage day.**

For consistency, all licensees need to categorize deviations similarly. One case of exceeding working hour limits can result in several deviations.

- For example: An individual works Monday through Saturday with no days off. Monday through Friday, the individual works 12-hour days. On Saturday, the individual works a 16-hour day. This would be categorized as two deviations since the individual exceeded the 72/7 and the 24/48 guideline.
- Similarly, if an individual works two weeks of consecutive twelve hour days with no days off, this would be categorized as 8 deviations, since the individual exceeded the 72/7 guideline on day 7 through day 14.

3a. For periods in which all plants at the facility were operating, Mode 1, provide the number of deviations in each category.

1997 Operating Data (Number of Days_____)

	Type of Deviation			
	8 hours between shifts	16/24	24/48	72/7
RO/SRO				
Non-Licensed Operators				
All Others				

1998 Operating Data (Number of Days_____)

	Type of Deviation			
	8 hours between shifts	16/24	24/48	72/7
RO/SRO				
Non-Licensed Operators				
All Others				

1999 Operating Data (Number of Days_____)

	Type of Deviation			
	8 hours between shifts	16/24	24/48	72/7
RO/SRO				
Non-Licensed Operators				
All Others				

3b. For periods in which at least one plant was in outage, not in Mode 1, provide the number of deviations in each category. Note, the days in 3a and 3b, for each year, should add up to 365.

1997 Outage Data (Number of Days_____)

	Type of Deviation			
	8 hours between shifts	16/24	24/48	72/7
RO/SRO				
Non-Licensed Operators				
All Others				

1998 Outage Data (Number of Days_____)

	Type of Deviation			
	8 hours between shifts	16/24	24/48	72/7
RO/SRO				
Non-Licensed Operators				
All Others				

1999 Outage Data (Number of Days_____)

	Type of Deviation			
	8 hours between shifts	16/24	24/48	72/7
RO/SRO				
Non-Licensed Operators				
All Others				

4. **The use of overtime during refueling outages is of particular interest. Please provide summary data for the last two refueling outages conducted at the site. If only one refueling outage has been conducted since January 1, 1997, only include the one outage in this section.**

Data for refueling outage from _____ to_____ Plant_____

	Type of Deviation			
	8 hours between shifts	16/24	24/48	72/7
RO/SRO				
Non-Licensed Operators				
All Others				

Data for refueling outage from _____ to_____ Plant_____

	Type of Deviation			
	8 hours between shifts	16/24	24/48	72/7
RO/SRO				
Non-Licensed Operators				
All Others				

5. **For the purposes of this survey, *Overtime* is defined as those hours worked in excess of a *nominal* 40-hour work-week. Overtime does not include special compensation for working nights, weekends, or holidays unless they are above and beyond the *nominal* 40-hour work-week.**

For example, if an individual is assigned to a rotating shift and works 36 hours the first week, 36 hours the second week, and 48 hours the third week, the individual has worked a *nominal* 40-hour work-week. Even if the individual has been compensated for the extra eight hours at an overtime rate during the 48-hour work-week, this should not be included as overtime in this survey.

For individuals that are subject to working hour restrictions as discussed in item 1 above, provide a summary of annual overtime hours worked:

1997 Data

	Overtime hours worked								
	0	<200	201 - 300	301 - 400	401 - 500	501 - 600	601 - 700	701 - 800	>800
RO/SRO									
Non-Licensed Operators									
All Others									

1998 Data

	Overtime hours worked								
	0	<200	201 - 300	301 - 400	401 - 500	501 - 600	601 - 700	701 - 800	>800
RO/SRO									
Non-Licensed Operators									
All Others									

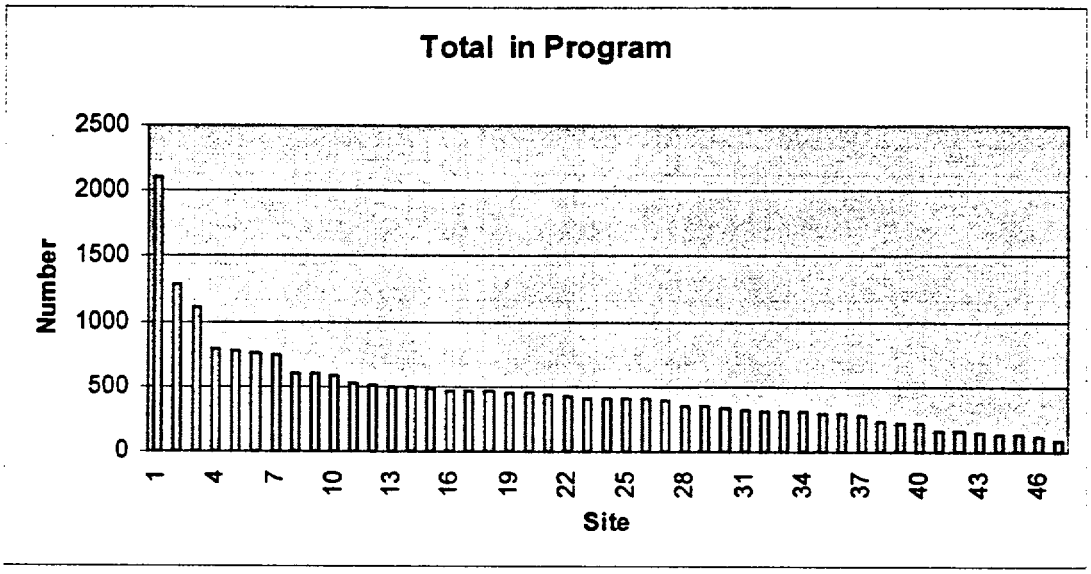
1999 Data

	Overtime hours worked								
	0	<200	201 - 300	301 - 400	401 - 500	501 - 600	601 - 700	701 - 800	>800
RO/SRO									
Non-Licensed Operators									
All Others									

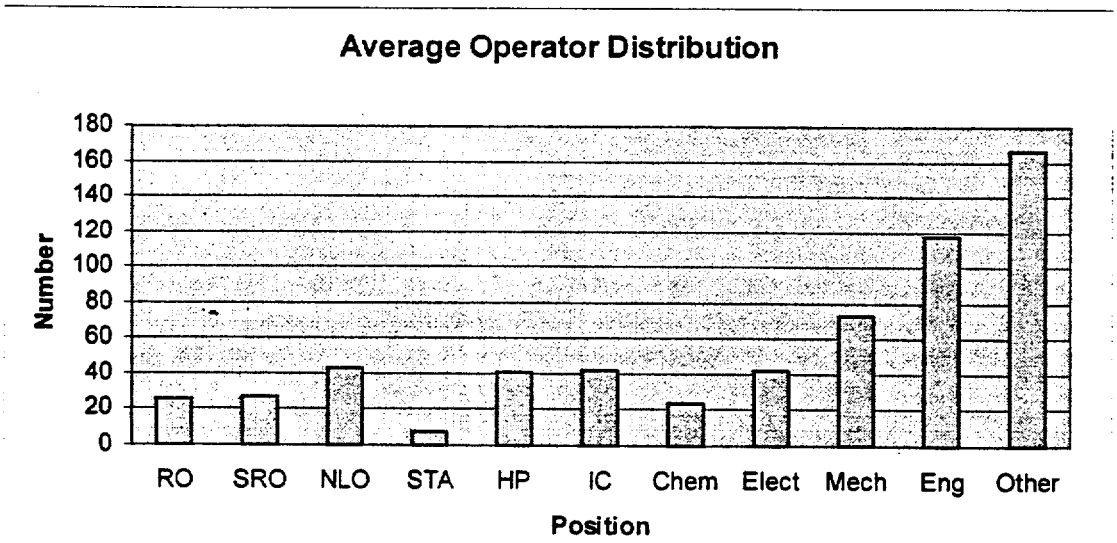
Working Hour Limits Survey Summary

Question 2:

This chart shows the total number of people at each site that are in positions to which working hour limits apply.



This chart shows, for the average facility, the number of operators in each category of question 2.



On average a site has 463 people covered by working hour limits. The distribution between RO/SRO, NLO, and Others should be considered in analyzing the number of exemptions in questions 3 and 4 of the survey: On average a site has:

52 RO/SROs
43 NLOs
368 Others

Question 3:

Chart for 1997 represents 30 plants operating an average of 265 days.

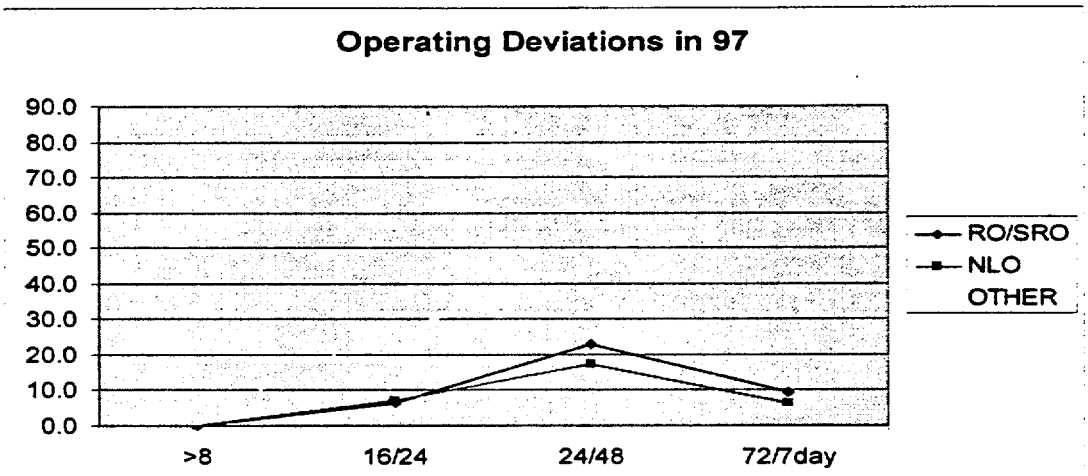


Chart for 1998 represents 34 plants operating an average of 296 days.

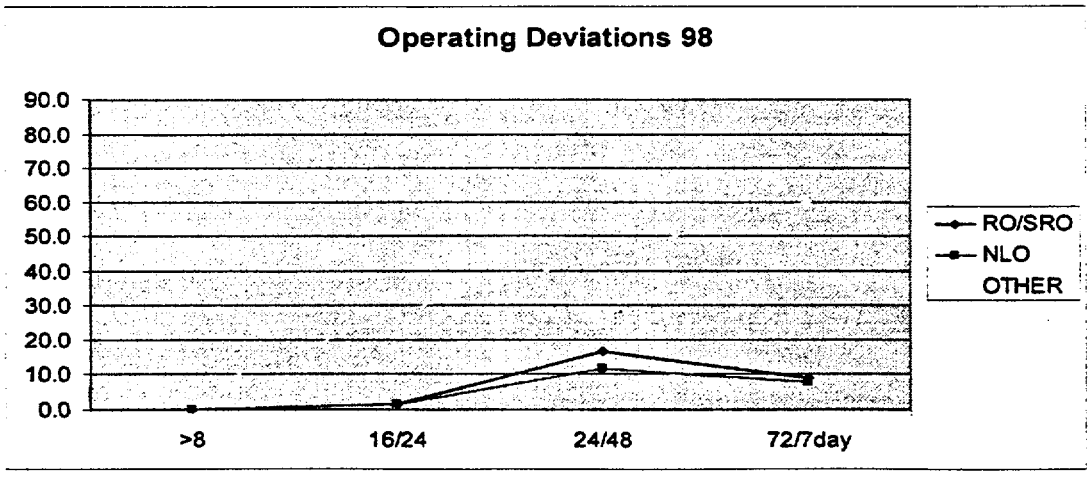


Chart for 1999 represents 41 plants operating an average of 304 days.

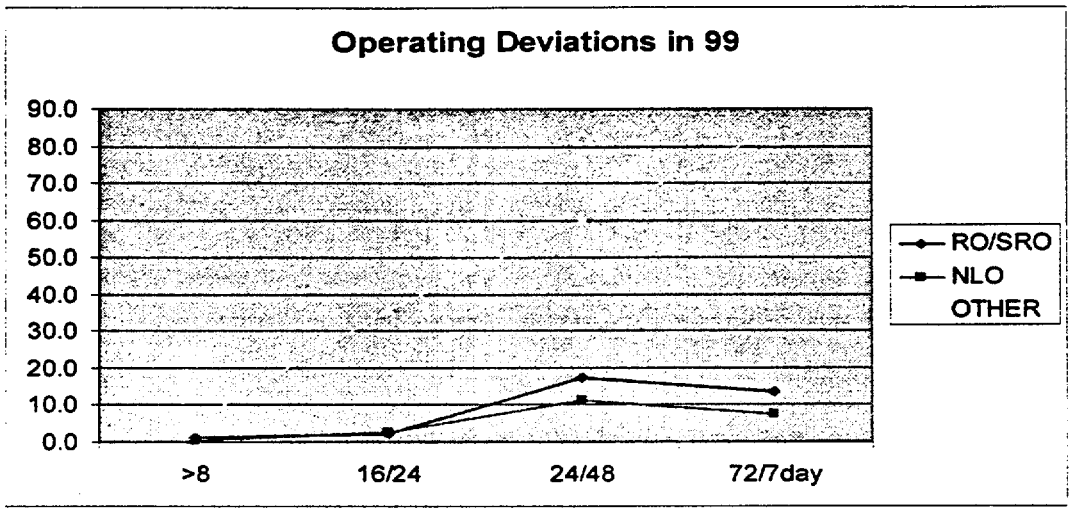
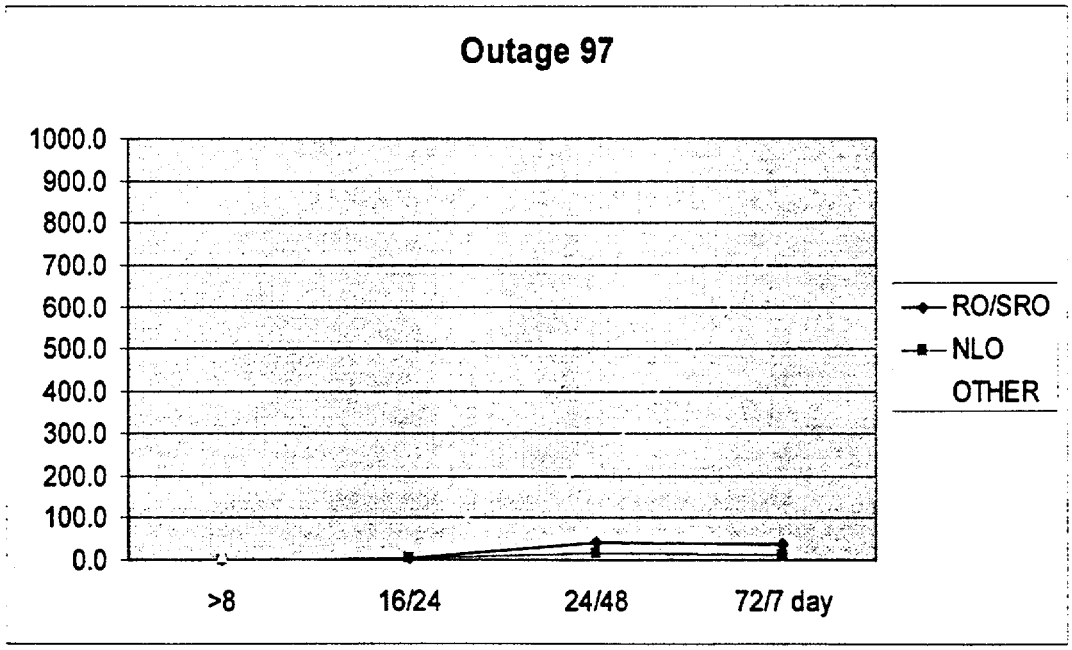


Chart for 1997 Outages represents 28 plants with an average 130 days in



outage.

Chart for 1998 Outages represents 34 plants with an average 99 days in outage.

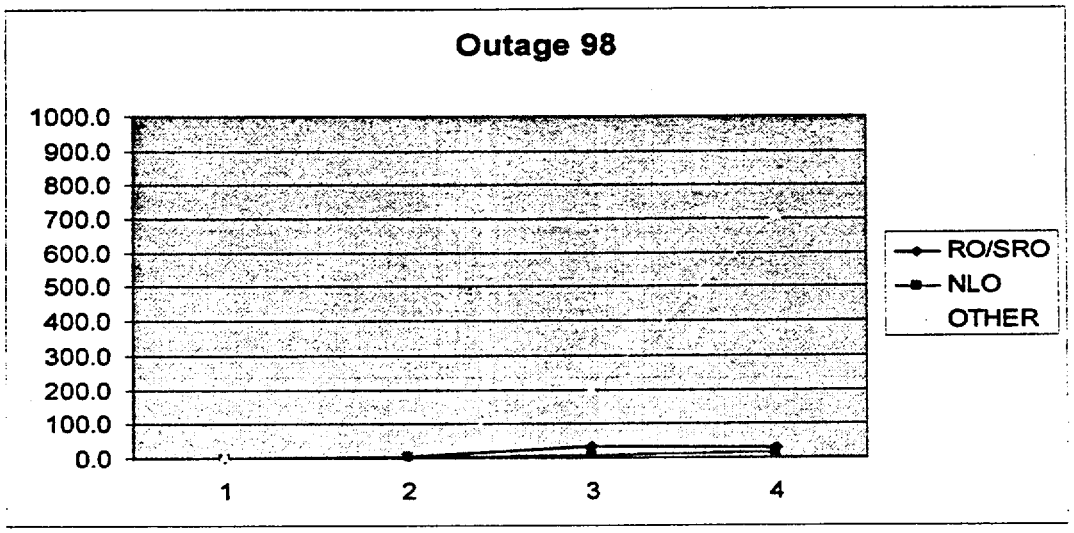
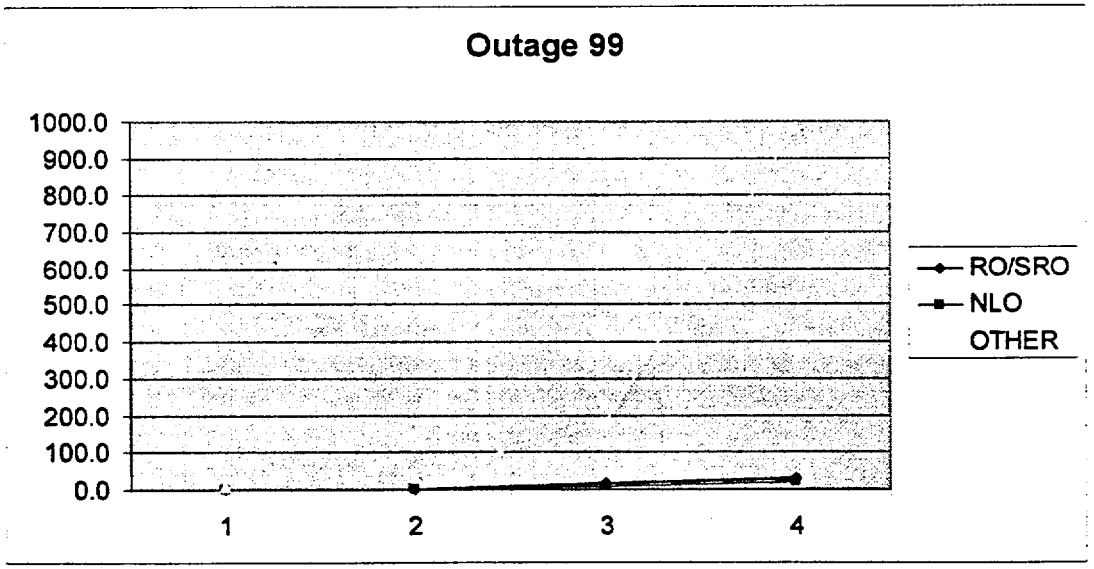


Chart for 1999 Outages represents 37 plants with an average 75 days in outage.

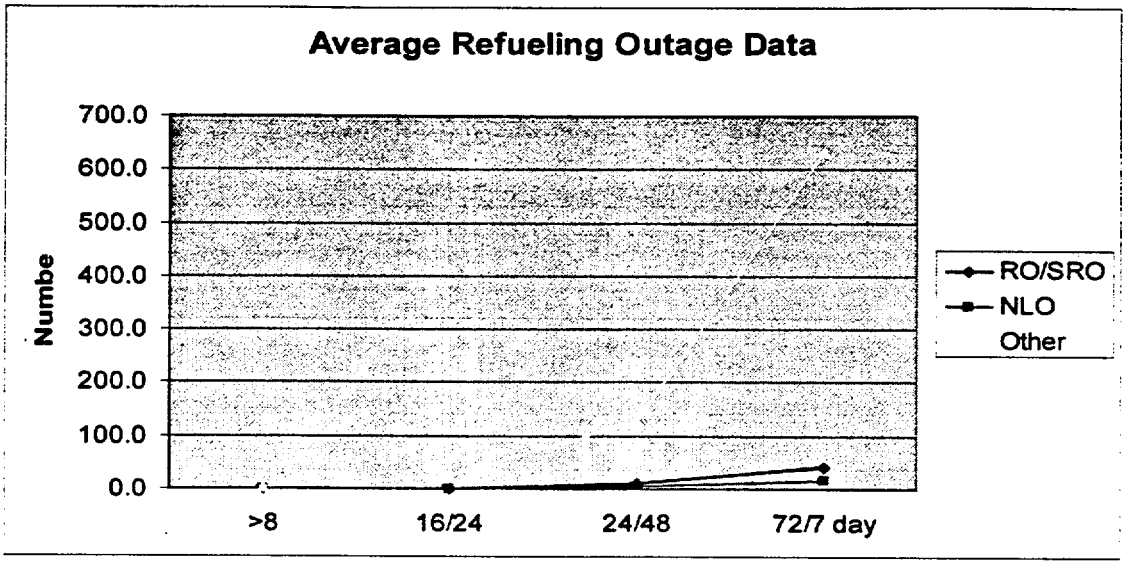


In 1999, deviations for the "average":

	Operating	Outage	Total
RO/SRO	0.7	1.0	1.7
NLO,	0.5	0.7	1.2
Other	0.5	3.3	3.8

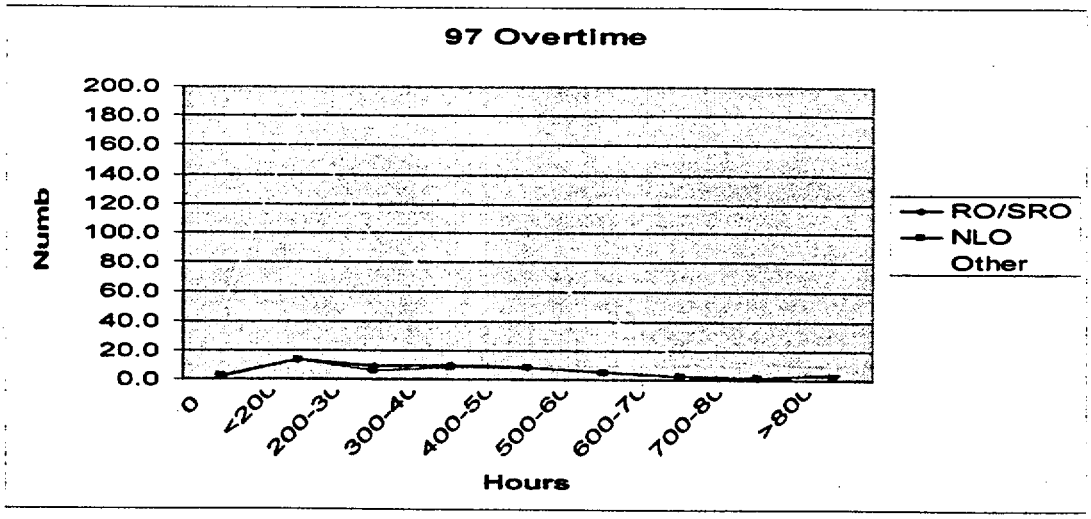
Question 4:

This chart represents 68 refueling outages with an average length of 43 days.



Question 5:

All overtime for 1997 for personnel subject to work hour limitations.



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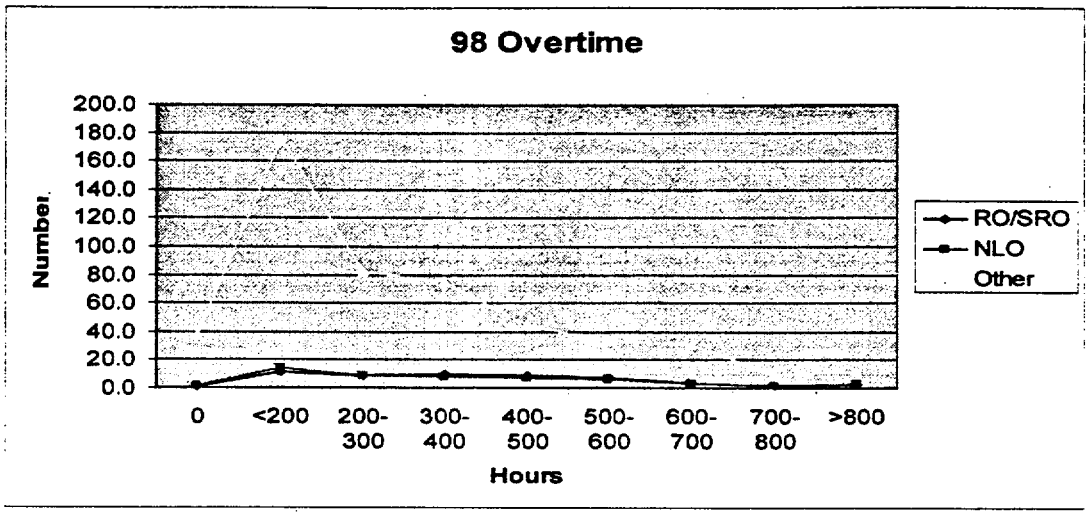

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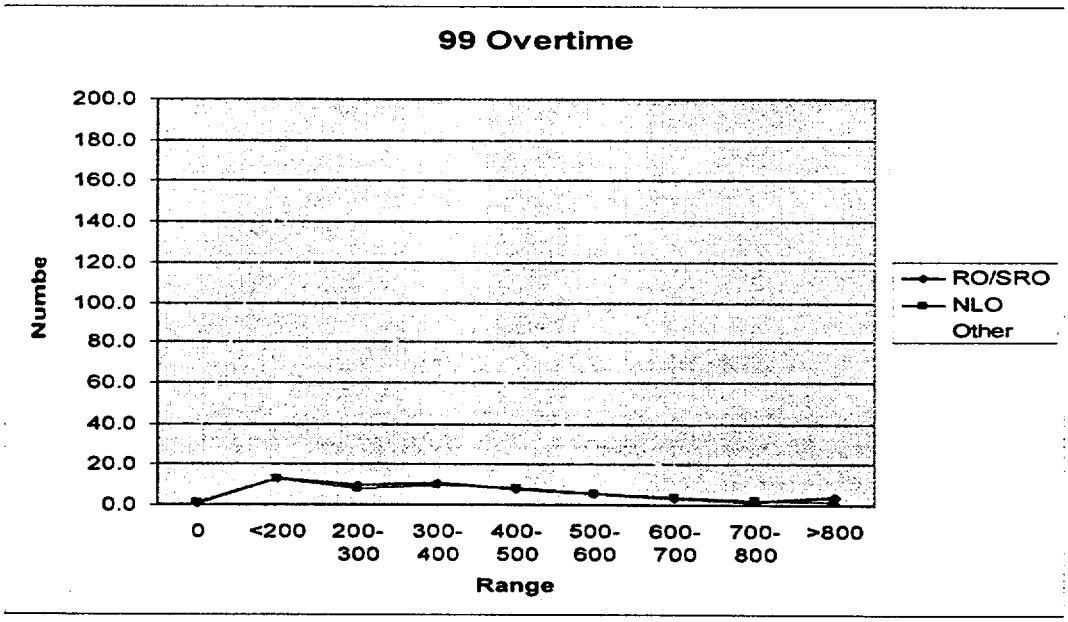
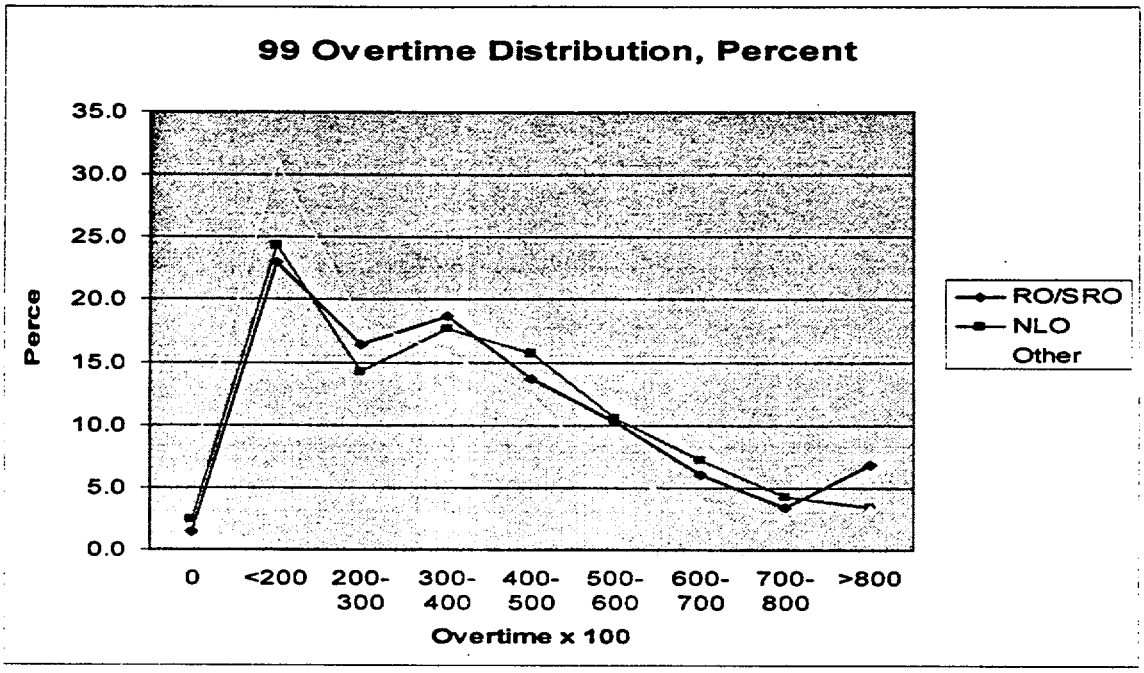


There are significantly more people in the "Other" category. To compare the use of overtime, the following chart shows the percentage distribution in each category.



Q2 Totals

Line	Total	RO	SRO	NLO	STA	HP	IC	Chem	Elect	Mech	Eng	Other
1	2100	58	50	73	20	34	74	59	113	148	295	1176
2	1290	34	15	49	6	169	50	10	71	55	246	585
3	1107	38	46	67	7	62	71	49	76	82	199	410
4	787	29	48	73	10	61	23	55	23	171	193	101
5	771	22	16	21	6	0	32	52	26	26	160	410
6	762	40	40	122	7	55	38	40	19	109	185	107
7	740	37	38	55	0	56	104	31	197	222	0	0
8	599	45	21	56	8	39	54	18	58	187	113	0
9	596	28	51	70	3	45	65	32	35	54	178	35
10	588	19	30	37	6	12	48	17	39	67	246	67
11	528	33	22	37	10	67	45	20	43	79	94	78
12	515	20	30	50	5	28	44	31	44	133	130	0
13	496	53	42	34	11	43	24	44	27	63	56	115
14	495	18	21	36	3	54	48	18	44	108	145	0
15	476	35	29	37	9	70	45	22	43	94	92	0
16	469	18	17	27	7	43	46	24	43	48	139	57
17	468	30	12	57	6	40	46	23	56	93	105	0
18	461	35	44	77	14	44	62	40	59	75	11	0
19	454	10	20	25	5	45	92	12	22	37	118	68
20	451	24	41	47	6	43	51	40	46	49	91	13
21	433	24	24	30	6	28	27	13	24	27	152	78
22	420	20	35	50	5	66	72	20	80	60	12	0
23	416	28	29	59	5	23	50	19	72	72	7	52
24	411	20	27	32	5	71	26	93	23	40	66	8
25	410	50	15	30	5	16	54	22	93	125	0	0
25	403	16	19	19	8	22	13	12	9	50	85	150
27	401	18	18	23	0	31	10	12	8	31	80	170
28	348	13	15	28	0	30	23	21	18	50	150	0
29	347	26	31	50	0	36	46	29	41	55	0	33
30	335	24	24	42	0	34	42	12	55	100	2	0
31	319	15	18	40	6	33	43	24	9	43	80	8
32	314	24	24	54	0	30	36	18	45	83	0	0
33	312	24	30	48	1	26	39	10	45	89	0	0
34	306	36	24	48	0	30	38	14	39	77	0	0
35	288	28	18	39	9	0	0	6	24	85	79	0

Line	Total	RO	SRO	NLO	STA	HP	IC	Chem	Elect	Mech	Eng	Other
36	286	14	24	21	8	26	33	14	18	37	91	0
37	273	18	21	46	9	34	40	7	38	60	0	0
38	240	25	19	30	5	27	24	14	19	20	0	57
39	223	21	26	36	9	16	24	14	27	36	0	14
40	215	18	21	27	6	18	22	10	22	22	49	0
41	160	21	18	13	7	19	18	12	9	26	0	17
42	154	12	16	22	5	27	24	16	5	27	0	0
43	140	10	15	20	0	35	12	3	18	27	0	0
44	132	27	31	44	0	20	0	10	0	0	0	0
45	128	19	18	38	5	36	0	12	0	0	0	0
46	123	34	35	45	9	0	0	0	0	0	0	0
47	85	27	17	36	5	0	0	0	0	0	0	0
Sum	21775	1238	1245	2020	267	1744	1778	1074	1825	3142	3649	3809
count	47	47	47	47	38	43	42	45	43	43	31	23
Average	463	26	26	43	7	41	42	24	42	73	118	166

Sort based on Total number in the program
Count is the number of non-zero entries
Average is average number for those reproting some workers in a category

Line	3 1997 Operating Days	3 RO/SRO <8 hrs 97 OD	3 RO/SRO 16/24 97 OD	3 RO/SRO 24/48 97 OD	3 RO/SRO 72/7 97 OD	97 RO/SRO Total	3 NLO <8 hrs 97 OD	3 NLO 16/24 97 OD	3 NLO 24/48 97 OD	3 NLO 72/7 97 OD	97 NOL Total
1	>300	0	0	17	1	18	0	0	14	1	15
2	>300	0	3	7	11	21	0	5	7	3	15
3	>300	0	0	0	0	0	0	0	0	0	0
4	>300	0	0	4	9	13	0	0	3	2	5
5	>300	0	0	0	0	0	0	0	0	0	0
6	>300	0	5	17	0	22	0	0	8	0	8
7	>300	1	10	41	27	79	2	13	12	10	37
8	>300	0	0	19	2	21	0	0	16	11	27
9	>300	0	0	7	1	8	0	0	9	0	9
10	>300	0	8	27	28	63	0	2	56	45	103
11	>300	0	1	0	40	41	0	0	0	12	12
12	>300	0	0	17	0	17	0	0	12	0	12
13	>300	0	0	21	3	24	0	0	16	1	17
14	>300	0	1	10	6	17	0	0	0	0	0
15	200 to 300	0	4	84	10	98	0	21	61	7	89
16	200 to 300	0	0	0	0	0	0	1	1	1	3
17	200 to 300	0	4	42	5	51	1	0	8	0	9
18	200 to 300	0	0	3	0	3	0	0	0	0	0
19	200 to 300	0	0	7	0	7	0	0	8	0	8
20	200 to 300	0	0	8	1	9	0	0	12	0	12
21	200 to 300	0	0	2	0	2	0	1	2	0	3
22	200 to 300	0	158	227	113	498	0	166	246	76	488
23	200 to 300	0	0	0	0	0	0	0	0	0	0
24	100 to 200	0	0	25	20	45	0	0	4	26	30
25	100 to 200	0	0	108	0	108	0	0	30	0	30
26	100 to 200	0	0	0	0	0	0	0	0	0	0
27	100 to 200	0	0	0	0	0	0	0	0	0	0
28	100 to 200	0	0	0	0	0	0	0	0	0	0
29	100 to 200	0	0	0	0	0	0	2	0	0	2
30	<100	0	0	0	0	0	0	0	0	0	0
Sum		1	194	693	277	1165	3	211	525	195	934
Count	30	30	30	30	30	30	30	30	30	30	30
Average		0.0	6.5	23.1	9.2	38.8	0.1	7.0	17.5	6.5	31.1

Sort based on total operating days

Line	3 1997 Operating Days	3 OTHERS <8 hrs 97 OD	3 OTHERS 16/24 97 OD	3 OTHERS 24/48 97 OD	3 OTHERS 72/7 97 OD	97 Other Total	97 All Total
1	>300	1	4	24	2	31	64
2	>300	2	8	8	14	32	68
3	>300	0	1	1	13	15	15
4	>300	0	2	5	21	28	46
5	>300	0	12	18	37	67	67
6	>300	0	9	22	0	31	61
7	>300	0	2	15	2	19	135
8	>300	0	7	43	33	83	131
9	>300	1	5	11	1	18	35
10	>300	0	3	69	102	174	340
11	>300	2	4	8	17	31	84
12	>300	0	16	76	241	333	362
13	>300	6	31	82	3	122	163
14	>300	0	0	0	0	0	17
15	200 to 300	7	428	309	86	830	1017
16	200 to 300	0	0	0	2	2	5
17	200 to 300	19	56	73	11	159	219
18	200 to 300	0	8	20	0	28	31
19	200 to 300	0	26	88	76	190	205
20	200 to 300	1	15	31	5	52	73
21	200 to 300	1	4	40	7	52	57
22	200 to 300	0	67	134	138	339	1325
23	200 to 300	0	8	8	1	17	17
24	100 to 200	0	25	30	97	152	227
25	100 to 200	0	0	0	0	0	138
26	100 to 200	2	93	4	60	159	159
27	100 to 200	0	3	3	0	6	6
28	100 to 200	0	0	0	0	0	0
29	100 to 200	0	15	9	3	27	29
30	<100	0	0	0	1	1	1
Sum		42	852	1131	973	2998	5097
Count	30	30	30	30	30	30	30
Average		1.4	28.4	37.7	32.4	99.9	169.9

Sort based (

Line	3 1998 Operating Days	3 RO/SRO <8 hrs 98 OD	3 RO/SRO 16/24 98 OD	3 RO/SRO 24/48 98 OD	3 RO/SRO 72/7 98 OD	RO/SRO Total	3 NLO <8 hrs 98 OD	3 NLO 16/24 98 OD	3 NLO 24/48 98 OD	3 NLO 72/7 98 OD	NLO Total
1	>300	0	1	7	0	8	0	0	1	0	1
2	>300	0	1	19	1	21	3	5	6	1	15
3	>300	0	0	68	1	69	0	1	40	6	47
4	>300	0	0	18	1	19	0	0	13	0	13
5	>300	0	0	14	8	22	0	0	8	9	17
6	>300	4	21	6	42	73	0	0	0	0	0
7	>300	0	0	10	40	50	0	0	15	25	40
8	>300	0	1	32	1	34	0	0	22	2	24
9	>300	0	0	4	1	5	0	0	0	3	3
10	>300	0	2	28	7	37	0	0	3	0	3
11	>300	2	0	10	0	12	0	0	2	0	2
12	>300	0	2	16	23	41	0	0	13	18	31
13	>300	0	0	10	0	10	1	0	2	0	3
14	>300	0	5	37	37	79	0	17	132	137	286
15	>300	0	1	6	1	8	0	0	0	0	0
16	>300	0	4	73	23	100	0	0	6	18	24
17	>300	0	0	104	33	137	0	7	28	7	42
18	>300	0	1	22	8	31	0	0	23	4	27
19	200 to 300	0	0	11	5	16	0	0	2	4	6
20	200 to 300	0	0	1	1	2	0	0	0	2	2
21	200 to 300	0	1	14	17	32	1	2	8	3	14
22	200 to 300	0	7	18	13	38	0	18	42	1	61
23	200 to 300	0	0	8	3	11	0	0	3	0	3
24	200 to 300	0	0	1	0	1	0	0	1	0	1
25	200 to 300	0	3	12	4	19	0	0	8	0	8
26	200 to 300	0	0	0	0	0	0	0	0	0	0
27	200 to 300	0	0	1	0	1	0	0	0	0	0
28	200 to 300	0	0	0	7	7	0	0	1	2	3
29	200 to 300	0	0	2	8	10	0	0	2	6	8
30	200 to 300	0	0	2	8	10	0	0	11	0	11
31	200 to 300	0	0	1	1	2	0	0	1	3	4
32	200 to 300	0	0	7	0	7	1	0	9	0	10

Line	3 1998 Operating Days	3 RO/SRO <8 hrs 98 OD	3 RO/SRO 16/24 98 OD	3 RO/SRO 24/48 98 OD	3 RO/SRO 72/7 98 OD	RO/SRO Total	3 NLO <8 hrs 98 OD	3 NLO 16/24 98 OD	3 NLO 24/48 98 OD	3 NLO 72/7 98 OD	NLO Total
33	100 to 200	0	1	5	7	13	0	0	0	0	0
34	100 to 200	0	2	2	11	15	0	5	1	19	25
Sum		6	53	569	312	940	6	55	403	270	734
Count	34	34	34	34	34	34	34	34	34	34	34
Average		0.2	1.6	16.7	9.2	27.6	0.2	1.6	11.9	7.9	21.6

Sort based on total operating days

Line	3 1998 Operating Days	3 OTHERS <8 hrs 98 OD	3 OTHERS 16/24 98 OD	3 OTHERS 24/48 98 OD	3 OTHERS 72/7 98 OD	Other Total	Total
1	>300	0	1	6	0	7	16
2	>300	4	10	47	1	62	98
3	>300	0	14	70	69	153	269
4	>300	0	0	4	0	4	36
5	>300	77	5	29	6	117	156
6	>300	5	203	19	13	240	313
7	>300	0	2	9	21	32	122
8	>300	2	17	42	12	73	131
9	>300	0	2	15	3	20	28
10	>300	12	47	57	8	124	164
11	>300	0	1	60	0	61	75
12	>300	0	2	17	0	19	91
13	>300	1	18	48	3	70	83
14	>300	0	102	274	249	625	990
15	>300	0	0	0	0	0	8
16	>300	1	2	12	5	20	144
17	>300	0	0	5	5	10	189
18	>300	0	1	39	14	54	112
19	200 to 300	13	10	84	95	202	224
20	200 to 300	0	0	2	13	15	19
21	200 to 300	27	23	0	621	671	717
22	200 to 300	7	307	233	47	594	693
23	200 to 300	4	12	31	327	374	388
24	200 to 300	0	17	30	1	48	50
25	200 to 300	2	10	7	0	19	46
26	200 to 300	0	21	107	117	245	245
27	200 to 300	0	0	9	1	10	11
28	200 to 300	3	4	39	10	56	66
29	200 to 300	0	26	47	72	145	163
30	200 to 300	6	3	23	0	32	53
31	200 to 300	0	2	0	2	4	10
32	200 to 300	8	17	54	1	80	97

Line	3 1998 Operating Days	3 OTHERS <8 hrs 98 OD	3 OTHERS 16/24 98 OD	3 OTHERS 24/48 98 OD	3 OTHERS 72/7 98 OD	Other Total	Total
33	100 to 200	0	3	24	25	52	65
34	100 to 200	0	71	64	313	448	488
Sum		172	953	1507	2054	4686	6360
Count	34	34	34	34	34	34	34
Average		5.1	28.0	44.3	60.4	137.8	187.1

Sort based

Line	3 1999 Operating Days	3 RO/SRO <8 hrs 99 OD	3 RO/SRO 16/24 99 OD	3 RO/SRO 24/48 99 OD	3 RO/SRO 72/7 99 OD	RO/SRO total	3 NLO <8 hrs 99 OD	3 NLO 16/24 99 OD	3 NLO 24/48 99 OD	3 NLO 72/7 99 OD	NLO Total
1	>300	0	0	36	1	37	0	0	0	0	0
2	>300	0	3	3	2	8	0	0	1	1	2
3	>300	0	2	0	100	102	0	3	0	63	66
4	>300	22	22	72	26	142	19	19	38	20	96
5	>300	0	0	10	1	11	0	0	8	1	9
6	>300	1	0	11	10	22	0	0	0	0	0
7	>300	0	2	16	0	18	0	0	3	0	3
8	>300	0	1	4	1	6	0	0	0	0	0
9	>300	0	1	27	12	40	0	0	4	1	5
10	>300	0	0	13	6	19	1	1	11	5	18
11	>300	0	0	10	0	10	0	0	14	0	14
12	>300	0	0	18	3	21	0	0	16	0	16
13	>300	1	1	9	3	14	0	0	3	3	6
14	>300	0	7	48	1	56	0	0	2	1	3
15	>300	0	0	4	2	6	0	0	1	0	1
16	>300	0	1	4	1	6	0	1	0	0	1
17	>300	0	0	0	0	0	0	0	0	0	0
18	>300	0	0	8	0	8	1	1	5	0	7
19	>300	0	7	25	9	41	0	20	36	2	58
20	>300	0	2	31	34	67	0	40	122	37	199
21	>300	0	0	2	0	2	0	2	5	19	26
22	>300	0	2	0	4	6	0	0	0	0	0
23	>300	0	0	0	0	0	0	0	0	0	0
24	>300	0	0	7	8	15	0	0	0	0	0
25	>300	0	1	3	0	4	0	0	5	0	5
26	200 to 300	0	8	40	59	107	0	3	50	77	130
27	200 to 300	0	0	0	15	15	0	0	0	16	16
28	200 to 300	0	0	0	0	0	0	0	0	0	0
29	200 to 300	3	7	1	6	17	0	0	0	10	10
30	200 to 300	0	1	21	0	22	0	0	36	0	36
31	200 to 300	0	4	20	1	25	0	5	13	4	22
32	200 to 300	0	0	51	3	54	0	0	25	11	36

Line	3 1999 Operating Days	3 RO/SRO <8 hrs 99 OD	3 RO/SRO 16/24 99 OD	3 RO/SRO 24/48 99 OD	3 RO/SRO 72/7 99 OD	RO/SRO total	3 NLO <8 hrs 99 OD	3 NLO 16/24 99 OD	3 NLO 24/48 99 OD	3 NLO 72/7 99 OD	NLO Total
33	200 to 300	0	1	6	12	19	0	0	7	2	9
34	200 to 300	0	0	1	2	3	0	0	0	2	2
35	200 to 300	8	14	113	175	310	0	0	0	0	0
36	200 to 300	0	0	0	11	11	0	8	2	13	23
37	200 to 300	0	0	3	2	5	0	0	5	1	6
38	200 to 300	0	0	15	1	16	0	0	12	0	12
39	200 to 300	3	4	16	17	40	0	5	7	15	27
40	200 to 300	0	3	44	13	60	0	0	24	2	26
Sum		38	94	692	541	1365	21	108	455	306	890
Count	40	40	40	40	40	40	40	40	40	40	40
Average		1.0	2.4	17.3	13.5	34.1	0.5	2.7	11.4	7.7	22.3

Sort based on total operating days

Line	3 1999 Operating Days	3 OTHERS <8 hrs 99 OD	3 OTHERS 16/24 99 OD	3 OTHERS 24/48 99 OD	3 OTHERS 72/7 99 OD	Other Total	Total for All
1	>300	0	1	8	0	9	46
2	>300	0	17	43	6	66	76
3	>300	0	13	228	95	336	504
4	>300	23	99	125	26	273	511
5	>300	0	25	50	43	118	138
6	>300	0	0	0	0	0	22
7	>300	9	4	80	0	93	114
8	>300	11	17	61	27	116	122
9	>300	0	18	29	13	60	105
10	>300	35	4	32	33	104	141
11	>300	0	0	1	2	3	27
12	>300	0	17	18	20	55	92
13	>300	12	14	30	11	67	87
14	>300	2	3	17	0	22	81
15	>300	0	0	19	4	23	30
16	>300	0	6	9	2	17	24
17	>300	0	1	97	79	177	177
18	>300	5	16	36	2	59	74
19	>300	7	453	314	96	870	969
20	>300	6	92	0	448	546	812
21	>300	7	28	32	7	74	102
22	>300	0	0	6	12	18	24
23	>300	0	0	12	0	12	12
24	>300	33	30	30	884	977	992
25	>300	5	9	23	2	39	48
26	200 to 300	0	55	161	93	309	546
27	200 to 300	1	8	8	26	43	74
28	200 to 300	0	2	14	0	16	16
29	200 to 300	7	124	49	57	237	264
30	200 to 300	0	19	379	1	399	457
31	200 to 300	7	20	44	410	481	528
32	200 to 300	2	2	7	8	19	109

Line	3 1999 Operating Days	3 OTHERS <8 hrs 99 OD	3 OTHERS 16/24 99 OD	3 OTHERS 24/48 99 OD	3 OTHERS 72/7 99 OD	Other Total	Total for All
33	200 to 300	0	7	49	17	73	101
34	200 to 300	0	6	1	0	7	12
35	200 to 300	7	94	85	74	260	570
36	200 to 300	12	101	44	230	387	421
37	200 to 300	0	11	24	17	52	63
38	200 to 300	0	0	0	0	0	28
39	200 to 300	5	17	22	392	436	503
40	200 to 300	31	91	222	241	585	671
Sum		227	1424	2409	3378	7438	9693
Count	40	40	40	40	40	40	40
Average		5.7	35.6	60.2	84.5	186.0	242.3

Sort based

Line	3 1997 Outage Days	RO/SRO <8 hrs 97 OutD	RO/SRO 16/24 97 OutD	RO/SRO 24/48 97 OutD	RO/SRO 72/7 97 OutD	RO/SRO Total	3 NLO <8 hrs 97 OutD	3 NLO 16/24 97 OutD	3 NLO 24/48 97 OutD	3 NLO 72/7 97 OutD	NLO Total
1	>200	12	108	660	540	1320	15	40	75	50	180
2	>200	0	0	27	3	30	0	0	15	0	15
3	>200	0	0	3	7	10	0	0	2	9	11
4	>200	0	0	0	4	4	0	1	0	1	2
5	>200	0	0	1	4	5	0	0	0	1	1
6	>200	0	0	0	1	1	0	0	0	1	1
7	>200	0	4	3	64	71	0	0	0	87	87
8	100 to 200	0	4	57	7	68	2	6	8	0	16
9	100 to 200	1	0	24	202	227	0	0	6	52	58
10	100 to 200	0	0	56	0	56	0	0	37	3	40
11	100 to 200	0	10	94	54	158	0	7	111	81	199
12	100 to 200	0	0	0	0	0	0	0	0	0	0
13	100 to 200	0	0	0	0	0	0	0	0	0	0
14	50 to 99	0	17	44	49	110	0	12	33	30	75
15	50 to 99	0	0	6	0	6	0	0	0	0	0
16	50 to 99	0	10	32	10	52	0	9	27	9	45
17	50 to 99	0	0	3	1	4	0	0	1	1	2
18	50 to 99	1	8	49	16	74	0	14	78	45	137
19	50 to 99	0	1	0	18	19	0	0	0	0	0
20	50 to 99	0	0	26	1	27	0	0	0	0	0
21	<50	1	1	34	13	49	0	0	23	3	26
22	<50	0	1	24	28	53	0	0	43	40	83
23	<50	0	0	0	0	0	0	0	0	0	0
24	<50	0	0	0	2	2	0	0	3	0	3
25	<50	0	4	2	8	14	0	0	0	0	0
26	<50	0	0	4	0	4	0	0	2	0	2
27	<50	0	0	0	1	1	0	0	0	0	0
28	<50	0	2	9	1	12	0	0	0	0	0
Sum		15	170	1158	1034	2377	17	89	464	413	983
Count	28	28	28	28	28	28	28	28	28	28	28
Average		0.5	6.1	41.4	36.9	84.9	0.6	3.2	16.6	14.8	35.1

Sort based on total outage days

Line	3 1997 Outage Days	OTHERS <8 hrs 97 OutD	OTHERS 16/24 97 OutD	OTHERS 24/48 97 OutD	OTHERS 72/7 97 OutD	Other Total	Total
1	>200	25	36	2520	240	2821	4321
2	>200	0	0	7	0	7	52
3	>200	0	11	9	24	44	65
4	>200	8	142	122	581	853	859
5	>200	0	3	27	6	36	42
6	>200	0	11	21	18	50	52
7	>200	13	228	47	1700	1988	2146
8	100 to 200	80	82	1150	1150	2462	2546
9	100 to 200	13	22	121	4333	4489	4774
10	100 to 200	0	0	36	65	101	197
11	100 to 200	0	20	91	388	499	856
12	100 to 200	0	0	0	0	0	0
13	100 to 200	3	12	34	81	130	130
14	50 to 99	0	57	188	241	486	671
15	50 to 99	0	12	30	662	704	710
16	50 to 99	33	136	521	496	1186	1283
17	50 to 99	0	0	2	3	5	11
18	50 to 99	15	465	957	8151	9588	9799
19	50 to 99	0	0	0	0	0	19
20	50 to 99	0	24	83	1846	1953	1980
21	<50	2	3	39	446	490	565
22	<50	0	3	100	269	372	508
23	<50	0	16	78	62	156	156
24	<50	0	0	6	6	12	17
25	<50	0	5	1	184	190	204
26	<50	0	9	11	27	47	53
27	<50	0	1	5	33	39	40
28	<50	2	9	9	4	24	36
Sum		194	1307	6215	21016	28732	32092
Count	28	28	28	28	28	28	28
Average		6.9	46.7	222.0	750.6	1026.1	1146.1
	Sort based						

Line	3 1998 Outage Days	3 RO/SRO <8 hrs 98 OutD	3 RO/SRO 16/24 98 OutD	3 RO/SRO 24/48 98 OutD	3 RO/SRO 72/7 98 OutD	Total RO/SRO	3 NLO <8 hrs 98 OutD	3 NLO 16/24 98 OutD	3 NLO 24/48 98 OutD	3 NLO 72/7 98 OutD	Total NLO
1	>200	2	0	55	5	62	0	0	30	2	32
2	>200	15	110	614	525	1264	24	42	67	55	188
3	>200	0	2	31	18	51	0	2	5	2	9
4	>200	10	4	5	90	109	1	5	3	115	124
5	100 to 200	0	0	17	41	58	0	0	0	98	98
6	100 to 200	0	0	0	0	0	0	0	0	0	0
7	100 to 200	0	0	12	11	23	0	0	10	9	19
8	100 to 200	0	14	37	7	58	0	4	18	14	36
9	50 to 99	0	2	3	16	21	0	1	4	24	29
10	50 to 99	0	0	2	6	8	0	0	0	0	0
11	50 to 99	0	0	9	15	24	0	0	14	3	17
12	50 to 99	0	0	0	0	0	0	0	0	0	0
13	50 to 99	0	0	1	0	1	0	2	1	0	3
14	50 to 99	0	0	0	0	0	0	0	0	0	0
15	50 to 99	1	0	24	22	47	0	18	34	42	94
16	50 to 99	0	0	0	27	27	0	0	0	16	16
17	50 to 99	0	0	9	16	25	0	0	5	6	11
18	50 to 99	0	0	1	0	1	0	0	1	0	1
19	50 to 99	0	0	1	1	2	0	0	1	1	2
20	50 to 99	0	7	59	12	78	0	0	5	0	5
21	50 to 99	0	1	0	2	3	0	0	2	1	3
22	50 to 99	0	0	17	3	20	0	0	0	0	0
23	50 to 99	0	3	22	17	42	0	9	37	21	67
24	50 to 99	0	1	1	0	2	0	0	0	0	0
25	<50	0	2	60	82	144	0	1	46	51	98
26	<50	0	0	7	0	7	0	0	2	0	2
27	<50	0	6	23	7	36	0	4	11	6	21
28	<50	0	0	54	26	80	0	0	5	7	12
29	<50	0	0	24	11	35	0	0	8	3	11
30	<50	0	0	2	13	15	0	0	1	7	8
31	<50	1	5	1	29	36	0	0	0	32	32
32	<50	0	0	0	0	0	0	0	0	0	0

Line	3 1998 Outage Days	3 RO/SRO <8 hrs 98 OutD	3 RO/SRO 16/24 98 OutD	3 RO/SRO 24/48 98 OutD	3 RO/SRO 72/7 98 OutD	Total RO/SRO	3 NLO <8 hrs 98 OutD	3 NLO 16/24 98 OutD	3 NLO 24/48 98 OutD	3 NLO 72/7 98 OutD	Total NLO
33	<50	0	0	7	2	9	0	0	0	18	18
34	<50	0	0	0	5	5	0	0	0	0	0
Sum		29	157	1098	1009	2293	25	88	310	533	956
Count	34	34	34	34	34	34	34	34	34	34	34
Average		0.9	4.6	32.3	29.7	67.4	0.7	2.6	9.1	15.7	28.1

Sort based on total outage days

Line	3 1998 Outage Days	3 OTHERS <8 hrs 98 OutD	3 OTHERS 16/24 98 OutD	3 OTHERS 24/48 98 OutD	3 OTHERS 72/7 98 OutD	Total Other	Total for all
1	>200	2	23	97	46	168	262
2	>200	31	42	2470	278	2821	4273
3	>200	21	46	294	1021	1382	1442
4	>200	7	239	513	5938	6697	6930
5	100 to 200	0	12	47	1528	1587	1743
6	100 to 200	10	41	91	4	146	146
7	100 to 200	0	4	34	52	90	132
8	100 to 200	32	95	210	377	714	808
9	50 to 99	0	153	329	1424	1906	1956
10	50 to 99	0	3	15	140	158	166
11	50 to 99	0	0	44	87	131	172
12	50 to 99	0	20	213	633	866	866
13	50 to 99	0	13	55	1146	1214	1218
14	50 to 99	2	8	13	16	39	39
15	50 to 99	13	287	443	5146	5889	6030
16	50 to 99	3	32	49	389	473	516
17	50 to 99	0	0	5	221	226	262
18	50 to 99	1	1	12	2	16	18
19	50 to 99	0	0	14	9	23	27
20	50 to 99	0	0	838	838	1676	1759
21	50 to 99	0	0	0	262	262	268
22	50 to 99	0	0	0	0	0	20
23	50 to 99	0	11	91	241	343	452
24	50 to 99	3	6	38	178	225	227
25	<50	0	32	263	480	775	1017
26	<50	0	2	8	0	10	19
27	<50	21	107	306	267	701	758
28	<50	0	7	139	109	255	347
29	<50	0	0	55	156	211	257
30	<50	1	9	5	813	828	851
31	<50	4	98	41	2153	2296	2364
32	<50	1	1	0	0	2	2

Line	3 1998 Outage Days	3 OTHERS <8 hrs 98 OutD	3 OTHERS 16/24 98 OutD	3 OTHERS 24/48 98 OutD	3 OTHERS 72/7 98 OutD	Total Other	Total for all
33	<50	6	2	6	250	264	291
34	<50	0	0	0	0	0	5
Sum		158	1294	6738	24204	32394	35643
Count	34	34	34	34	34	34	34
Average	.	4.6	38.1	198.2	711.9	952.8	1048.3
	Sort based						

Line	3 1999 Outage Days	3 RO/SRO <8 hrs 99 OutD	3 RO/SRO 16/24 99 OutD	3 RO/SRO 24/48 99 OutD	3 RO/SRO 72/7 99 OutD	Total Ro/SRO	3 NLO <8 hrs 99 OutD	3 NLO 16/24 99 OutD	3 NLO 24/48 99 OutD	3 NLO 72/7 99 OutD	Total NLO
1	>200	0	0	31	12	43	0	0	8	2	10
2	100 to 200	5	10	95	14	124	10	10	84	13	117
3	100 to 200	0	2	35	445	482	0	2	15	163	180
4	100 to 200	0	0	8	9	17	0	0	6	13	19
5	100 to 200	0	0	16	5	21	0	0	1	0	1
6	100 to 200	0	1	0	31	32	0	1	2	47	50
7	100 to 200	0	0	20	44	64	0	0	0	0	0
8	100 to 200	0	0	10	2	12	0	0	0	0	0
9	100 to 200	0	8	83	37	128	0	0	26	17	43
10	100 to 200	0	0	28	57	85	0	0	13	50	63
11	50 to 99	0	0	18	8	26	0	0	16	0	16
12	50 to 99	1	0	16	2	19	0	0	1	0	1
13	50 to 99	2	13	6	75	96	0	0	0	151	151
14	50 to 99	0	0	0	0	0	0	0	0	0	0
15	50 to 99	0	0	1	6	7	0	0	0	4	4
16	50 to 99	0	5	95	203	303	0	2	103	174	279
17	50 to 99	0	0	1	3	4	0	0	0	0	0
18	50 to 99	0	0	25	27	52	0	0	20	16	36
19	50 to 99	0	0	9	7	16	0	1	10	10	21
20	50 to 99	0	1	3	4	8	0	0	0	2	2
21	50 to 99	0	0	0	0	0	0	0	0	0	0
22	50 to 99	0	0	0	0	0	0	0	0	0	0
23	50 to 99	0	6	61	35	102	0	10	18	104	132
24	>50	0	0	0	0	0	0	0	0	0	0
25	>50	0	0	4	0	4	0	0	0	0	0
26	>50	0	0	0	0	0	0	0	0	0	0
27	>50	0	0	3	2	5	0	0	7	2	9
28	>50	0	0	1	0	1	0	0	0	0	0
29	>50	0	0	11	40	51	0	0	3	13	16
30	>50	0	0	4	0	4	0	0	3	0	3
31	>50	0	0	1	10	11	0	0	0	5	5
32	>50	0	0	0	0	0	0	0	0	0	0

Line	3 1999 Outage Days	3 RO/SRO <8 hrs 99 OutD	3 RO/SRO 16/24 99 OutD	3 RO/SRO 24/48 99 OutD	3 RO/SRO 72/7 99 OutD	Total Ro/SRO	3 NLO <8 hrs 99 OutD	3 NLO 16/24 99 OutD	3 NLO 24/48 99 OutD	3 NLO 72/7 99 OutD	Total NLO
33	>50	0	3	11	58	72	0	1	2	6	9
34	>50	0	0	5	0	5	0	0	0	0	0
35	>50	0	0	4	24	28	0	0	0	0	0
36	>50	0	0	8	4	12	0	0	2	3	5
37	>50	0	7	52	3	62	0	6	6	3	15
Sum		8	56	665	1167	1896	10	33	346	798	1187
Count	37	37	37	37	37	37	37	37	37	37	37
Average		0.2	1.5	18.0	31.5	51.2	0.3	0.9	9.4	21.6	32.1

Sort Based on total outage days

Line	3 1999 Outage Days	3 OTHERS <8 hrs 99 OutD	3 OTHERS 16/24 99 OutD	3 OTHERS 24/48 99 OutD	3 OTHERS 72/7 99 OutD	Total Other	Total
1	>200	88	142	390	110	730	783
2	100 to 200	50	101	481	1230	1862	2103
3	100 to 200	3	62	123	6703	6891	7553
4	100 to 200	29	37	251	584	901	937
5	100 to 200	0	0	3	2	5	27
6	100 to 200	9	101	88	5906	6104	6186
7	100 to 200	0	3	3	9	15	79
8	100 to 200	0	39	68	73	180	192
9	100 to 200	2	5	2959	2946	5912	6083
10	100 to 200	0	14	692	700	1406	1554
11	50 to 99	5	12	97	1132	1246	1288
12	50 to 99	0	0	2	168	170	190
13	50 to 99	9	175	55	2519	2758	3005
14	50 to 99	0	18	50	805	873	873
15	50 to 99	2	7	21	2369	2399	2410
16	50 to 99	0	39	199	818	1056	1638
17	50 to 99	1	7	153	385	546	550
18	50 to 99	3	7	36	451	497	585
19	50 to 99	0	0	49	39	88	125
20	50 to 99	0	0	10	158	168	178
21	50 to 99	0	3	5	1	9	9
22	50 to 99	14	18	0	3570	3602	3602
23	50 to 99	6	282	550	2490	3328	3562
24	>50	2	13	39	5	59	59
25	>50	4	8	15	25	52	56
26	>50	0	0	12	43	55	55
27	>50	0	0	42	39	81	95
28	>50	1	5	11	51	68	69
29	>50	1	8	7	300	316	383
30	>50	0	0	0	0	0	7
31	>50	1	0	3	29	33	49
32	>50	2	0	0	5	7	7

Line	3 1999 Outage Days	3 OTHERS <8 hrs 99 OutD	3 OTHERS 16/24 99 OutD	3 OTHERS 24/48 99 OutD	3 OTHERS 72/7 99 OutD	Total Other	Total
33	>50	0	5	23	2393	2421	2502
34	>50	2	11	106	1	120	125
35	>50	0	0	0	0	0	28
36	>50	0	2	99	288	389	406
37	>50	28	81	108	51	268	345
Sum		262	1205	6750	36398	44615	47698
Count	37	37	37	37	37	37	37
Average		7.1	32.6	182.4	983.7	1205.8	1289.1
	Sort Based						

Refueling Outages

Line	Days	Year	RO/SRO <8 hrs	RO/SRO 16/24	RO/SRO 24/48	RO/SRO 72/7	RO/SRO Total	NLO <8 hrs	NLO 16/24	NLO 24/48	NLO 72/7	NLO Total
1	63	97	0	8	26	8	42	0	7	18	6	31
2	39	97	0	0	1	0	1	0	0	0	0	0
3	30	97	0	4	2	8	14	0	0	0	0	0
4	58	97	1	0	3	1	5	0	0	5	3	8
5	46	98	0	0	24	11	35	0	0	8	3	11
6	40	98	0	0	8	1	9	0	0	0	73	73
7	36	98	0	0	5	0	5	0	0	0	0	0
8	74	98	0	0	9	16	25	0	0	5	6	11
9	49	98	0	0	0	0	0	0	0	0	0	0
10	31	98	0	0	17	7	24	0	0	6	17	23
11	56	98	0	0	6	0	6	0	0	4	3	7
12	54	98	0	0	0	0	0	0	0	0	0	0
13	33	98	0	1	0	1	2	0	0	2	1	3
14	25	98	0	0	6	48	54	0	0	0	40	40
15	65	98	0	1	2	15	18	0	1	4	24	29
16	42	98	0	0	54	26	80	0	0	5	7	12
17	33	98	0	0	8	11	19	0	0	13	0	13
18	36	98	0	4	19	2	25	0	4	9	5	18
19	28	98	0	0	2	8	10	0	0	0	28	28
20	53	99	0	0	1	0	1	0	0	0	0	0
21	90	99	0	0	2	2	4	0	0	0	0	0
22	55	99	0	8	42	16	66	0	0	2	0	2
23	25	99	0	14	43	839	896	0	0	0	0	0
24	36	99	0	0	0	0	0	0	0	0	0	0
25	34	99	0	2	28	75	105	0	2	50	103	155
26	61	99	0	0	13	2	15	0	0	1	0	1
27	34	99	1	8	2	42	53	0	0	0	39	39
28	30	99	0	0	1	4	5	0	0	0	1	1
29	43	99	0	0	41	20	61	0	0	24	17	41
30	36	99	0	0	0	0	0	0	0	0	0	0
31	33	99	0	0	9	57	66	0	0	3	46	49
32	29	99	0	0	0	0	0	0	0	0	0	0
33	91	99	0	0	11	8	19	0	0	8	0	8
34	36	99	0	0	15	3	18	0	0	1	0	1
35	49	99	0	0	0	0	0	0	0	1	0	1
36	66	99	0	0	7	183	190	0	0	5	81	86
37	39	99	0	0	0	0	0	0	0	0	0	0

Refueling Outages

Line	Days	Year	RO/SRO <8 hrs	RO/SRO 16/24	RO/SRO 24/48	RO/SRO 72/7	RO/SRO Total	NLO <8 hrs	NLO 16/24	NLO 24/48	NLO 72/7	NLO Total
38	36	99	0	0	0	8	8	0	0	0	0	0
39	42	99	0	0	1	0	1	0	0	6	1	7
40	32	99	0	6	50	35	91	0	10	15	104	129
41	26	99	0	0	4	24	28	0	0	0	0	0
42	34	99	0	0	0	0	0	0	0	0	0	0
43	55	99	0	0	12	4	16	0	0	0	0	0
44	50	99	1	1	0	23	25	0	0	0	110	110
45	36	99	0	0	8	8	16	0	0	2	11	13
46	36	99	0	0	1	0	1	0	0	0	0	0
47	48	99	0	3	67	128	198	0	0	53	71	124
48	35	99	0	0	0	2	2	0	0	0	3	3
49	35	99	0	1	9	6	16	0	0	10	6	16
50	36	99	0	0	0	0	0	0	0	0	0	0
51	76	99	0	0	10	2	12	0	0	0	0	0
52	55	99	0	0	0	3	3	0	0	1	2	3
53	59	99	0	0	9	7	16	0	1	10	10	21
54	39	99	0	0	1	3	4	0	0	0	0	0
55	31	99	0	0	20	44	64	0	0	0	0	0
56	24	99	0	0	0	0	0	0	0	0	0	0
57	34	99	0	0	11	40	51	0	0	3	13	16
58	42	99	0	0	0	10	10	0	1	2	42	45
59	21	99	0	0	0	4	4	0	0	0	0	0
60	48	99	0	0	22	810	832	0	0	1	225	226
61	82	99	0	0	9	7	16	0	1	1	1	3
62	37	99	0	0	3	0	3	0	0	0	0	0
63	28	99	2	3	10	3	18	0	3	16	5	24
64	34	99	0	0	0	0	0	0	0	0	0	0
65	19	99	0	0	2	100	102	0	0	0	0	0
66	27	99	0	0	1	0	1	0	0	0	0	0
67	36	99	0	0	0	15	15	0	0	0	80	80
68	41	99	0	4	107	31	142	0	0	28	17	45
Sum			5	68	764	2731	3568	0	30	322	1204	1556
Average			0.1	1.0	11.2	40.2	52.5	0.0	0.4	4.7	17.7	22.9

Sort based on Outage start date

Refueling Outages

Line	Days	Year	OTHERS <8 hrs	OTHERS 16/24	OTHERS 24/48	OTHERS 72/7	Other Total	Total
1	63	97	25	107	438	423	993	1066
2	39	97	0	1	46	1551	1598	1599
3	30	97	0	5	1	184	190	204
4	58	97	0	2	66	23	91	104
5	46	98	0	0	55	156	211	257
6	40	98	0	2	49	105	156	238
7	36	98	2	11	106	1	120	125
8	74	98	0	0	5	221	226	262
9	49	98	3	3	13	90	109	109
10	31	98	0	5	12	277	294	341
11	56	98	8	12	101	298	419	432
12	54	98	0	7	180	542	729	729
13	33	98	0	0	0	182	182	187
14	25	98	0	6	181	257	444	538
15	65	98	0	133	252	1223	1608	1655
16	42	98	0	7	139	109	255	347
17	33	98	0	0	30	25	55	87
18	36	98	17	101	287	246	651	694
19	28	98	0	10	20	1015	1045	1083
20	53	99	4	24	58	4	90	91
21	90	99	0	0	2	83	85	89
22	55	99	2	2	572	562	1138	1206
23	25	99	0	10	96	5731	5837	6733
24	36	99	0	8	94	993	1095	1095
25	34	99	0	29	116	619	764	1024
26	61	99	0	0	2	0	2	18
27	34	99	8	130	41	2063	2242	2334
28	30	99	0	4	6	1392	1402	1408
29	43	99	0	3	2383	2380	4766	4868
30	36	99	0	3	5	352	360	360
31	33	99	0	3	650	672	1325	1440
32	29	99	10	52	0	147	209	209
33	91	99	5	6	86	1048	1145	1172
34	36	99	1	6	63	52	122	141
35	49	99	0	0	0	0	0	1
36	66	99	0	30	30	3341	3401	3677
37	39	99	2	13	39	5	59	59

Line	Days	Year	OTHERS <8 hrs	OTHERS 16/24	OTHERS 24/48	OTHERS 72/7	Other Total	Total
38	36	99	2	3	5	877	887	895
39	42	99	0	0	6	8	14	22
40	32	99	6	248	525	2276	3055	3275
41	26	99	0	0	0	0	0	28
42	34	99	0	0	0	0	0	0
43	55	99	0	0	3	2	5	21
44	50	99	0	30	10	456	496	631
45	36	99	5	25	234	541	805	834
46	36	99	1	5	11	51	68	69
47	48	99	1	10	83	198	292	614
48	35	99	1	2	12	977	992	997
49	35	99	0	25	41	292	358	390
50	36	99	0	8	38	455	501	501
51	76	99	0	2	17	15	34	46
52	55	99	0	1	9	77	87	93
53	59	99	0	0	49	39	88	125
54	39	99	1	7	138	370	516	520
55	31	99	0	3	3	9	15	79
56	24	99	4	47	0	146	197	197
57	34	99	1	8	7	300	316	383
58	42	99	2	34	11	1168	1215	1270
59	21	99	0	0	0	7	7	11
60	48	99	22	59	209	3425	3715	4773
61	82	99	17	18	35	68	138	157
62	37	99	2	0	5	151	158	161
63	28	99	4	288	590	2271	3153	3195
64	34	99	0	0	0	0	0	0
65	19	99	0	4	1	0	5	107
66	27	99	4	7	14	17	42	43
67	36	99	0	22	122	2183	2327	2422
68	41	99	0	22	227	338	587	774
Sum			160	1613	8629	43089	53491	58615
Average			2.4	23.7	126.9	633.7	786.6	862.0

	5 RO/SRO 0 1997	5 RO/SRO <200 1997	RO/SRO 201-300 1997	5 RO/SRO 301-400 1997	5 RO/SRO 401-500 1997	5 RO/SRO 501-600 1997	5 RO/SRO 601-700 1997	5 RO/SRO 701-800 1997	5 RO/SRO >800 1997	Total RO
1	1	19	27	29	29	6	1	0	0	112
2	0	7	12	11	29	13	3	0	1	76
3	0	7	10	4	7	6	2	0	0	36
4	0	14	2	2	7	5	0	0	0	30
5	0	16	5	12	6	3	1	1	0	44
6	0	9	13	27	11	7	7	4	13	91
7	30	20	5	14	17	23	23	12	26	170
8	13	15	9	15	17	5	0	3	2	79
9	0	7	22	4	7	4	1	0	0	45
10	1	25	6	7	8	6	1	0	0	54
11	6	28	4	2	0	0	0	0	0	40
12	0	1	2	6	8	7	4	2	0	30
13	0	0	2	12	9	14	6	1	2	46
14	0	22	11	0	0	0	0	0	0	33
15	0	3	4	7	3	4	2	1	0	24
16	1	10	9	12	10	2	1	0	0	45
17	0	8	7	4	1	0	0	5	14	39
18	0	20	0	0	0	0	0	0	0	20
19	0	42	11	17	2	3	0	0	0	75
20	1	12	30	14	10	2	0	0	0	69
21	1	19	9	5	7	7	5	9	7	69
22	0	6	7	25	25	3	2	0	0	68
23	0	0	1	0	0	0	0	0	27	28
24	0	8	9	9	6	8	1	1	0	42
25	0	7	4	0	0	0	0	0	0	11
26	2	25	14	7	5	4	1	0	0	58
sum	56	350	235	245	224	132	61	39	92	1434
Average	2.2	13.5	9.0	9.4	8.6	5.1	2.3	1.5	3.5	55.2

Sort based on total in program from item # 2

	5 NLO 0 1997	5 NLO <200 1997	5 NLO 201-300 1997	5 NLO 301-400 1997	5 NLO 401-500 1997	5 NLO 501-600 1997	5 NLO 601-700 1997	5 NLO 701-800 1997	5 NLO >800 1997	Total NLO
1	1	21	23	23	24	14	2	1	0	109
2	0	1	1	6	29	10	3	0	0	50
3	0	20	6	15	16	7	3	3	0	70
4	0	73	9	1	0	0	0	0	0	83
5	0	29	13	22	12	6	3	0	0	85
6	0	3	5	10	4	2	4	2	5	35
7	18	39	0	0	0	0	0	0	0	57
8	19	3	2	9	11	21	5	0	0	70
9	0	0	0	5	10	20	3	0	0	38
10	5	9	6	4	8	7	1	1	1	42
11	0	26	6	10	2	1	1	0	0	46
12	0	4	4	3	4	4	3	2	1	25
13	0	0	2	4	7	9	4	6	6	38
14	0	2	9	10	4	0	0	0	0	25
15	0	20	2	8	7	2	2	5	4	50
16	6	41	12	16	8	0	1	0	0	84
17	0	4	8	0	1	2	2	3	16	36
18	0	19	8	3	1	0	0	0	0	31
19	0	5	16	26	9	4	0	0	0	60
20	4	2	8	12	14	7	2	0	0	49
21	13	6	4	4	14	5	11	16	1	74
22	0	2	5	15	22	8	3	0	0	55
23	0	2	0	2	4	7	5	3	50	73
24	0	2	1	6	5	0	1	0	0	15
25	0	5	3	0	0	0	0	0	0	8
26	1	12	5	2	2	0	0	0	0	22
sum	67	350	158	216	218	136	59	42	84	1330
Average	2.6	13.5	6.1	8.3	8.4	5.2	2.3	1.6	3.2	51.2

	5 OTHERS 0 1997	5 OTHERS <200 1997	5 OTHERS 201-300 1997	5 OTHERS 301-400 1997	5 OTHERS 401-500 1997	5 OTHERS 501-600 1997	5 OTHERS 601-700 1997	5 OTHERS 701-800 1997	5 OTHERS >800 1997	Total Other
1	616	768	283	208	60	20	15	12	14	1996
2	0	346	174	143	120	111	53	21	12	980
3	0	134	64	48	593	29	9	8	2	887
4	0	101	117	70	262	19	12	4	0	585
5	0	110	49	55	40	408	33	41	6	742
6	0	316	134	94	57	54	25	27	42	749
7	121	137	43	52	46	26	16	4	2	447
8	125	194	96	28	1	1	1	0	1	447
9	5	39	74	92	35	11	0	0	0	256
10	0	0	0	0	0	0	0	0	0	0
11	10	128	43	16	2	2	0	0	0	201
12	0	145	80	79	81	82	44	24	9	544
13	25	25	20	42	38	32	16	13	10	221
14	0	54	74	112	60	16	3	0	0	319
15	0	0	0	0	0	0	0	0	0	0
16	30	178	49	32	19	3	0	0	1	312
17	0	417	105	87	57	49	31	24	43	813
18	0	120	150	0	0	0	0	0	0	270
19	0	80	104	27	19	9	0	0	0	239
20	35	226	130	142	103	56	25	14	11	742
21	2	8	3	0	3	0	1	2	1	20
22	16	206	109	72	15	27	8	5	0	458
23	0	0	0	0	0	0	0	0	0	0
24	0	33	55	49	19	9	3	1	0	169
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
sum	985	3765	1956	1448	1630	964	295	200	154	11397
Average	46.9	179.3	93.1	69.0	77.6	45.9	14.0	9.5	7.3	542.7

Line	RO/SRO 0 1998	RO/SRO <200 1998	RO/SRO 201-300 1998	RO/SRO 301-400 1998	RO/SRO 401-500 1998	RO/SRO 501-600 1998	RO/SRO 601-700 1998	RO/SRO 701-800 1998	RO/SRO >800 1998	Total RO
1	2	22	15	18	23	29	0	0	0	109
2	0	5	3	18	17	28	6	0	2	79
3	0	13	16	11	2	0	0	0	0	42
4	0	6	8	3	6	0	0	0	0	23
5	0	18	14	10	1	0	0	0	0	43
6	0	10	2	8	8	8	4	1	0	41
7	0	8	4	9	18	19	13	12	8	91
8	16	11	7	10	14	16	2	2	1	79
9	0	32	10	0	0	0	0	0	0	42
10	0	25	0	11	6	6	6	3	1	58
11	0	12	8	17	5	0	0	0	0	42
12	0	5	20	24	7	1	0	0	0	57
13	6	23	18	21	26	18	14	5	11	142
14	0	6	9	8	3	2	1	0	1	30
15	0	2	2	3	12	17	15	8	11	70
16	0	16	19	23	16	9	1	0	0	84
17	0	5	5	24	15	2	0	0	0	51
18	0	4	3	10	0	2	4	0	1	24
19	0	5	7	8	14	11	4	0	0	49
20	0	0	0	0	4	10	3	9	12	38
21	0	0	0	1	15	4	0	0	0	20
22	0	33	10	8	13	3	5	1	0	73
23	1	11	32	13	9	2	0	0	0	68
24	0	15	9	9	5	12	16	2	0	68
25	1	2	8	8	27	16	6	3	1	72
26	0	0	0	0	0	0	1	1	26	28
27	0	15	11	6	8	8	3	5	2	58
28	0	27	2	0	0	0	0	0	0	29
29	0	16	9	13	2	1	0	0	0	41
30	0	19	11	1	0	0	0	0	0	31
31	11	2	9	9	6	5	9	8	6	65
Sum	37	368	271	304	282	229	113	60	83	1747
Average	1.2	11.9	8.7	9.8	9.1	7.4	3.6	1.9	2.7	56.4

Sort based on total in program from item 2.

Line	NLO 0 1998	5 NLO <200 1998	5 NLO 201-300 1998	5 NLO 301-400 1998	5 NLO 401-500 1998	5 NLO 501-600 1998	5 NLO 601-700 1998	5 NLO 701-800 1998	5 NLO >800 1998	Total NLO
1	0	16	28	31	20	8	2	0	0	105
2	0	5	6	11	12	11	3	0	0	48
3	0	29	37	5	1	0	0	0	0	72
4	0	44	24	7	0	0	0	0	0	75
5	0	29	0	3	1	0	0	0	0	33
6	0	36	23	17	13	8	5	2	0	104
7	0	2	1	5	7	4	10	3	3	35
8	11	10	5	6	4	16	14	2	2	70
9	0	4	27	11	0	0	0	0	0	42
10	0	6	1	3	4	16	10	1	2	43
11	0	3	9	7	6	4	8	5	0	42
12	0	14	22	17	6	0	0	0	0	59
13	22	25	1	0	2	2	1	4	1	58
14	0	4	3	6	3	8	2	2	0	28
15	0	0	0	2	6	7	5	8	4	32
16	0	79	0	0	0	0	0	0	0	79
17	0	1	2	12	19	6	1	0	0	41
18	0	22	4	13	4	7	4	0	0	54
19	6	30	11	8	19	6	2	0	1	83
20	0	4	4	1	2	6	5	10	12	44
21	0	9	7	6	6	3	1	0	0	32
22	0	3	13	28	14	17	5	1	0	81
23	4	2	10	14	15	8	2	0	0	55
24	1	17	3	18	27	22	1	0	0	89
25	0	4	4	6	15	10	9	3	1	52
26	0	1	0	1	2	6	4	16	41	71
27	0	10	5	7	7	6	6	1	11	53
28	0	10	1	0	0	0	0	0	0	11
29	0	6	7	2	0	0	0	0	0	15
30	0	12	3	1	0	0	0	0	0	16
31	0	2	1	2	1	2	1	4	5	18
Sum	44	439	262	250	216	183	101	62	83	1640
Average	1.4	14.2	8.5	8.1	7.0	5.9	3.3	2.0	2.7	52.9

Line	OTHERS 0 1998	OTHERS <200 1998	OTHERS 201-300 1998	OTHERS 301-400 1998	OTHERS 401-500 1998	OTHERS 501-600 1998	OTHERS 601-700 1998	OTHERS 701-800 1998	OTHERS >800 1998	Total Other
1	646	747	277	194	48	26	11	12	15	1976
2	0	303	172	145	136	114	51	46	46	1013
3	0	134	49	196	6	9	0	0	0	394
4	0	105	89	247	35	15	8	6	3	508
5	0	434	60	44	13	14	5	3	1	574
6	0	53	42	40	42	42	431	22	24	696
7	0	292	133	114	95	73	41	18	39	805
8	126	178	85	38	10	5	0	2	3	447
9	18	205	49	12	6	0	0	0	0	290
10	0	0	0	0	0	0	0	0	0	0
11	0	42	52	49	45	18	5	1	0	212
12	0	0	0	0	0	0	0	0	0	0
13	71	232	86	42	16	4	3	3	0	457
14	0	298	117	52	13	3	0	2	0	485
15	0	5	13	27	33	34	17	15	9	153
16	0	95	72	77	54	9	6	4	0	317
17	0	21	16	19	103	228	40	5	1	433
18	0	0	0	0	0	0	0	0	0	0
19	24	100	80	56	33	18	6	1	51	369
20	0	276	105	96	93	83	89	51	86	879
21	0	60	160	30	0	0	0	0	0	250
22	0	30	69	102	88	32	9	14	0	344
23	36	221	126	140	101	53	22	10	10	719
24	0	17	3	3	2	0	1	0	0	26
25	1	143	125	102	106	49	17	14	7	564
26	0	0	0	0	0	0	0	0	0	0
27	0	147	60	33	23	8	5	3	1	280
28	0	0	0	0	0	0	0	0	0	0
29	0	130	17	7	0	1	0	1	0	156
30	0	125	10	12	5	0	0	0	0	152
31	0	0	0	0	0	0	0	0	0	0
Sum	922	4393	2067	1877	1106	838	767	233	296	12499
Average	36.9	175.7	82.7	75.1	44.2	33.5	30.7	9.3	11.8	500.0

Line	5 RO/SRO 0 1999	5 RO/SRO <200 1999	RO/SRO 201-300 1999	5 RO/SRO 301-400 1999	5 RO/SRO 401-500 1999	5 RO/SRO 501-600 1999	5 RO/SRO 601-700 1999	5 RO/SRO 701-800 1999	5 RO/SRO >800 1999	Total
1	4	30	37	37	7	0	0	0	0	115
2	0	1	1	4	0	3	4	16	46	75
3	0	15	6	13	4	3	0	0	0	41
4	0	16	5	7	2	0	0	0	0	30
5	0	8	8	9	10	14	5	1	0	55
6	0	11	9	12	4	2	0	0	0	38
7	0	21	20	17	18	11	5	1	0	93
8	2	12	15	32	37	34	9	0	0	141
9	14	10	6	12	5	11	14	4	3	79
10	0	20	5	13	3	0	0	0	0	41
11	0	26	13	8	8	3	1	0	0	59
12	0	10	14	15	4	0	1	0	0	44
13	0	9	9	9	14	12	10	7	21	91
14	0	2	5	21	18	9	2	0	1	58
15	0	0	2	5	8	8	4	1	1	29
16	0	2	3	7	8	9	13	7	12	61
17	0	28	4	11	16	18	11	2	0	90
18	0	4	9	0	1	0	0	0	0	14
19	0	12	9	3	2	2	0	0	0	28
20	0	15	30	4	2	0	0	0	0	51
21	0	0	0	1	2	5	6	7	17	38
22	0	2	4	11	5	3	0	0	0	25
23	0	2	1	7	5	7	5	1	0	28
24	0	23	13	12	7	9	8	3	1	76
25	1	11	31	13	9	2	0	0	0	67
26	7	8	14	16	15	7	11	7	0	85
27	0	6	10	24	12	4	2	0	1	59
28	0	1	1	0	0	0	0	0	24	26
29	0	21	15	13	9	4	1	0	0	63
30	0	27	1	0	0	0	0	0	0	28
31	0	4	2	17	9	5	0	1	0	38
32	0	20	10	4	2	0	0	0	0	36

Line	5 RO/SRO 0 1999	5 RO/SRO <200 1999	RO/SRO 201-300 1999	5 RO/SRO 301-400 1999	5 RO/SRO 401-500 1999	5 RO/SRO 501-600 1999	5 RO/SRO 601-700 1999	5 RO/SRO 701-800 1999	5 RO/SRO >800 1999	Total
33	2	27	12	10	4	2	1	0	2	60
34	0	31	5	7	11	7	4	8	9	82
35	0	14	1	0	10	8	1	4	1	39
36	0	17	3	4	6	6	5	0	0	41
Sum	30	466	333	378	277	208	123	70	139	2024
Ave	0.8	12.9	9.3	10.5	7.7	5.8	3.4	1.9	3.9	56.2
percent	1.5	23.0	16.5	18.7	13.7	10.3	6.1	3.5	6.9	100.0

Sort based on total number in prgram from item 2
Averages for RO/SRO, NLO and others based on rows with data.

Line	5 NLO 0 1999	5 NLO <200 1999	5 NLO 201-300 1999	5 NLO 301-400 1999	5 NLO 401-500 1999	5 NLO 501-600 1999	5 NLO 601-700 1999	5 NLO 701-800 1999	5 NLO >800 1999	Total
1	0	11	37	52	2	1	1	1	0	105
2	0	24	5	2	5	8	9	12	11	76
3	0	12	15	16	22	2	1	3	0	71
4	0	62	9	0	0	0	0	0	0	71
5	0	6	7	2	8	8	2	0	1	34
6	0	80	19	11	2	0	0	0	0	112
7	0	4	10	28	4	0	0	0	0	46
8	26	20	0	0	3	3	1	0	0	53
9	11	1	2	11	9	34	2	0	0	70
10	0	1	2	11	25	1	1	0	0	41
11	0	6	7	22	10	1	0	0	0	46
12	0	9	14	5	4	5	7	4	3	51
13	0	2	2	5	3	11	3	5	5	36
14	0	3	13	14	24	4	0	0	0	58
15	0	7	3	1	3	5	6	5	4	34
16	0	0	6	4	6	4	9	5	6	40
17	0	49	6	7	28	27	10	0	0	127
18	0	1	4	21	0	0	0	0	0	26
19	1	13	9	11	5	2	0	0	0	41
20	5	57	13	6	0	0	0	0	0	81
21	0	4	4	8	7	9	7	2	0	41
22	0	11	9	10	8	0	0	0	0	38
23	0	0	21	11	5	2	0	0	0	39
24	0	1	2	10	31	12	10	3	0	69
25	5	3	9	12	12	6	3	0	0	50
26	0	1	5	5	3	14	27	9	1	65
27	0	18	9	15	12	3	0	1	1	59
28	0	3	2	3	4	7	20	20	21	80
29	0	5	12	12	11	6	1	0	0	47
30	0	17	1	0	0	0	0	0	0	18
31	0	2	1	4	7	1	0	0	0	15
32	0	10	6	4	0	0	0	0	0	20

Line	5 NLO 0 1999	5 NLO <200 1999	5 NLO 201-300 1999	5 NLO 301-400 1999	5 NLO 401-500 1999	5 NLO 501-600 1999	5 NLO 601-700 1999	5 NLO 701-800 1999	5 NLO >800 1999	Total
33	0	5	3	1	5	2	1	0	0	17
34	0	14	1	6	3	6	14	10	14	68
35	0	9	6	3	9	13	3	3	0	46
36	0	0	1	8	23	7	1	0	0	40
Sum	48	471	275	341	303	204	139	83	67	1931
Ave	1.3	13.1	7.6	9.5	8.4	5.7	3.9	2.3	1.9	53.6
percent	2.5	24.4	14.2	17.7	15.7	10.6	7.2	4.3	3.5	100.0

Line	5 OTHERS 0 1999	5 OTHERS <200 1999	5 OTHERS 201-300 1999	5 OTHERS 301-400 1999	5 OTHERS 401-500 1999	5 OTHERS 501-600 1999	5 OTHERS 601-700 1999	5 OTHERS 701-800 1999	5 OTHERS >800 1999	Total Other
1	590	735	311	187	50	18	9	14	17	1931
2	0	278	95	105	130	163	172	133	211	1287
3	0	122	207	54	24	12	9	3	1	432
4	0	171	216	44	20	11	7	0	5	474
5	0	207	123	107	70	33	18	20	4	582
6	0	85	64	51	298	18	14	7	0	537
7	0	46	71	73	70	32	14	3	0	309
8	14	162	66	80	65	25	8	4	2	426
9	109	69	79	105	60	14	6	2	3	447
10	1	54	83	50	21	13	3	1	0	226
11	0	0	0	0	0	0	0	0	0	0
12	0	28	39	56	39	27	14	4	5	212
13	0	257	91	111	90	68	48	46	63	774
14	0	0	0	0	0	0	0		0	0
15	0	172	60	57	45	49	40	34	38	495
16	0	8	16	25	31	37	19	14	12	162
17	0	22	44	99	83	43	2	0	0	293
18	0	40	165	271	78	14	2	1	1	572
19	0	0	0	0	0	0	0	0	0	0
20	83	247	8	2	1	3	1	0	2	347
21	0	220	120	158	122	86	63	36	52	857
22	0	180	75	0	0	0	0	0	0	255
23	0	0	0	0	0	0	0	0	0	0
24	0	38	88	140	126	30	28	1	0	451
25	32	215	128	138	100	54	23	12	11	713
26	0	7	4	1	5	2	0	0	0	19
27	96	275	101	61	43	14	13	3	2	608
28	0	0	0	0	0	0	0	0	0	0
29	0	214	50	22	8	1	0	1	0	296
30	0	0	0	0	0	0	0	0	0	0
31	0	32	68	41	21	5	3	0	2	172
32	0	128	12	14	6	0	0	0	0	160

Line	5 OTHERS 0 1999	5 OTHERS <200 1999	5 OTHERS 201-300 1999	5 OTHERS 301-400 1999	5 OTHERS 401-500 1999	5 OTHERS 501-600 1999	5 OTHERS 601-700 1999	5 OTHERS 701-800 1999	5 OTHERS >800 1999	Total Other
33	0	0	0	0	0	0	0	0	0	0
34	0	34	5	5	0	0	0	0	0	44
35	0	25	16	7	2	0	0	0	0	50
36	0	0	0	0	0	0	0	0	0	0
Sum	925	4071	2405	2064	1608	772	516	339	431	13131
Ave	33.0	145.4	85.9	73.7	57.4	27.6	18.4	12.1	15.4	469.0
percent	7.0	31.0	18.3	15.7	12.2	5.9	3.9	2.6	3.3	100.0

Review of Industry Working Hours Data

Clare Goodman, Senior Human Factors Analyst
Operator Licensing, Human Performance, and Plant Support Branch

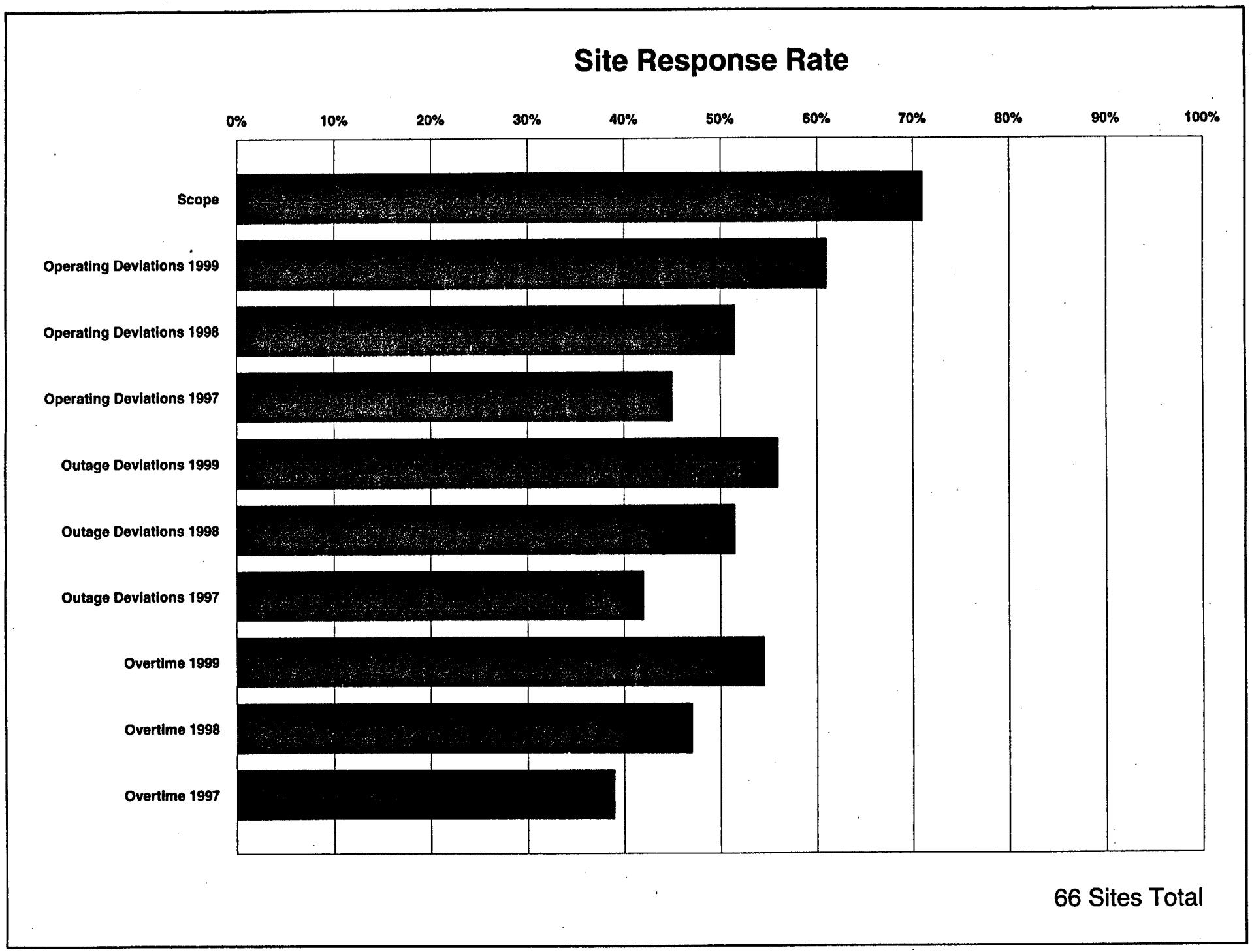
September 14, 2000

Attachment 5

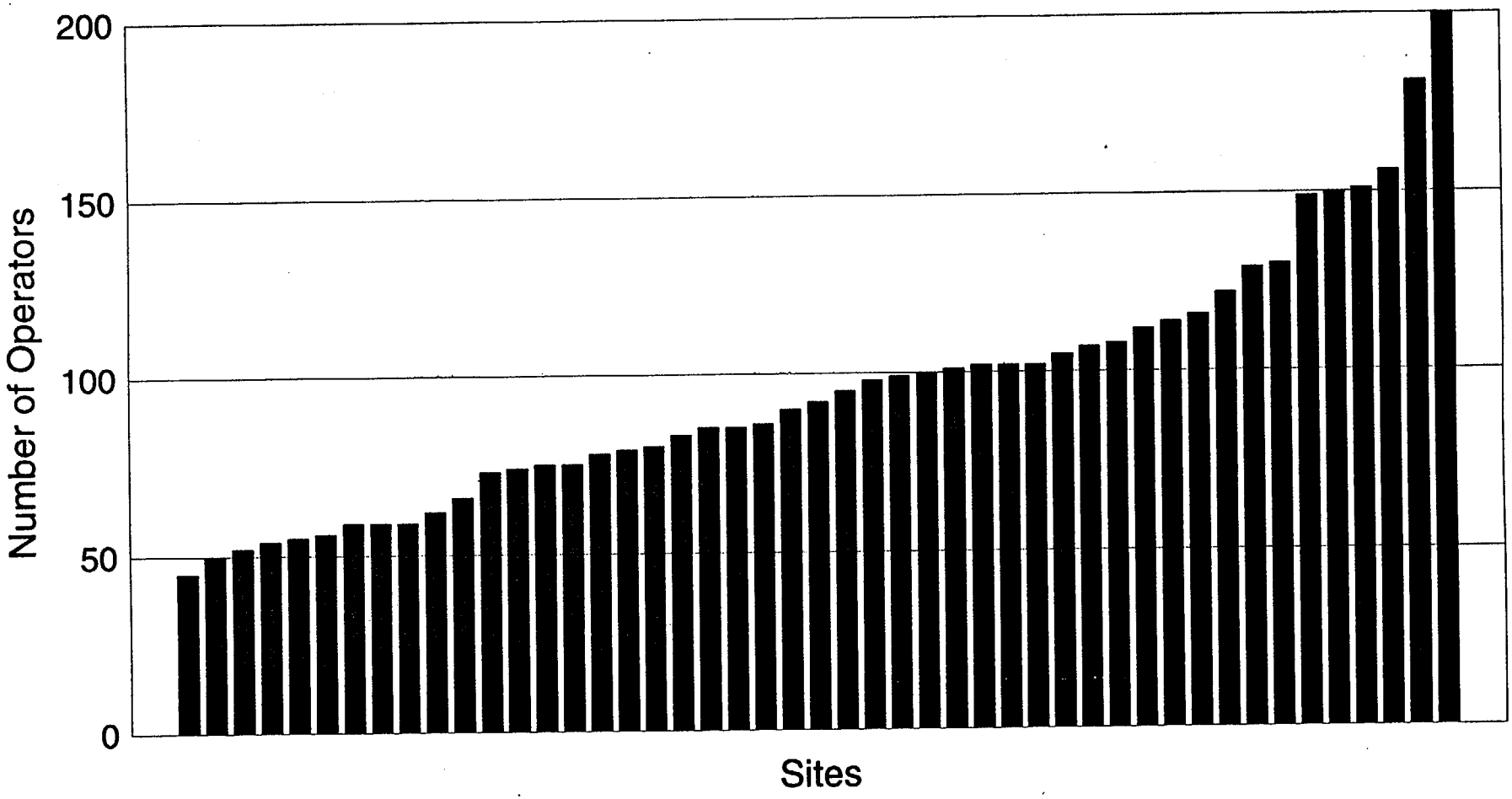
Limitations of Data Provided to NRC

Data does not:

- Distinguish single unit from multi-unit sites
- Provide how many individuals at a site contributed to the total number of deviations
- Allow correlation of site responses across questions
- Provide deviation or overtime data for nearly one-half of nuclear plant sites

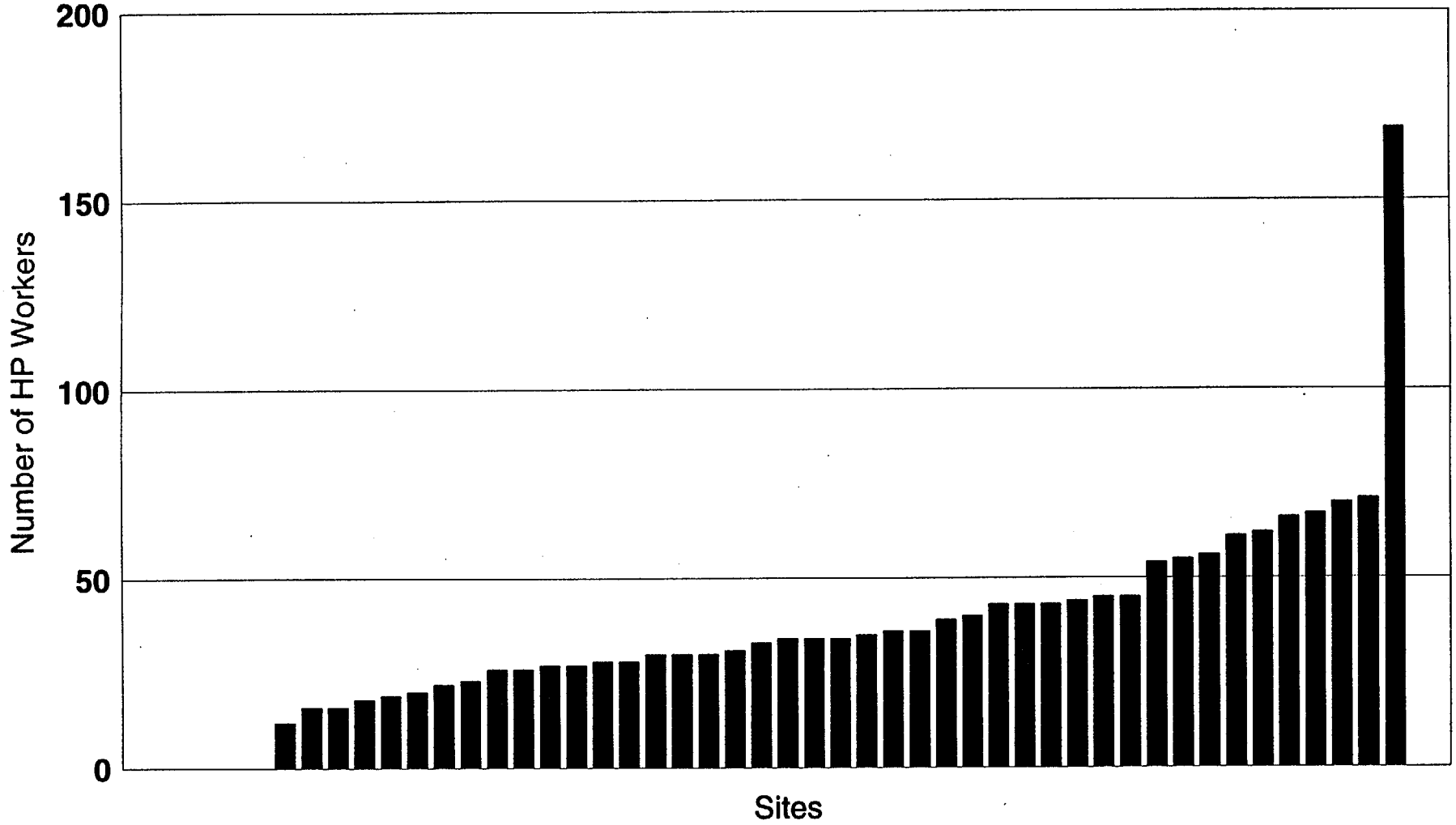

Site Response Rate
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Scope
Operating Deviations 1999
Operating Deviations 1998
Operating Deviations 1997
Outage Deviations 1999
Outage Deviations 1998
Outage Deviations 1997
Overtime 1999
Overtime 1998
Overtime 1997
66 Sites Total

Number of ROs, SROs, and NLO's at a Site Covered by Working Hour Limits



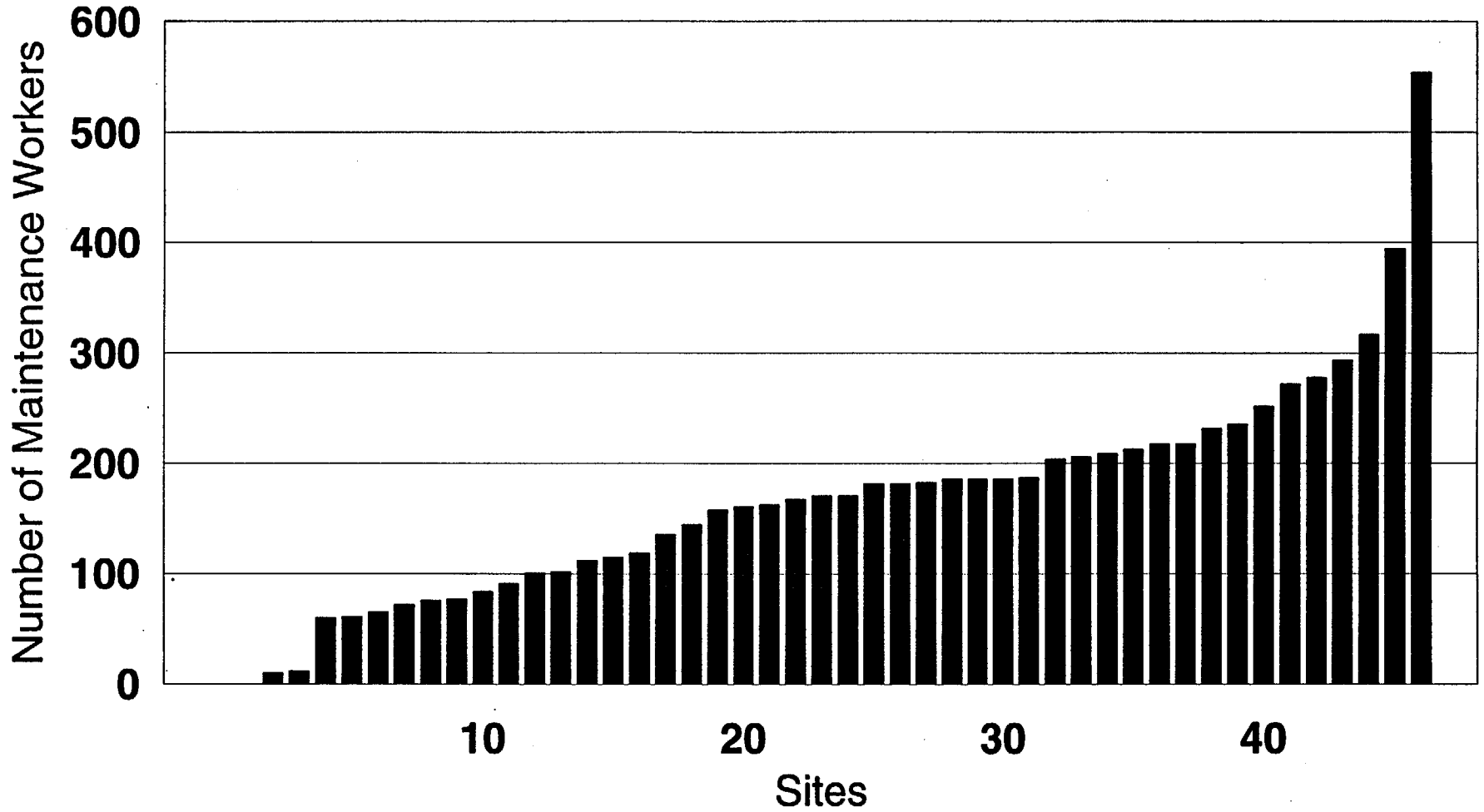
47 of 66 sites reporting data (71%)
Range is 45 to 202

Number of HP Workers at a Site
Covered by Working Hour Limits



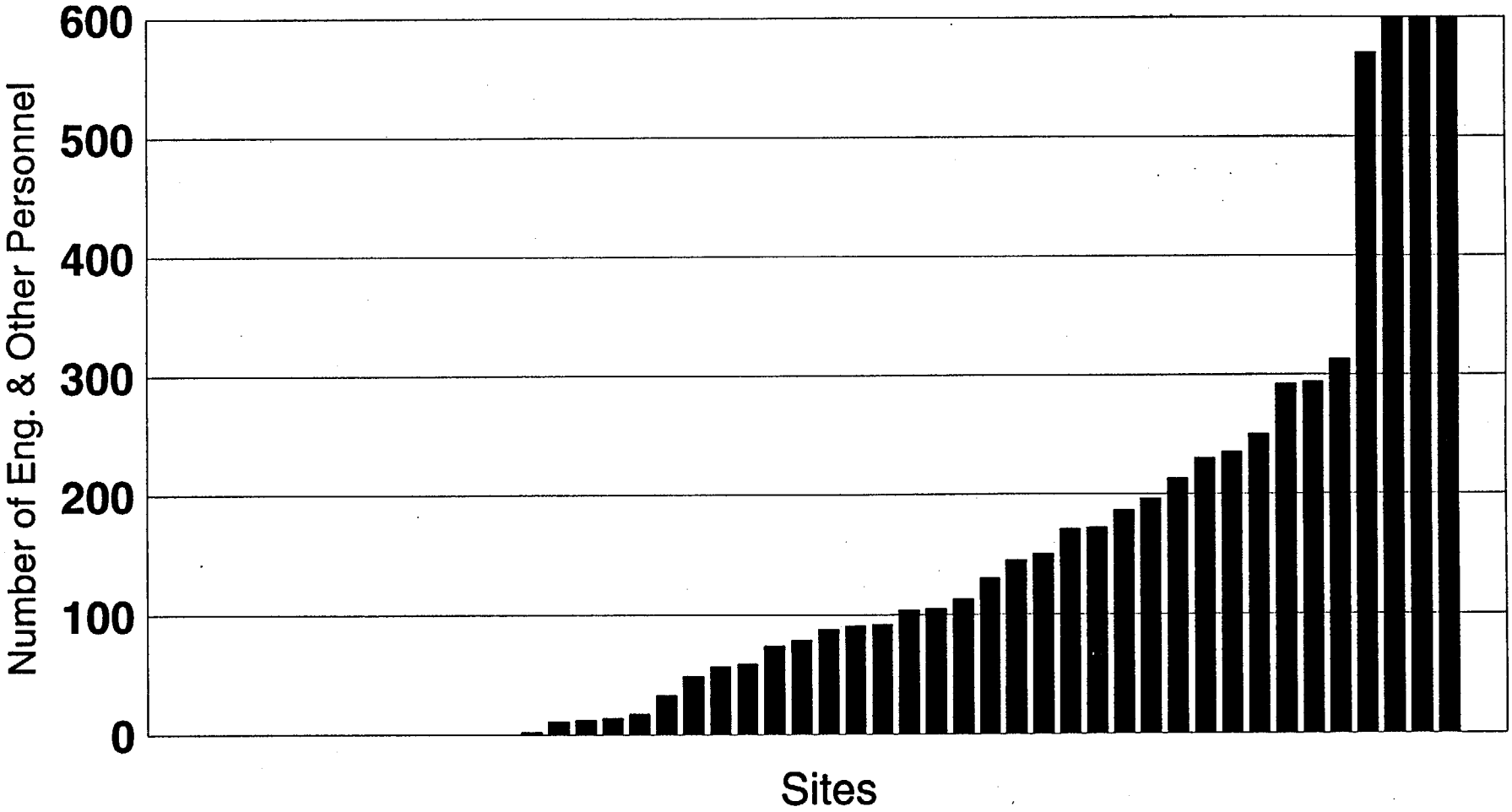
47 of 66 sites reporting data (71%)
Range is 0 to 169

Number of Maintenance Workers at a Site Covered by Working Hour Limits



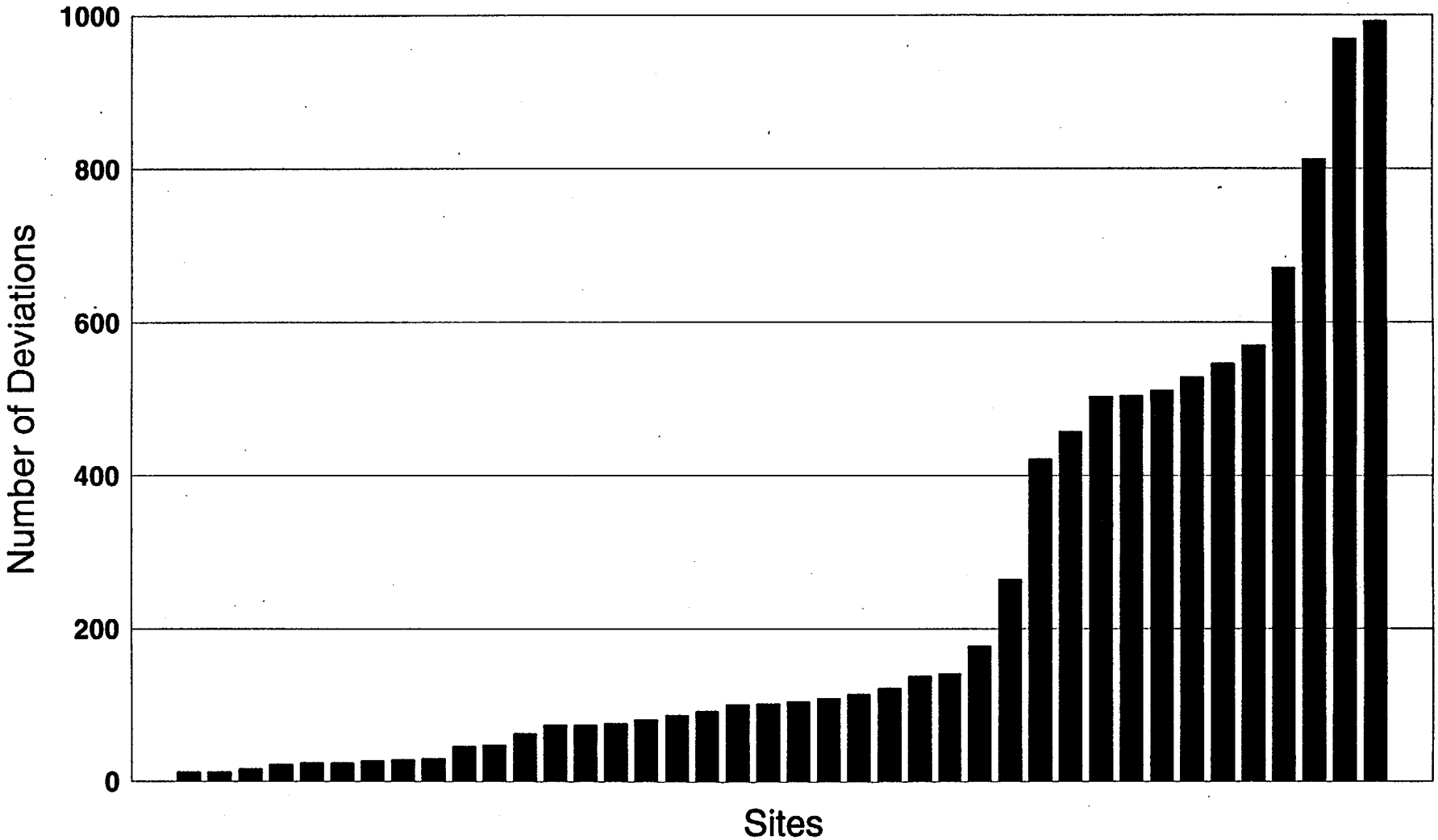
47 of 66 sites reporting data (71%)
Range is 0 to 554

Number of Eng. & Other Personnel at a Site Covered by Working Hour Limits



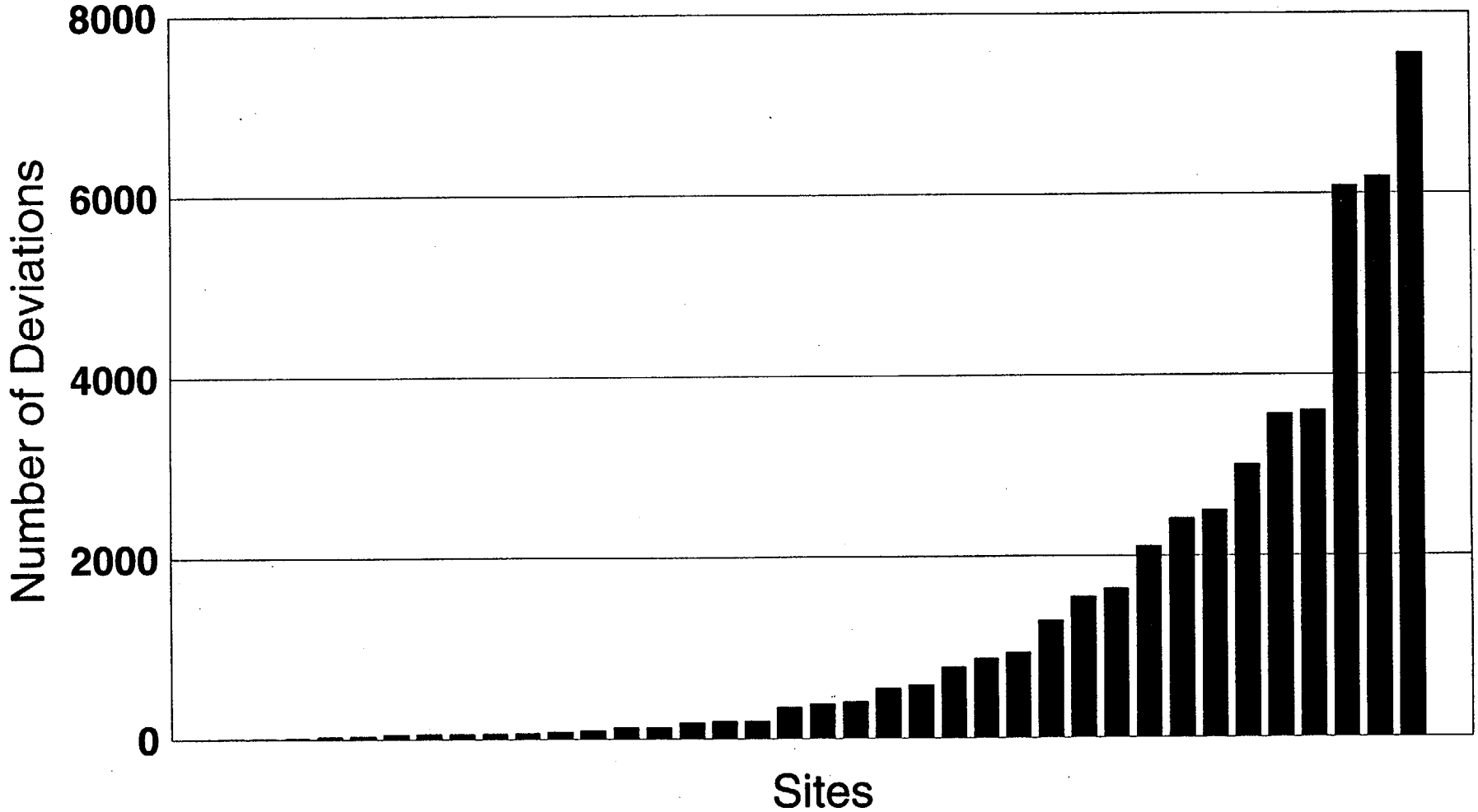
47 of 66 sites reporting data (71%)
Range is 0 to 1471 (609, 831 & 1471 are above 600)

Deviations While Site Operating - 1999



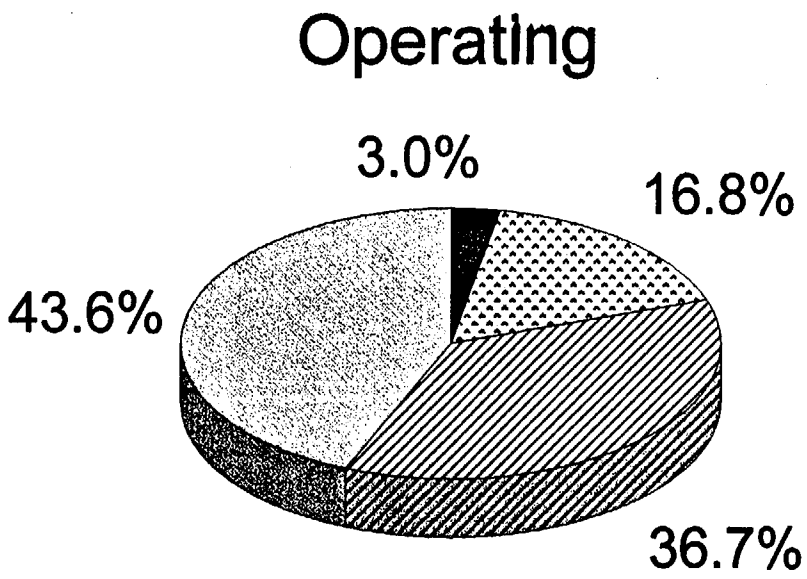
40 of 66 reporting data (61%)
Range of Deviations - 12 to 992

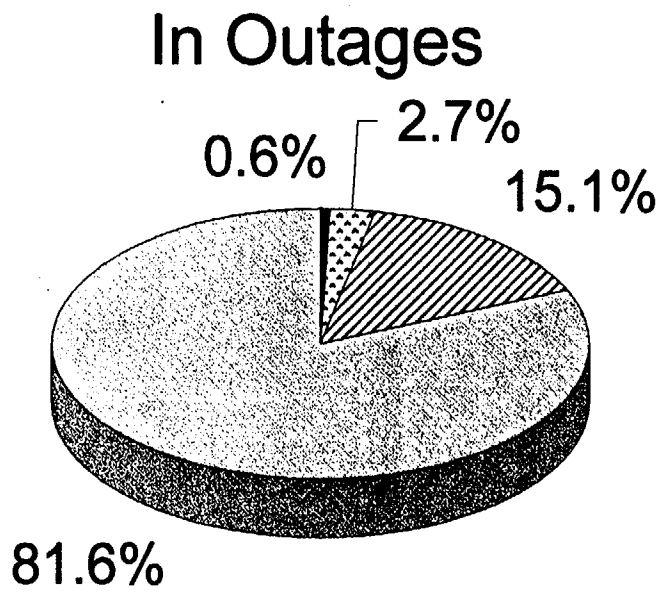
Deviations While Site in Outages - 1999



37 of 66 sites reporting data (56%)
Range of deviations - 7 to 7553

Type of Deviation While Site





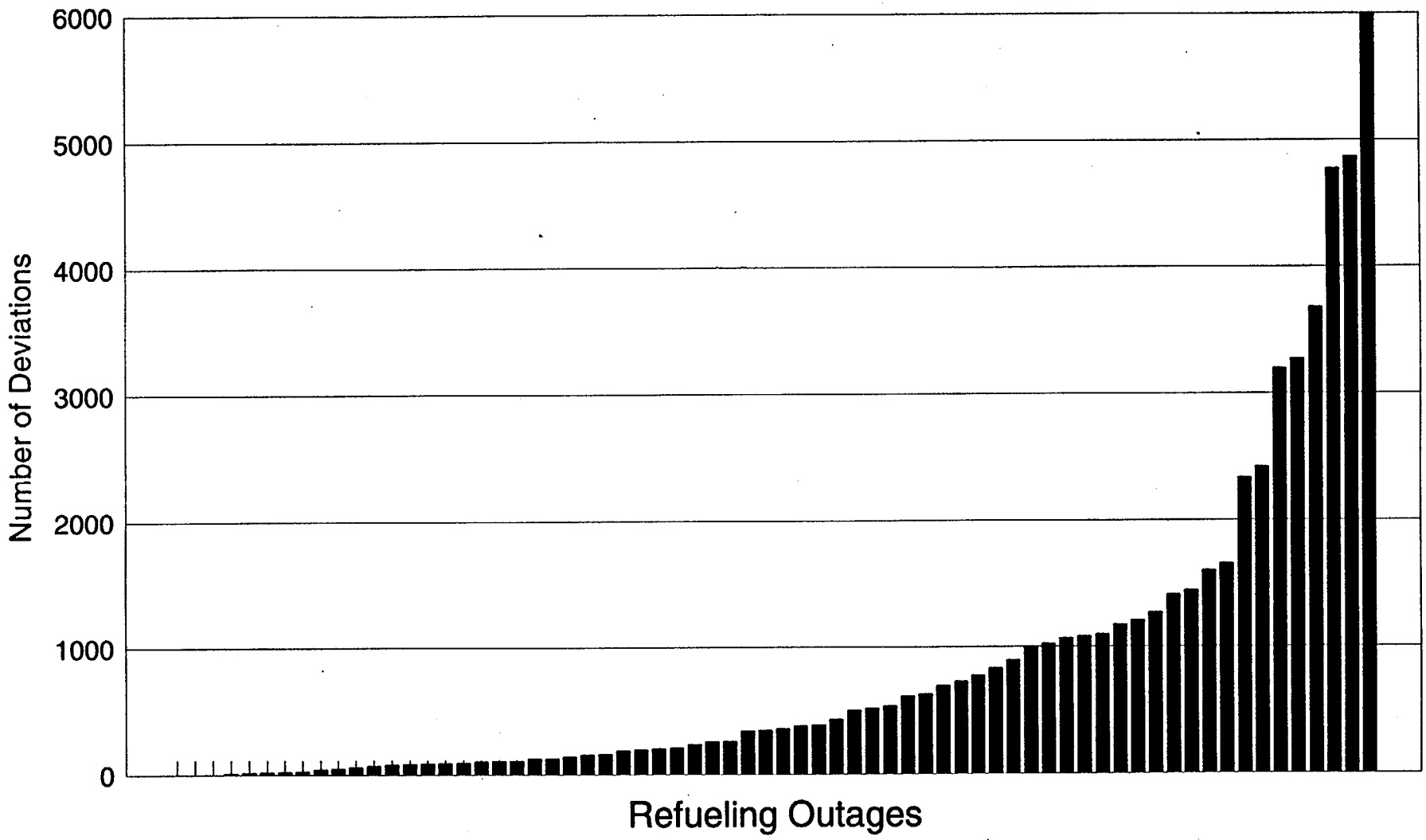
< 8 hrs. break

>24 hrs. in 48 hrs.

>72 hrs. in 7 days

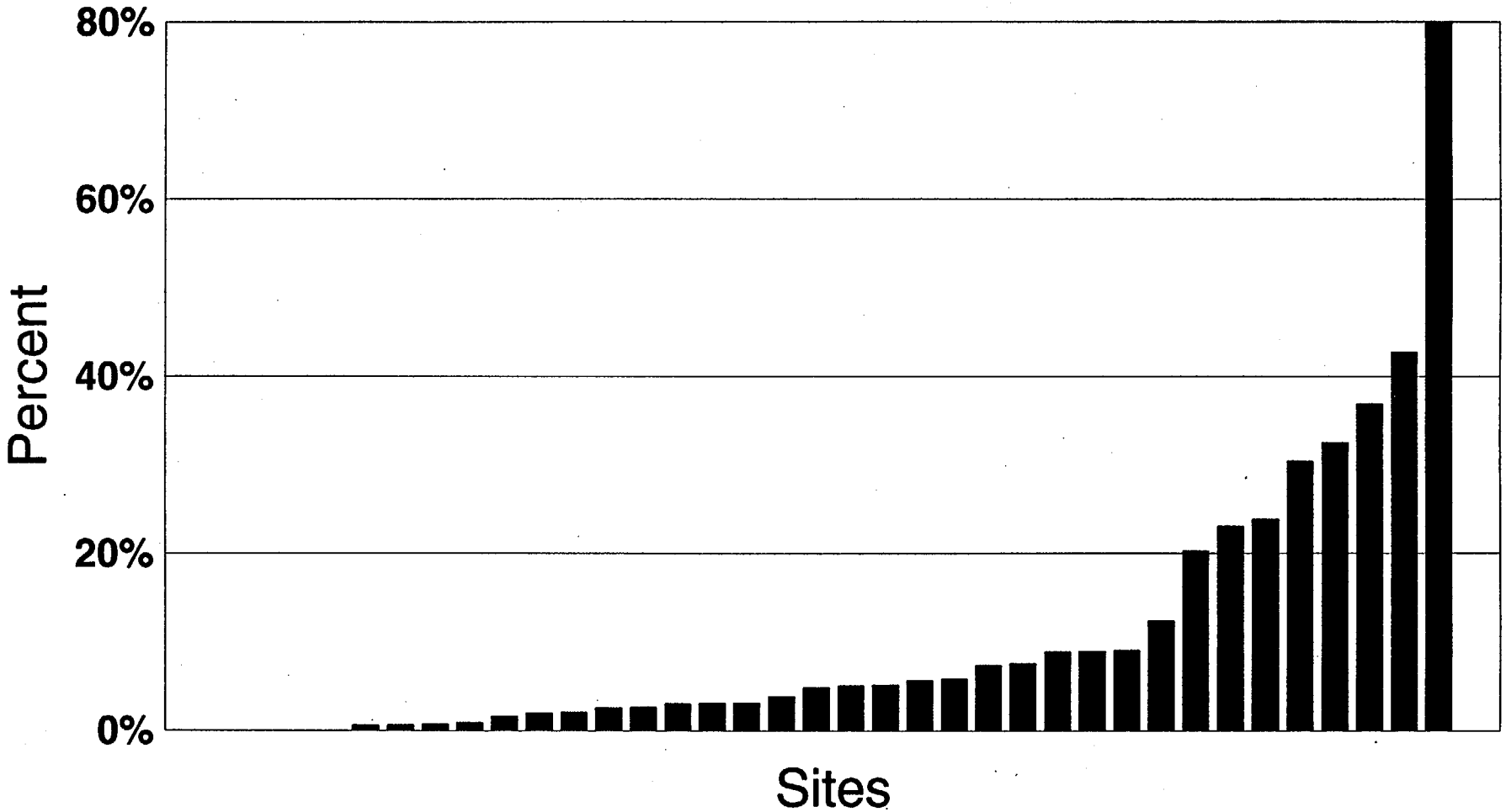
>16 hrs. in 24 hrs.

Number of Deviations During a Refuel Outage

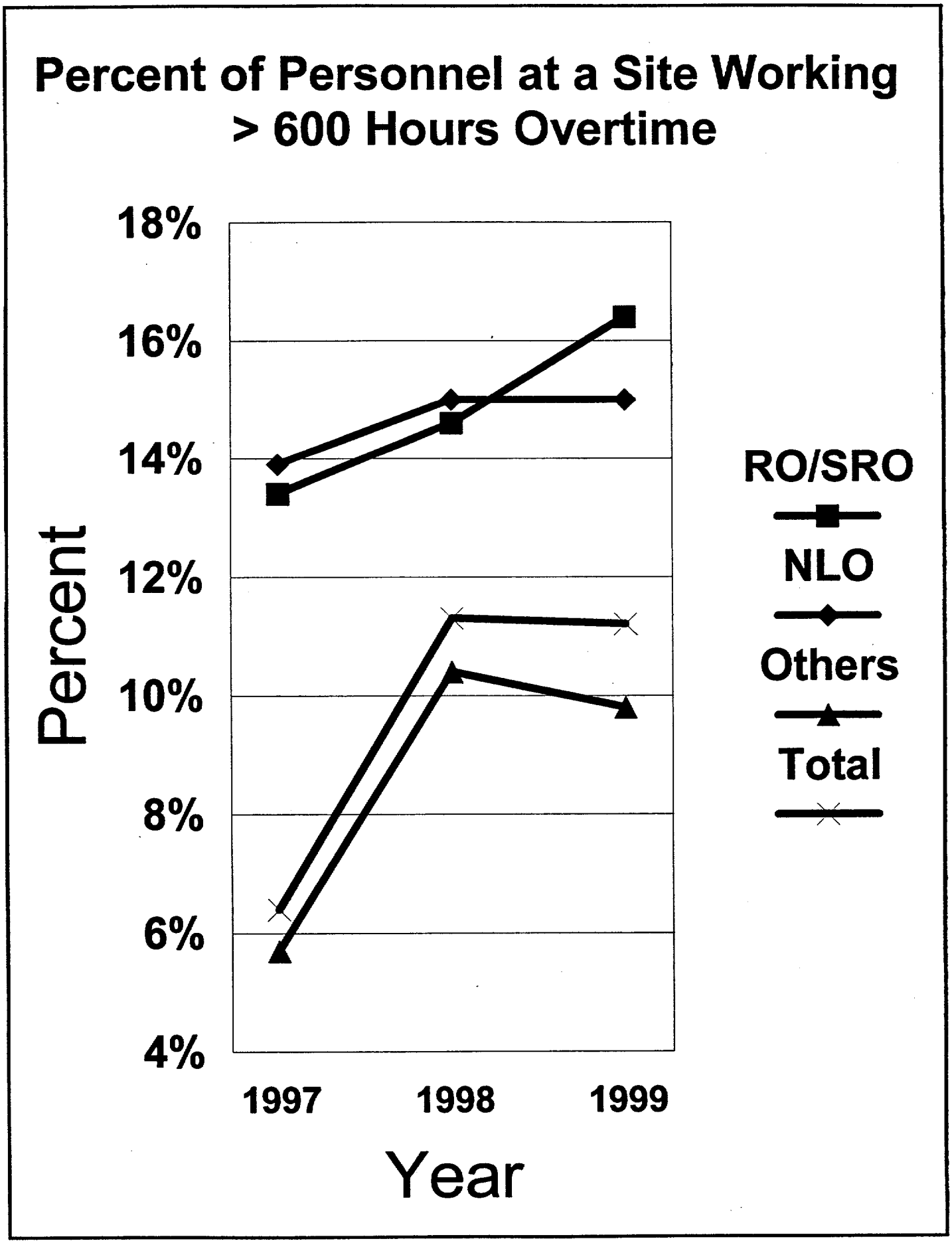


Total Outages = 68
Range of Deviations - 0 to 6733

Percent of Personnel at a Site Working > 600 Hours Overtime per Year - 1999



36 out of 66 Sites Reporting Data


Percent of Personnel at a Site Working
> 600 Hours Overtime
18%
16%
14%
12%
10%
8%
6%
4%
Percent
1997
1998
1999
Year
RO/SRO
NLO
Others
Total

Summary of Industry Data of Working Hours

Scope

- SROs, ROs, and NLOs are the only categories of personnel covered at all sites responding to the survey
- Some sites do not apply the working hour TS limits to any maintenance personnel
- Several sites apply the working hour limits to only very few non-operator positions

Summary of Industry Data of Working Hours

Deviations

- Normal operations - about 1/3 of the sites authorized more than 200 deviations annually
- Outages - about 1/3 of the sites authorized more than a thousand deviations annually
- Refueling outages - about 1/4 of the sites authorize hundreds (341-997) of deviations and over 1/4 of the sites authorize thousands (1024-6733)
- Some sites authorize relatively few deviations

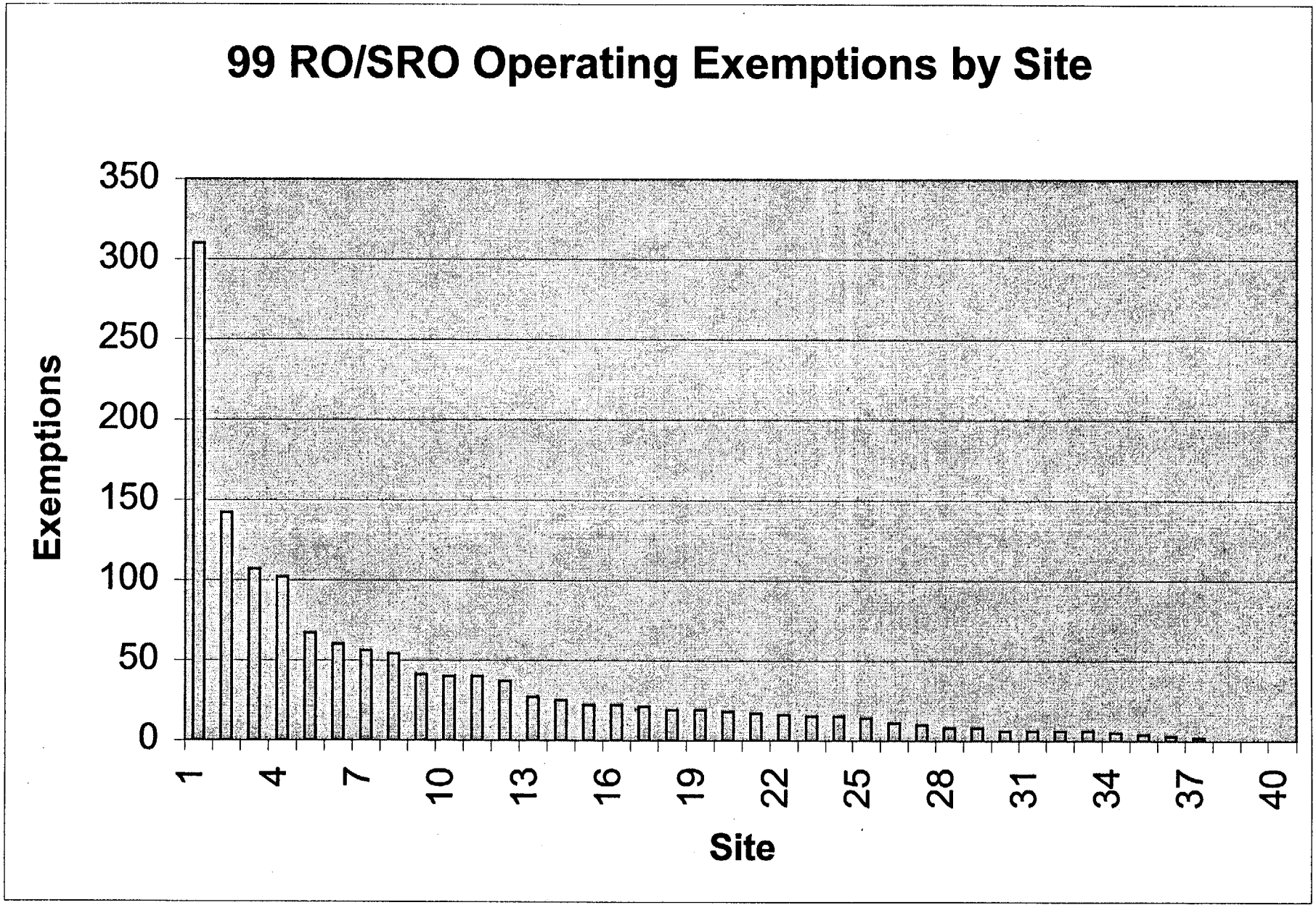
Summary of Industry Data of Working Hours

Overtime

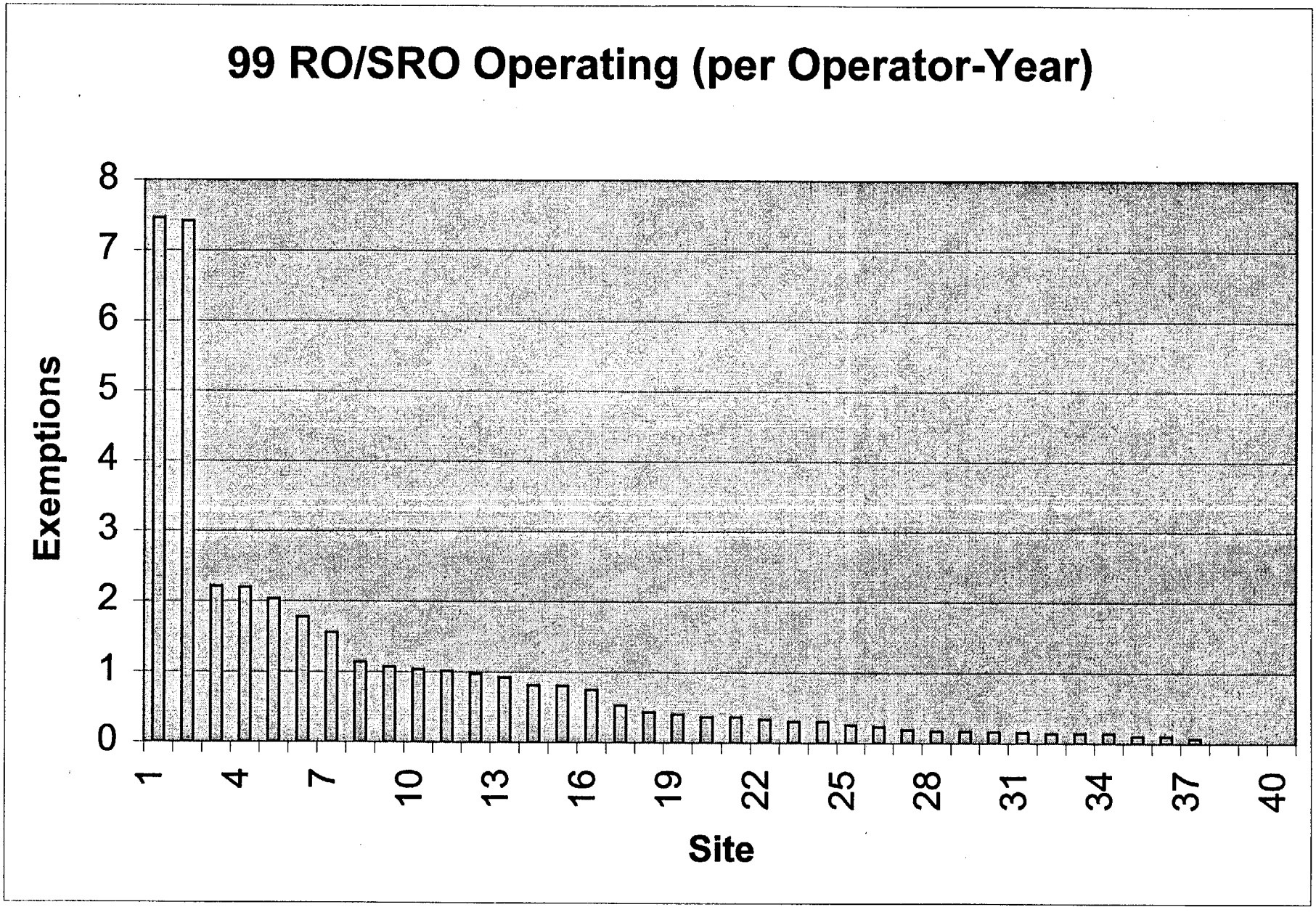
- 1/4 of the sites have a substantial percentage of personnel covered by working hour limits working in excess of 600 hours of overtime annually
- The percent of personnel working in excess of 600 hours of overtime annually has increased since 1997

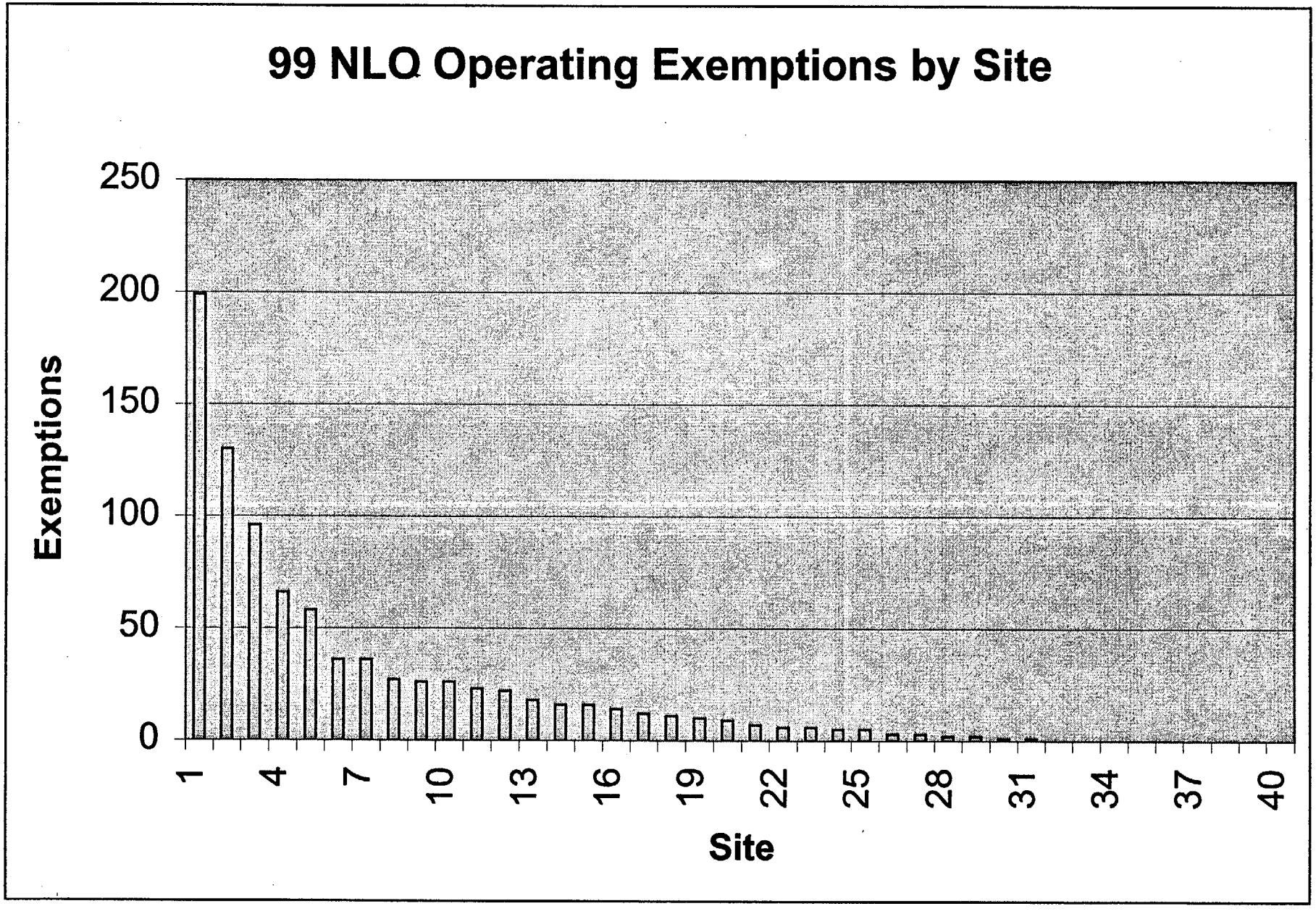
Conclusion

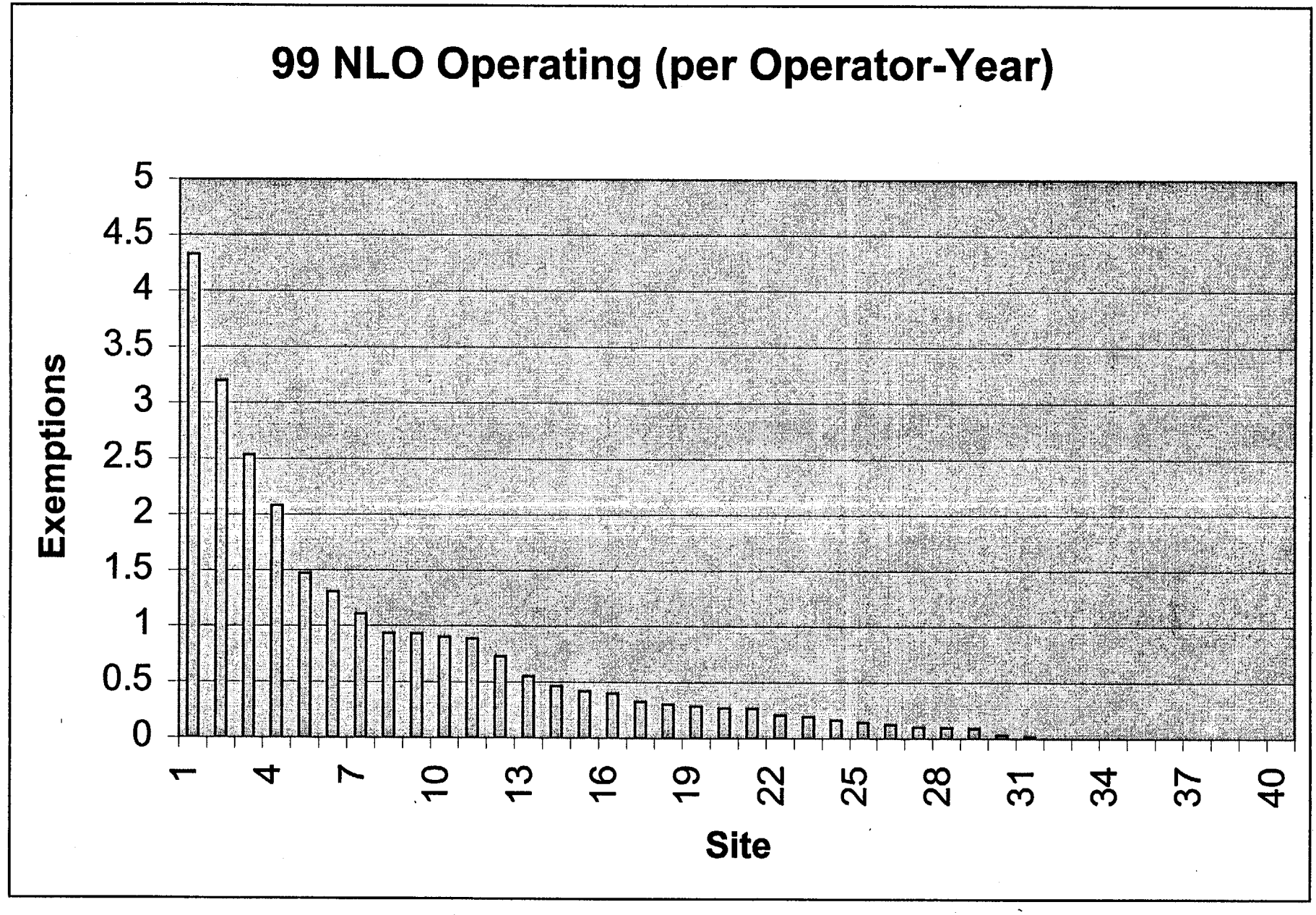
- Inconsistency among sites in scope of personnel covered by work hour limits
- Numerous instances of individuals exceeding policy working hour guidelines
- Frequency of guideline deviations and amount of overtime appears inconsistent with intent of policy
- Deviations increase risk of fatigue-induced impairment

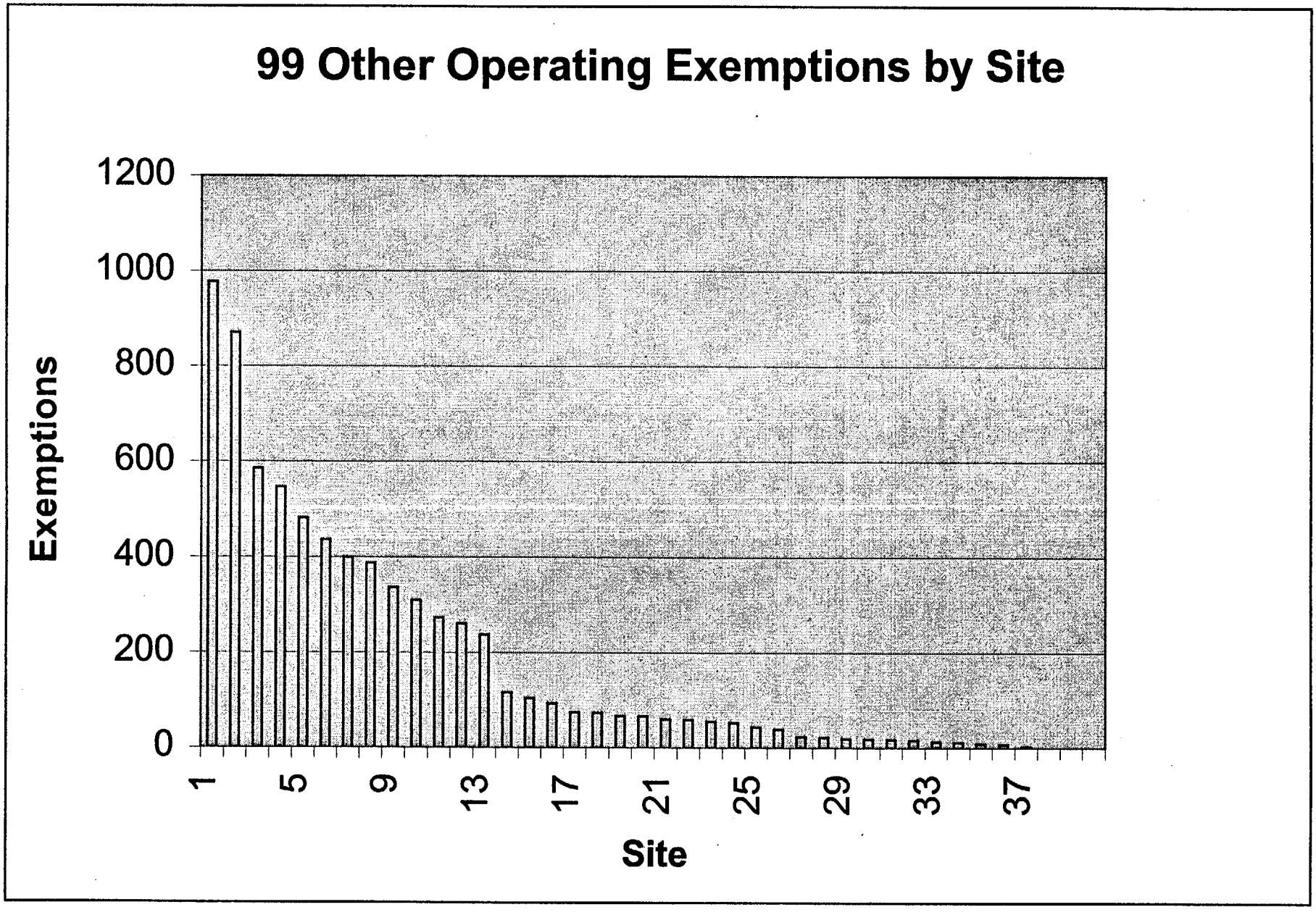


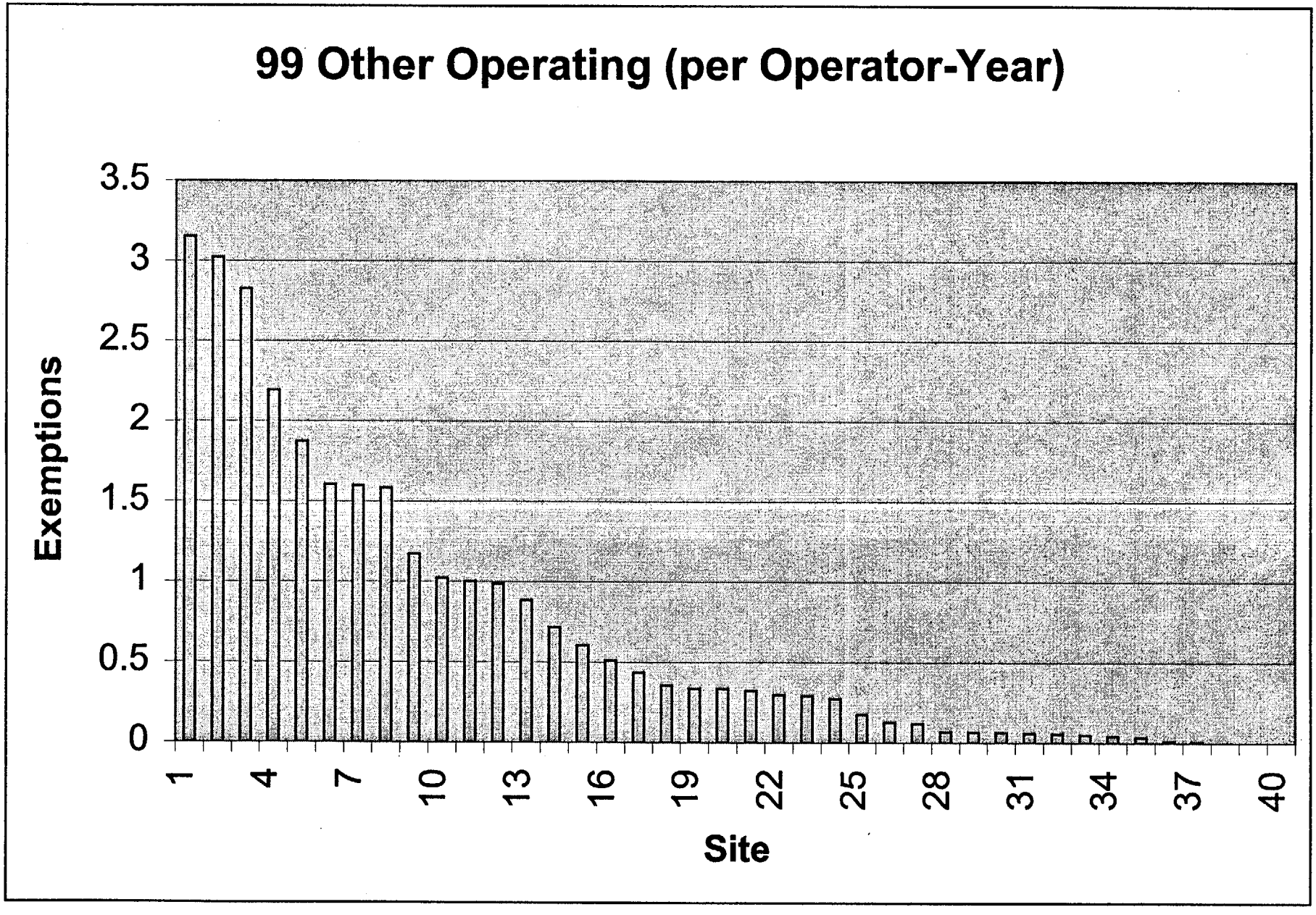
Attachment 6

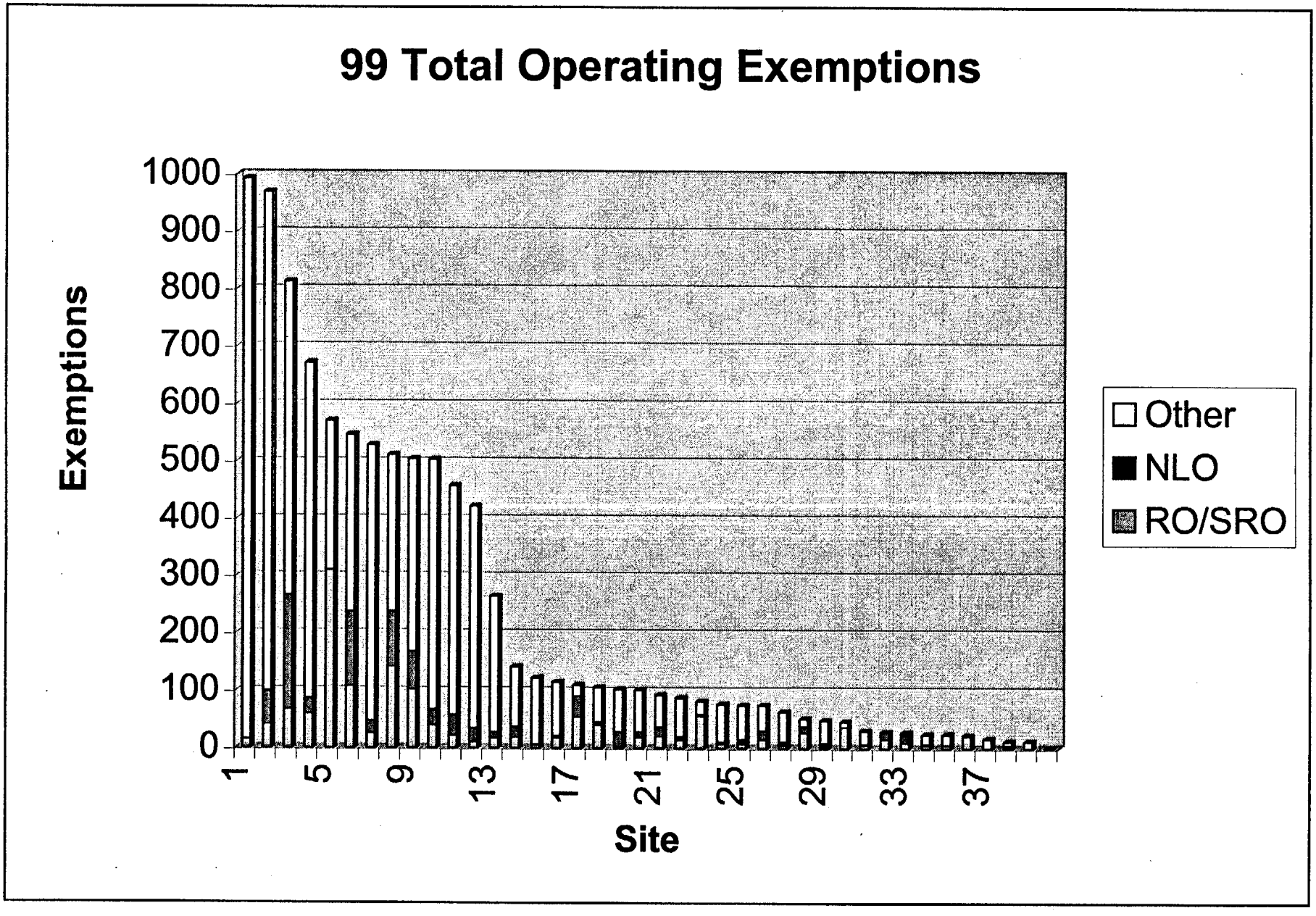

99 RO/SRO Operating (per Operator-Year)
Exemptions
0
1
2
3
4
5
6
7
8
1
4
7
10
13
16
19
22
25
28
31
34
37
40
Site

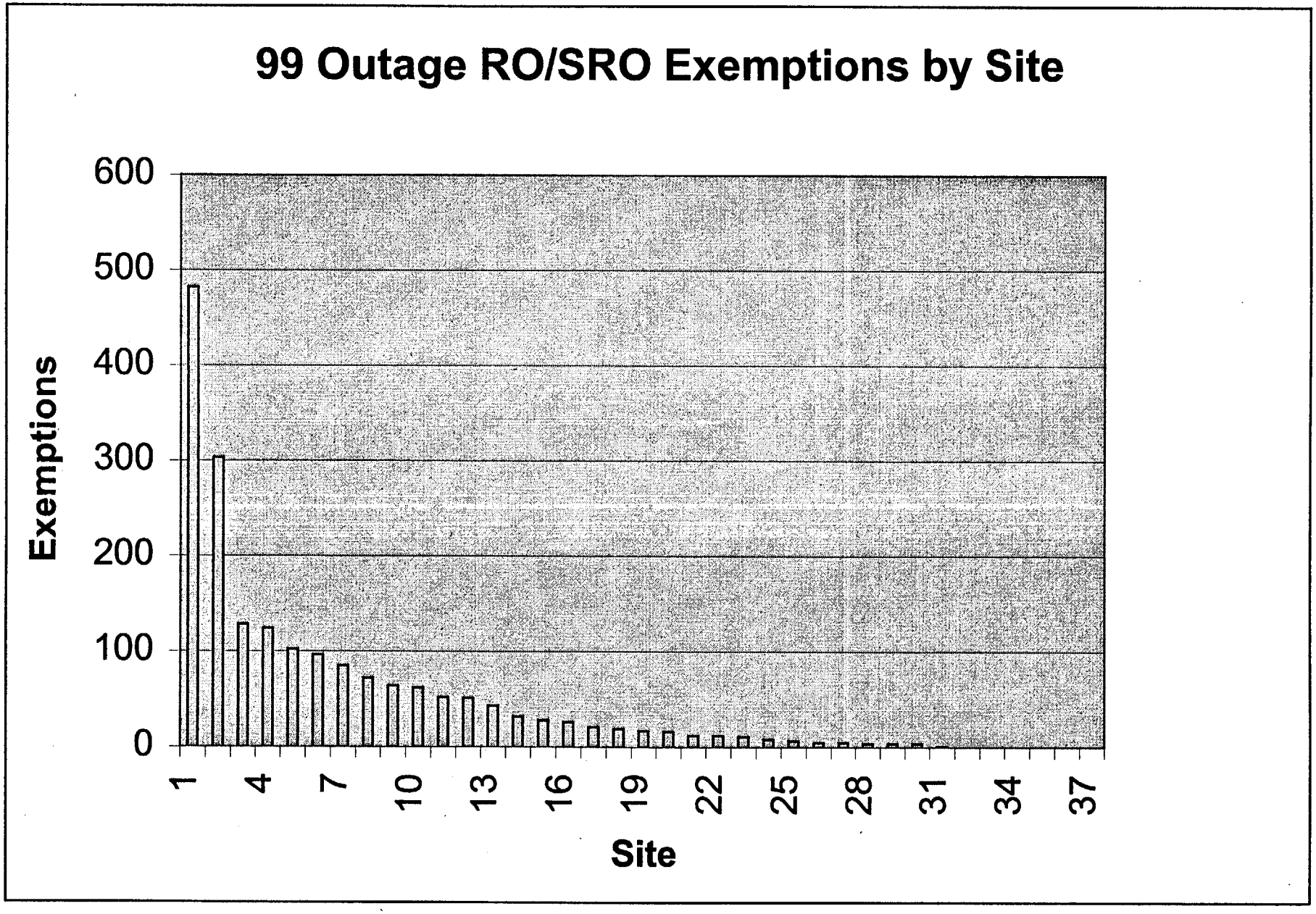

99 NLQ Operating Exemptions by Site
Exemptions
250
200
150
100
50
0
1
4
7
10
13
16
19
22
25
28
31
34
37
40
Site

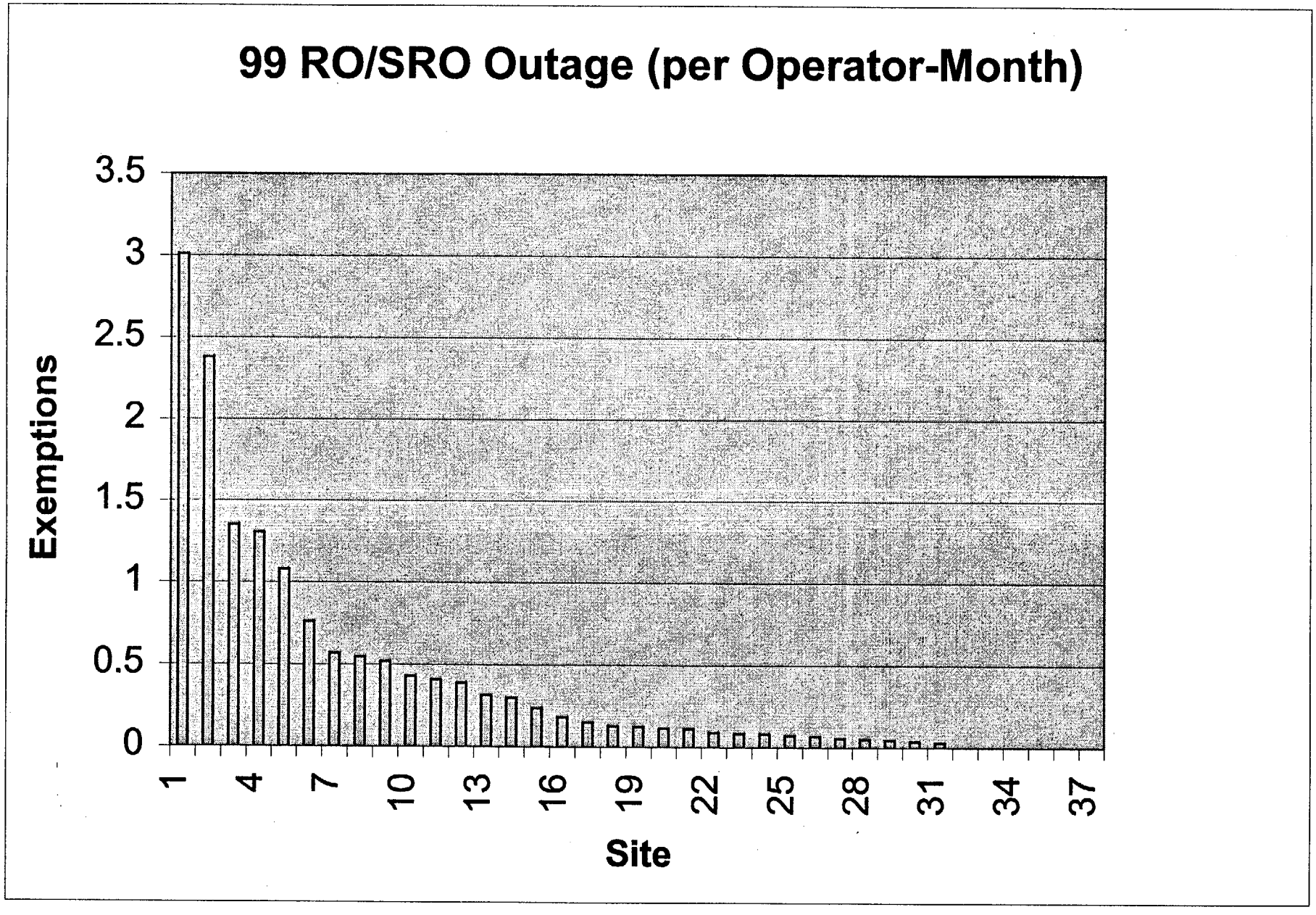

99 NLO Operating (per Operator-Year)
Exemptions
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1
4
7
10
13
16
19
22
25
28
31
34
37
40
Site

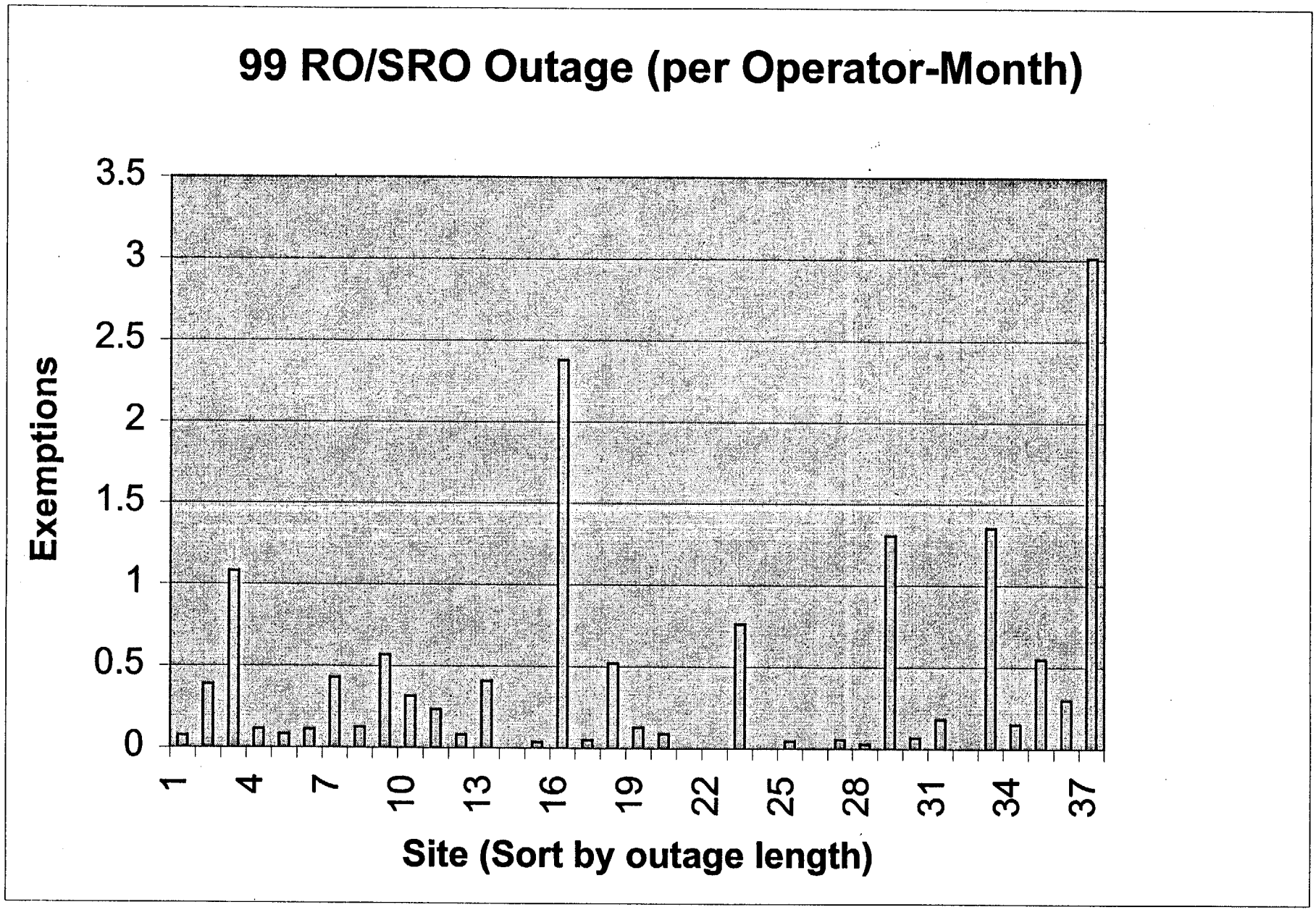

99 Other Operating Exemptions by Site
Exemptions
1200
1000
800
600
400
200
0
1
5
9
13
17
21
25
29
33
37
Site

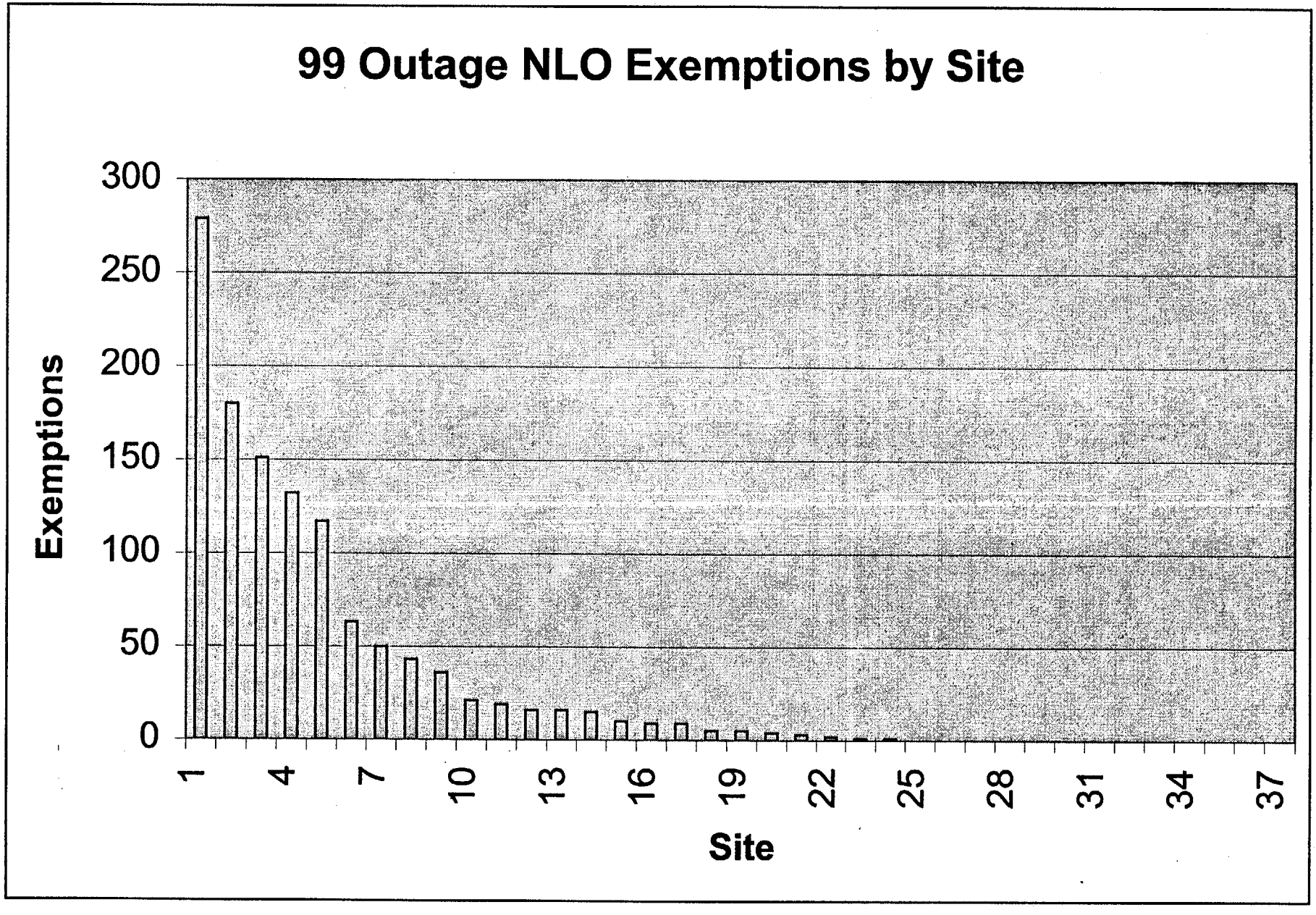

99 Other Operating (per Operator-Year)
Exemptions
3.5
3
2.5
2
1.5
1
0.5
0
1
4
7
10
13
16
19
22
25
28
31
34
37
40
Site

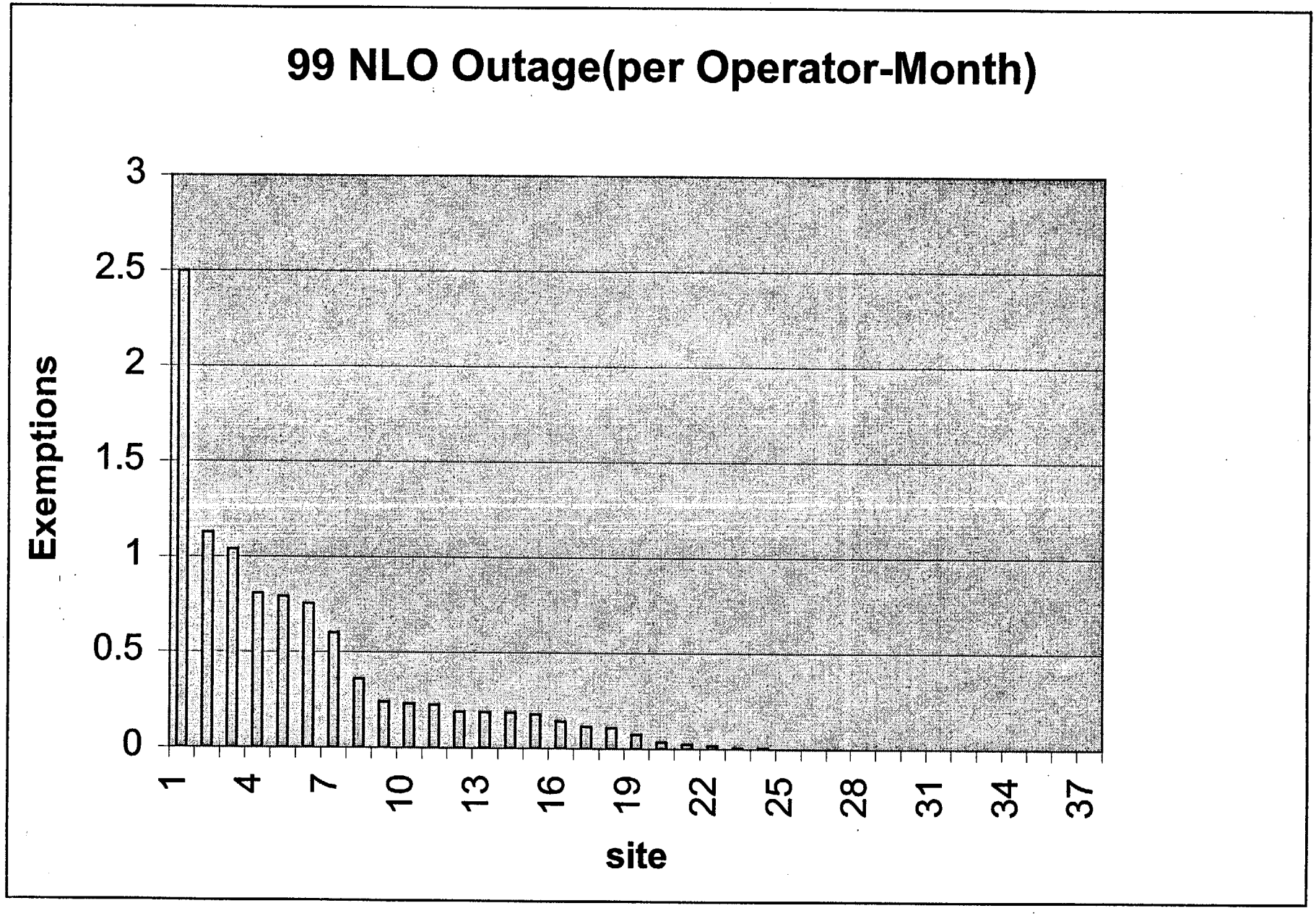

99 Total Operating Exemptions
Exemptions
1000
900
800
700
600
500
400
300
200
100
0
1
5
9
13
17
21
25
29
33
37
Site
Other
NLO
RO/SRO

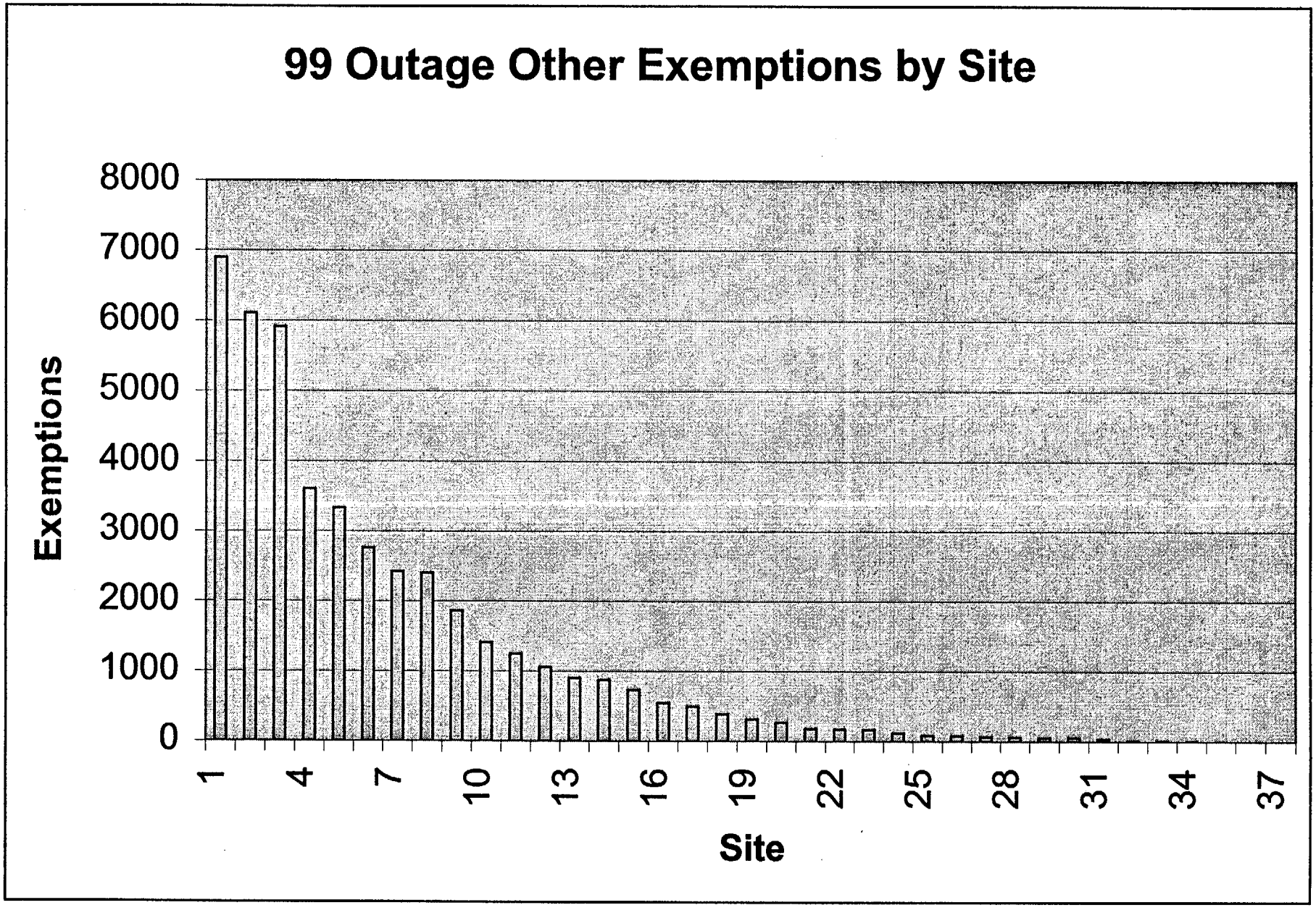

99 Outage RO/SRO Exemptions by Site
Exemptions
600
500
400
300
200
100
0
1
4
7
10
13
16
19
22
25
28
31
34
37
Site

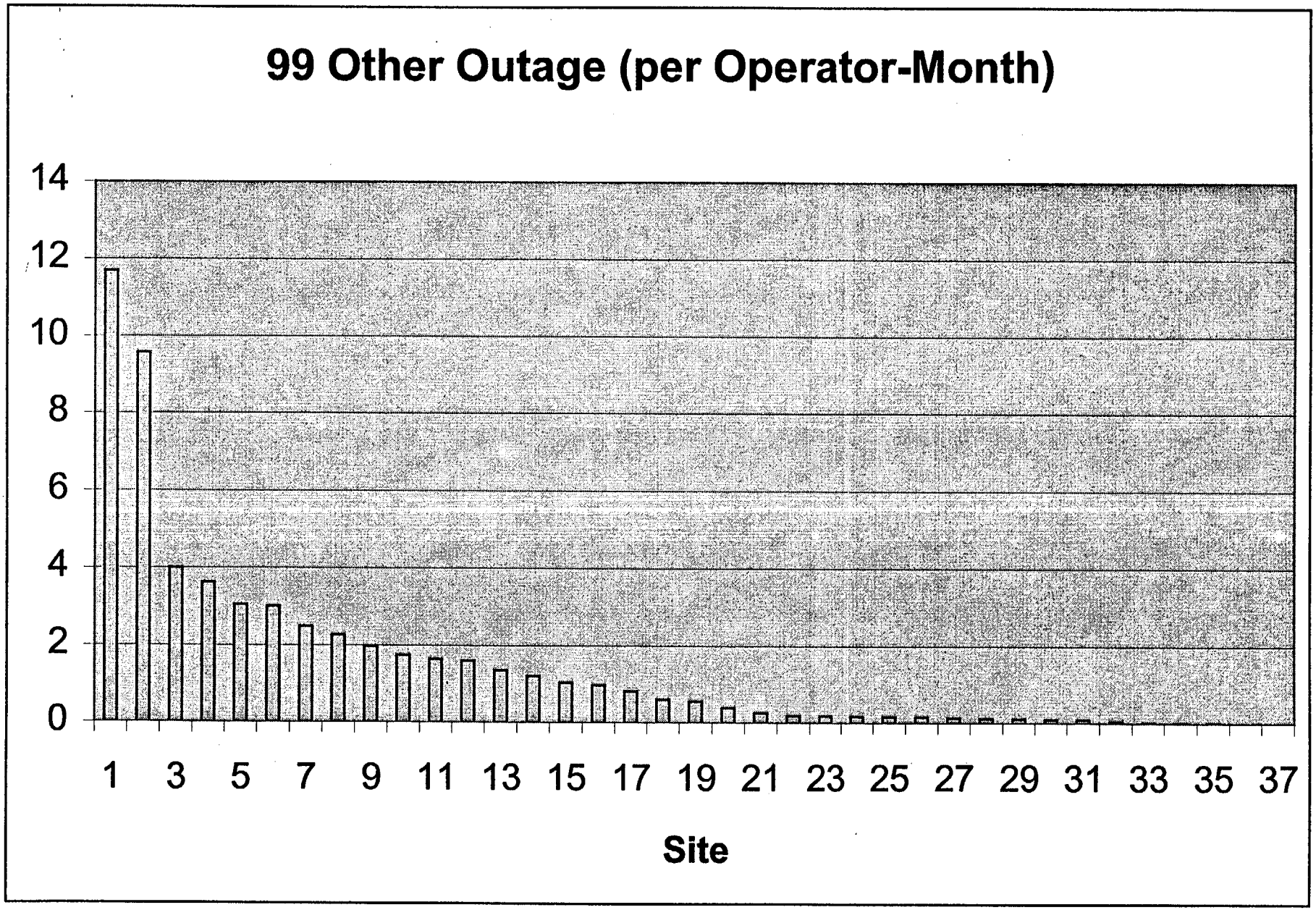

99 RO/SRO Outage (per Operator-Month)
Exemptions
3.5
3
2.5
2
1.5
1
0.5
0
1
4
7
10
13
16
19
22
25
28
31
34
37
Site

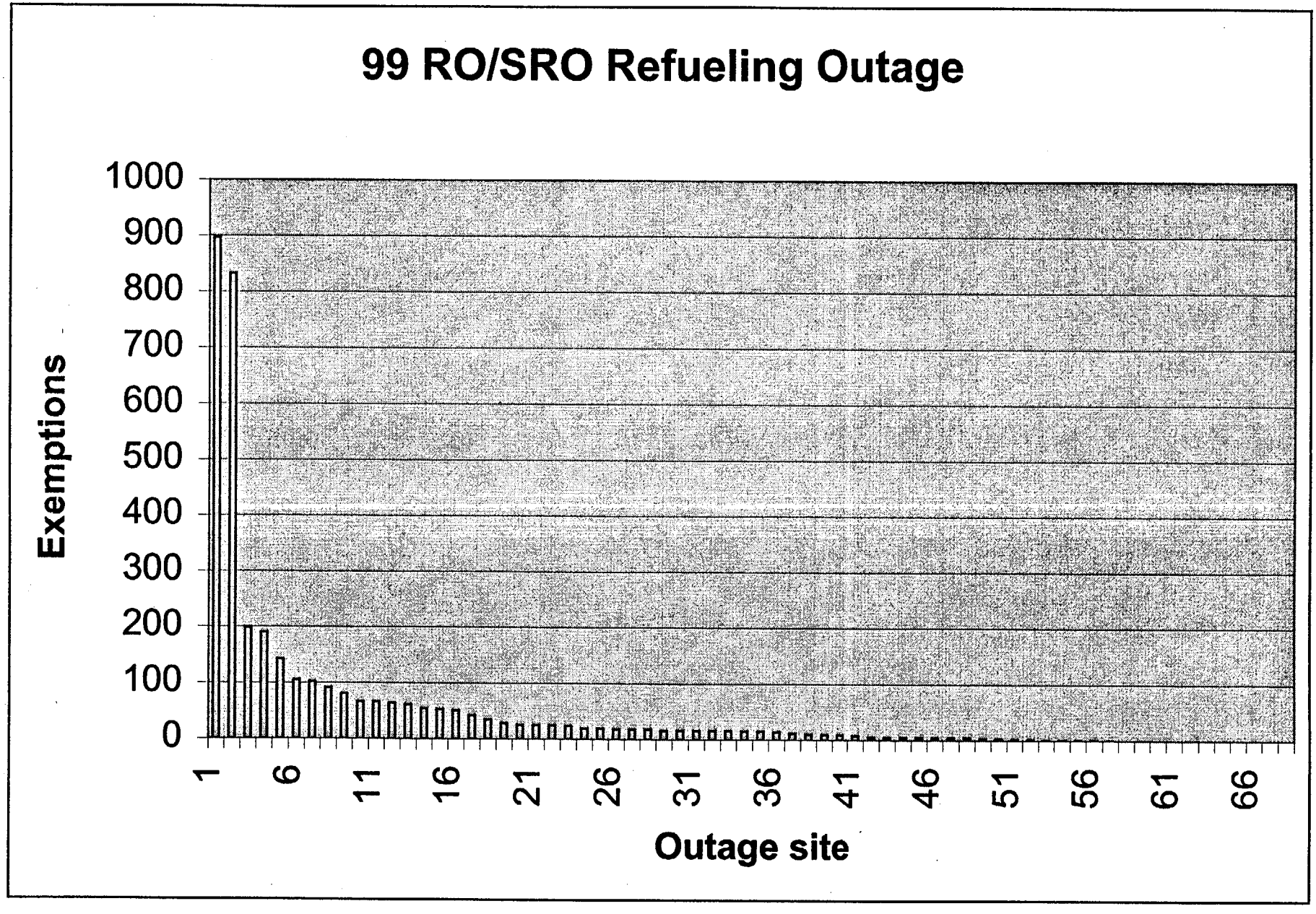

99 RO/SRO Outage (per Operator-Month)
Exemptions
3.5
3
2.5
2
1.5
1
0.5
0
1
4
7
10
13
16
19
22
25
28
31
34
37
Site (Sort by outage length)

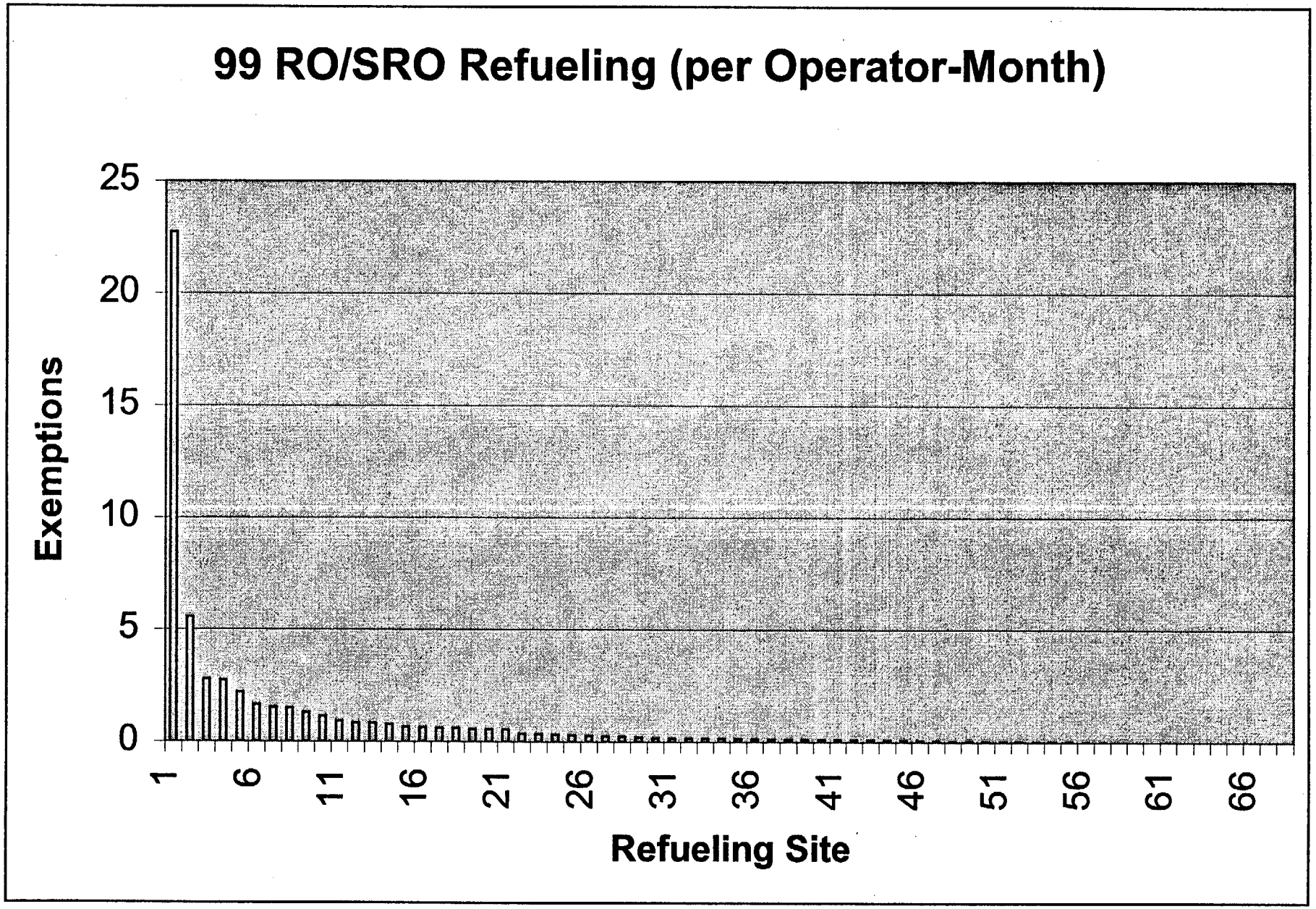

99 Outage NLO Exemptions by Site
Exemptions
300
250
200
150
100
50
0
1
4
7
10
13
16
19
22
25
28
31
34
37
Site

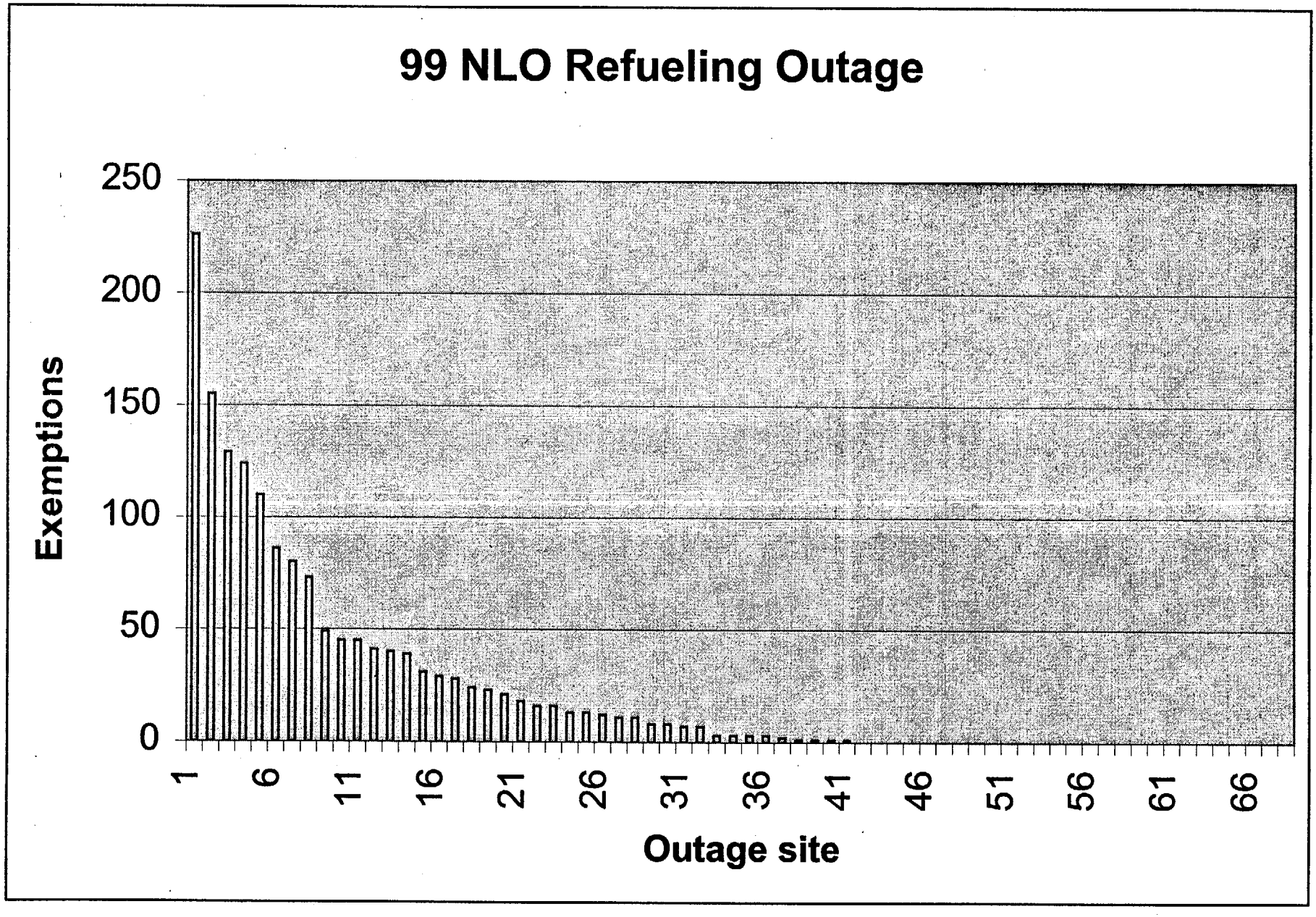

99 NLO Outage(per Operator-Month)
Exemptions
3
2.5
2
1.5
1
0.5
0
1
4
7
10
13
16
19
22
25
28
31
34
37
site

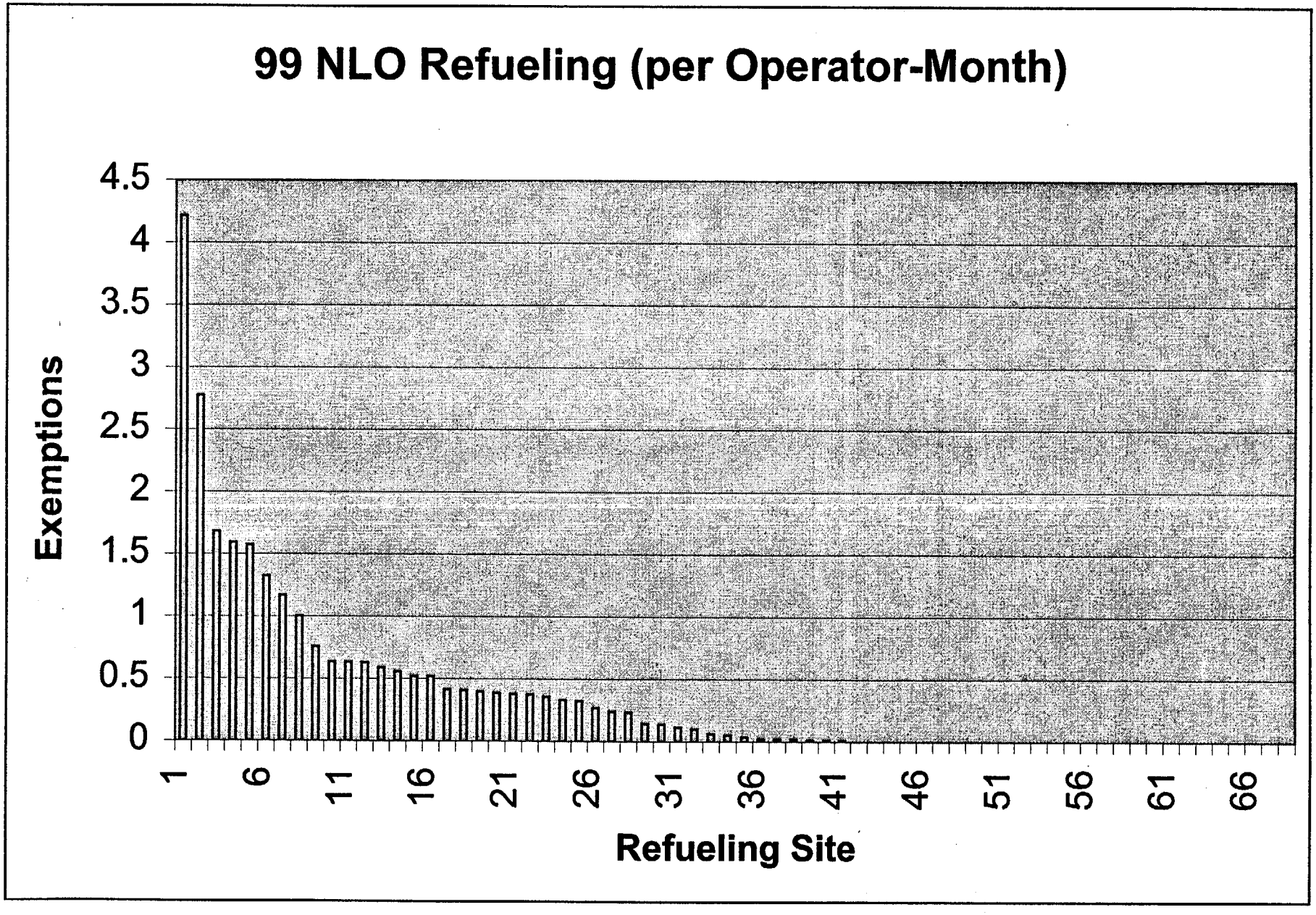

99 Outage Other Exemptions by Site
Exemptions
8000
7000
6000
5000
4000
3000
2000
1000
0
1
4
7
10
13
16
19
22
25
28
31
34
37
Site

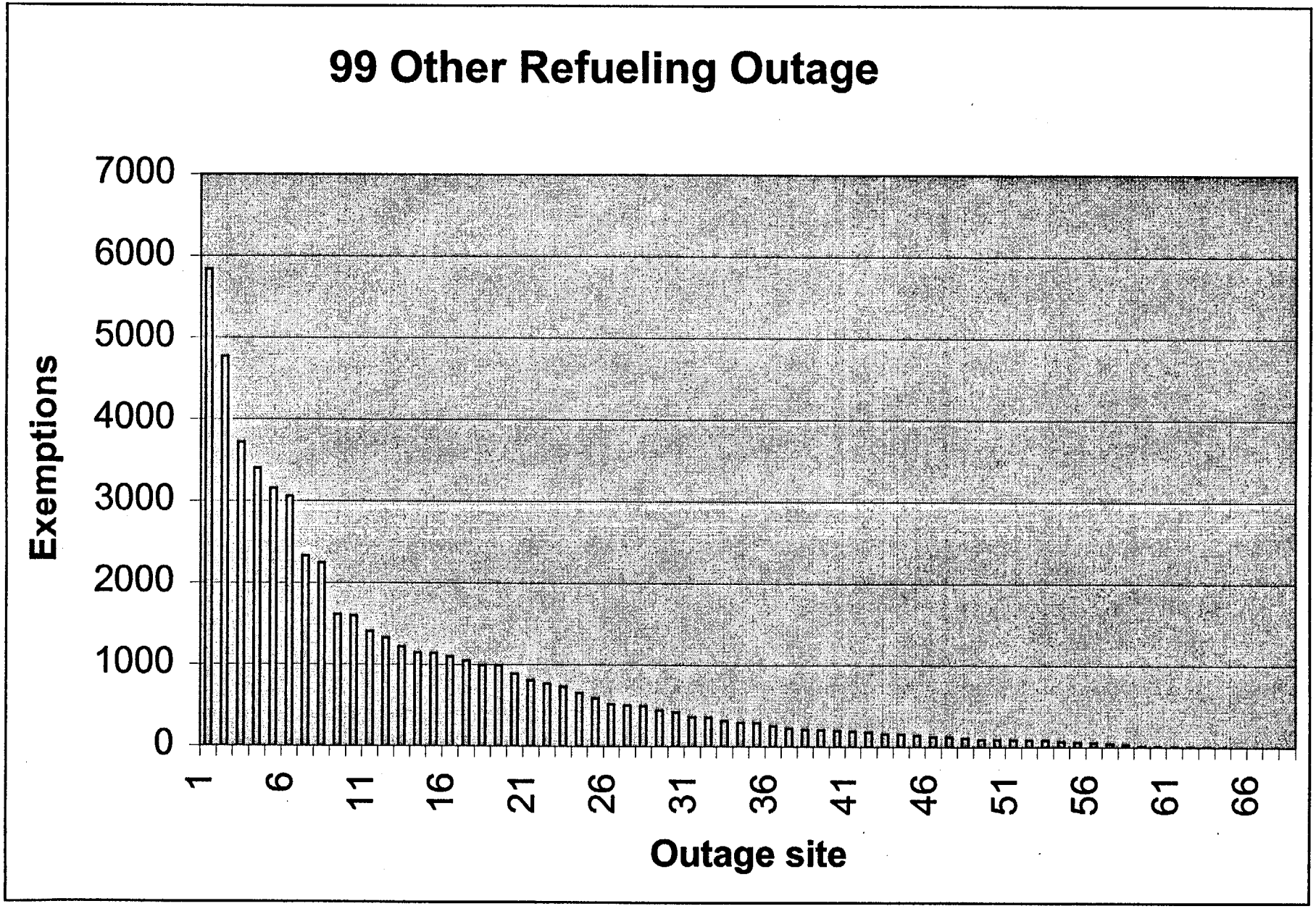

99 Other Outage (per Operator-Month)
14
12
10
8
6
4
2
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37
Site

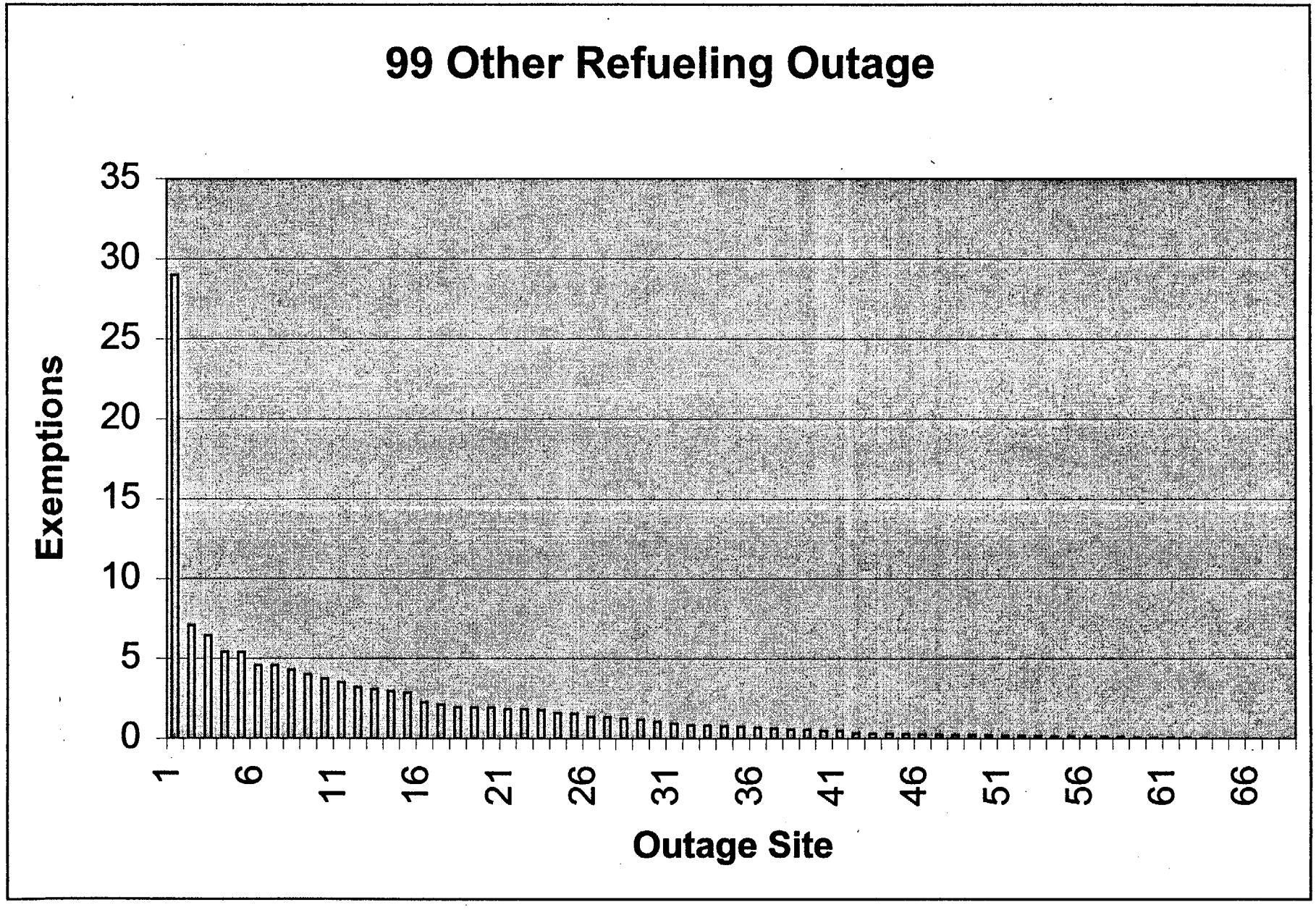

99 RO/SRO Refueling Outage
Exemptions
1000
900
800
700
600
500
400
300
200
100
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
Outage site


99 RO/SRO Refueling (per Operator-Month)
Exemptions
25
20
15
10
5
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
Refueling Site


99 NLO Refueling Outage
Exemptions
250
200
150
100
50
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
Outage site


99 NLO Refueling (per Operator-Month)
Exemptions
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
Refueling Site


99 Other Refueling Outage
Exemptions
7000
6000
5000
4000
3000
2000
1000
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
Outage site


99 Other Refueling Outage
Exemptions
35
30
25
20
15
10
5
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
Outage Site