February 21, 2008

MEMORANDUM TO: Chairman Klein
Commissioner Jaczko
Commissioner Lyons

FROM: Luis A. Reyes ***/RA/***
Executive Director for Operations

SUBJECT: CORRELATION BETWEEN FACILITY LICENSEE PERFORMANCE AND THE NUMBER OF LICENSED OPERATORS

The purpose of this memo is to provide staff's response to the Staff Requirements Memorandum M070724C, "Briefing on Palo Verde Nuclear Generating Station," dated August 13, 2007, the staff assessed whether there is any current or historical correlation between facility licensee performance and the number of licensed operators at a facility. Based on its analysis covering the 4-year period of 2004 through 2007, the staff found no statistically significant correlation between the selected measures of licensee performance and the number of licensed operators at a facility.

The staff compiled the agency's readily available operator staffing data from the Operator Licensing Tracking System (OLTS), plant performance data developed under the Reactor Oversight Process (ROP), and operator performance data contained in the Human Factors Information System (HFIS). The staff executed correlation analyses of several relevant variables in these data sources. Each of these data sources are briefly summarized as follows:

- The OLTS database is a computerized record of every individual who ever applied for, currently holds, or previously held a license to operate a nuclear reactor in the United States. The database records both the effective and termination dates for every license. The staff used these records to determine the number of reactor operators (ROs) and senior reactor operators (SROs) licensed at every power reactor facility annually from 2004 through 2007.

- As part of the ROP, the staff updates the Action Matrix Summary every calendar quarter to reflect overall plant performance based on inputs from the most recent performance indicators and inspection findings. Each nuclear power plant (unit) is assigned to one of four columns in the Action Matrix depending on its overall level of safety during the quarter. Historical data (past performance) from the beginning of the ROP are posted on the U.S. Nuclear Regulatory Commission (NRC) public Web site.

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- The HFIS database provides a searchable record of a broad range of unit-specific human performance issues screened from Licensee Event Reports (LERs) and NRC inspection reports since 1997. Each performance issue is sorted into one or more general categories (e.g., training, procedures and reference documents, human-system interface and environment) and coded with a number of specific details to facilitate future analysis. Every issue also is coded for work type and department of the individual involved with the issue. Although the database is not all-inclusive, the staff considers it indicative of overall performance.

With respect to operators in the training pipeline, the staff routinely solicits information from facility licensees regarding their future license examination needs, including estimated numbers of applicants and preferred examination dates. Although the information is useful to the staff for preparing examination schedules and budgets, the estimates are often unreliable given uncertainties in the facilities' ability to recruit trainees who can successfully complete the lengthy and demanding operator training and licensing process. For that reason, and in the absence of a statistically significant historical correlation, the staff did not attempt to analyze the available pipeline data.

The staff analyzed these data using the following methods and has provided the pertinent observations, findings, and conclusions, as applicable. The data for single- and multiple-unit facilities are summarized in the enclosed tables.

Analysis using the Average Number of Licensed Operator Staff

The staff calculated an average licensed operator staffing level (including ROs and SROs) at each facility over the last 4 years (2004–2007) and the net change in operator staffing at each facility during that time. The staff also summarized the overall plant performance over the same time period by summing each facility's quarterly ROP Action Matrix standings. Each quarter in Column 1 counted as a "0," each quarter in Column 2 counted as a "1," each quarter in Column 3 counted as a "2," and each quarter in Column 4 counted as a "3." Multi-unit facilities had only one score, based on the higher or highest scoring unit in the Action Matrix. (For example, if a facility was in Column 1 for the first quarter of 2006, Column 3 for the second and third quarters of 2006, and Column 4 for the fourth quarter of 2006 its overall plant performance for 2006 would have been equal to 0, plus 2, plus 2, plus 3 or a total of 7). The staff then ranked the single- and multi-unit facilities from lowest to highest average staffing and from best to worst cumulative performance over the 4-year period and analyzed the rankings to determine if a correlation existed. Although the staff determined that there was no statistically significant correlation in those parameters, it did note that the vast majority of facilities—33 out of 39 single-unit facilities and 25 out of 32 multi-unit facilities—experienced a decline in the number of licensed operator staff over the 4-year period, with an average decline of almost 10 percent.

The OLTS database does not track whether an operator with an effective license is maintaining his or her license active by periodically standing watch in the control room. The regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' Licenses," require every operator to participate in the requalification program. The regulations also allow facility licensees the flexibility to administratively control their operators' active status without notifying the NRC. Consequently, the staff would have to survey facility licensees or conduct inspections to determine (1) how many active licensees there were at any point in time and (2) whether the

observed decline in the number of license holders had an impact on control room shift staffing or the amount of operator overtime.

Analysis using the Average Number of Licensed Reactor Operators

Because the majority of the inactive license holders at most facilities (e.g., training staff and operations management) are licensed as SROs, the staff repeated the analysis described above using only the average number of licensed ROs at each facility to determine if a stronger performance correlation might exist. The staff was unable to find any statistically significant correlation.

Analysis Comparing the Number of Human Performance Issues with the Net Change of Licensed Staff

In addition to the overall plant performance scores based on the Action Matrix, the staff searched the HFIS database to determine the number of human performance issues involving operations staff. The staff determined annual and cumulative totals over the same 4-year period for each facility. Because most of the human performance issues at multi-unit facilities affect all the units at the facility, the staff analyzed only the data from the worst performing units. The staff compared each of the annual and the number of cumulative HFIS human performance issues with the net change in the number of ROs and SROs at each facility over the 4-year period. The staff was unable to find any statistically significant correlation.

In addition, the staff assumed that any decline in operator performance could lag behind the decrease in operator staffing observed at most facilities. The staff thus compared the HFIS human performance issues during 2007, the last year in the period of interest, with the average number of ROs and SROs at each facility over the 4-year period. Again, the staff was unable to find any statistically significant correlation.

Conclusion

The staff found no apparent statistically significant correlation in the current analyses that might support using changes in operator staffing as a predictor of future plant performance. However, the staff based these analyses on comparisons across plants and controlled only the analyses for the number of operating units. The many differences between plants may account for performance variations. The analyses, therefore, do not provide a basis for concluding that there is no cause and effect relationship between operator staffing and plant performance. Licensed operator staffing at most facilities has declined over the past 4 years, and the recent 95003 inspection (ML080320562) conducted at the Palo Verde Nuclear Generating Station confirmed that reductions in staffing contributed to declining performance at that facility. Conversely, the largest increase in licensed operator staffing over the 4-year period occurred at the Davis-Besse facility, which had previously exhibited significant performance deficiencies.

The staff limited its analyses to operator staffing because NRC data are limited to the number of licensed operators. It is possible, as recently identified at Palo Verde, that other plant staffing levels (e.g., maintenance) will correlate to plant performance. Finally, more than 4 years might be necessary to notice a decline in performance at the facilities.

Please let me know if you have any further questions or desire a briefing regarding this matter.

Enclosures: As stated

cc: SECY
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Single-Unit Facilities	Average Number of ROs and SROs (2004–2007)	Rank of Average Number of ROs and SROs	Average Number of ROs Only (2004–2007)	Rank of Average Number of ROs Only	Plant ROP Matrix Performance (2004–2007)	ROP Performance Rank	Change in RO and SRO Staffing (2004–2007)	Number of HFIS Issues Involving Operations Staff in 2007	Total Number of HFIS Issues Involving Operations Staff (2004–2007)
Arkansas 1	56.0	33	20.8	21	3	16	-1.8%	4	32
Arkansas 2	58.0	37	20.2	19	0	1	-11.1%	6	31
Beaver Valley 1	37.6	2	17.6	11	5	25	-7.7%	1	18
Beaver Valley 2	44.6	9	23.2	28	5	25	-14.3%	1	17
Callaway	58.6	38	22.4	27	6	29	-26.2%	39	113
Clinton	50.8	23	22.0	25	4	19	-9.4%	6	42
Columbia	57.0	35	26.4	38	5	25	-15.3%	8	58
Cooper	45.4	12	18.0	14	13	36	-4.3%	19	127
Crystal River	51.6	25	24.4	31	4	19	-21.7%	4	26
Davis-Besse	52.8	29	19.0	17	2	10	20.0%	3	141
Duane Arnold	54.0	31	26.2	37	4	19	-12.5%	34	68
Fermi	54.4	32	25.0	33	6	29	-1.9%	4	43
Fitzpatrick	50.2	20	25.4	34	0	1	-5.9%	0	11
Fort Calhoun	50.4	22	17.6	11	11	35	0.0%	13	80
Ginna	36.4	1	15.2	4	2	10	-5.4%	12	35
Grand Gulf	56.8	34	25.6	35	0	1	-10.2%	11	57
Harris	39.4	5	14.0	3	2	10	-5.0%	0	0
Hope Creek	52.8	29	22.2	26	6	29	-20.3%	4	69
Indian Point 2	43.8	8	15.6	5	6	29	-19.1%	8	56
Indian Point 3	48.8	17	18.8	16	2	10	-3.8%	0	21
Kewaunee	37.8	3	15.6	5	19	38	-7.7%	12	104
Millstone 2	59.0	39	23.4	30	6	29	-8.2%	5	36
Millstone 3	50.2	20	17.8	13	0	1	-7.7%	3	41
Monticello	39.0	4	16.2	9	0	1	0.0%	18	51
Nine Mile Point 1	45.0	11	25.6	35	4	19	-2.2%	14	41
Nine Mile Point 2	57.4	36	32.8	39	0	1	-27.7%	13	48
Oyster Creek	46.6	13	21.2	23	14	37	-10.6%	7	48
Palisades	48.4	15	19.8	18	3	16	-9.6%	22	37
Perry	52.2	27	20.8	21	40	39	-14.0%	11	138
Pilgrim	48.6	16	21.4	24	0	1	-16.1%	5	33
River Bend	49.4	18	20.4	20	2	10	-11.1%	24	92
Robinson	43.0	7	16.6	10	1	9	-2.3%	0	3
Seabrook	52.2	27	10.4	1	2	10	-21.3%	7	31
Summer	51.6	25	15.6	5	5	25	-14.3%	12	46
Three Mile Island	48.2	14	23.2	28	4	19	1.9%	4	37
Vermont Yankee	42.8	6	15.80	8	8	34	6.8%	1	20
Waterford	49.4	18	12.00	2	4	19	-30.9%	1	40
Watts Bar	44.6	9	18.40	15	3	16	-18.4%	6	51
Wolf Creek	51.4	24	24.40	31	0	1	8.5%	9	31

Enclosure

Multi-Unit Facilities	Average Number of ROs and SROs (2004–2007)	Rank of Average Number of ROs and SROs	Average Number of ROs Only (2004–2007)	Rank of Average Number of ROs Only	Plant ROP Matrix Performance (2004 2007)	ROP Performance Rank	Change in RO and SRO Staffing (2004–2007)	Unit for the Source of HFIS Data	Number of HFIS Issues Involving Operations Staff in 2007	Total Number of HFIS Issues Involving Operations Staff (2004–2007)
Dual-Unit										
Braidwood	73.4	14	36	26	6	17	-15.0%	2	3	19
Brunswick	73.2	13	21.4	1	14	27	-14.3%	2	14	42
Byron	67.2	7	30.8	13	7	22	-14.9%	1	4	52
Calvert Cliffs	82.2	21	33.2	18	7	22	-3.6%	2	9	25
Catawba	79.2	20	31.2	16	0	1	-13.1%	1	2	11
Comanche Peak	85.0	22	33.4	19	1	8	-4.4%	2	3	38
D.C. Cook	76.4	17	35	24	15	28	1.3%	2	4	54
Diablo Canyon	78.2	18	30.2	10	1	8	-13.3%	1	5	77
Dresden	59.2	2	29.2	8	8	24	-6.3%	2	12	35
Farley	95.0	26	28	7	6	17	-21.5%	2	4	33
Hatch	103.8	29	35.6	25	6	17	-16.2%	1	4	19
La Salle	69.8	9	31	14	0	1	-6.9%	1	11	38
Limerick	63.6	4	30.4	11	0	1	1.6%	2	4	13
McGuire	87.8	24	39.6	27	0	1	-11.8%	2	0	27
North Anna	65.0	6	34.4	21	0	1	-7.2%	2	3	19
Peach Bottom	64.2	5	30	9	6	17	16.4%	2	11	39
Point Beach	58.6	1	25.8	4	39	31	-4.8%	1	1	65
Prairie Island	70.4	10	27.8	6	0	1	11.9%	1	0	21
Quad Cities	72.6	11	30.4	11	4	14	8.5%	1	8	63
Salem	72.6	11	34.4	21	5	16	-5.5%	1	5	48
San Onofre	86.4	23	42.6	29	4	14	16.9%	3	9	28
Sequoyah	78.6	19	34	20	3	12	-15.9%	1	6	26
South Texas	96.4	28	31	14	3	12	-6.1%	1	3	35
Saint Lucie	74.2	15	26.4	5	2	11	-4.1%	2	2	28
Surry	68.8	8	34.4	21	11	26	-8.6%	1	1	14
Susquehanna	76.0	16	31.6	17	0	1	5.6%	2	4	24
Turkey Point	60.4	3	22.8	2	9	25	-3.3%	3	1	22
Vogtle	94.0	25	25.6	3	6	17	-7.9%	2	8	34
Triple-Unit										
Browns Ferry	95.6	27	48.2	31	1	8	-3.1%	2	16	32
Oconee	107.8	30	43.8	30	18	29	-1.0%	3	4	27
Palo Verde	123.4	31	40.2	28	26	30	-12.2%	1	40	220