Capacity factor remains over 90 percent

BY E. MICHAEL BLAKE

The three-year median design electrical rating capacity factor of the United States' 104 power reactors has remained at a high level, with no sign of adverse effects from work on new reactors.

EVERY YEAR DURING the preparation of this survey and the article that is meant to derive meaning from the survey's extensive data, the author must sometimes fight off the impulse to find something here that differs from what has been said before. While there may be some entirely new insights to be gleaned from all of this, an old one still remains in effect and is almost certainly more significant than any other: The United States' power reactor fleet was extremely productive before, is continuing that level of productivity now, and shows every sign of continuing to do so in the future.

In the three-year period from 2007 through 2009, the median design electrical rating (DER) net capacity factor of the 104 operable power reactors was 90.24 percent. In 2004 through 2006, the median DER net factor was 90.13 percent. It may not be statistically valid to think of a change of about one-ninth of a percentage point as an "improvement," so we will try to avoid doing so. It will have to suffice to make the point we have made for the past several years, following the steep improvements of the 1980s and 1990s: Maintaining the current level of performance is itself a formidable achievement, and if a median factor of 90.35, or 90.24, or 90.13, or even (gasp!) something slightly below 90 is turned in during 2010–2012, that would also be formidable, and steadily more impressive the longer this level of performance continues.

There have been slightly larger increases in the other measures we track in this survey. The average capacity factor for 2007–2009 was 89.54 percent, up from 88.64 percent in 2004–2006, a change that is attributable to a great extent to the return to service of the Tennessee Valley Authority's Browns Ferry-1 in the spring of 2007. While the median capacity factor has not changed much, there were somewhat larger positive changes to both the top quartile (93.47 percent, up from 92.88 percent) and the bottom quartile (87.94 percent, up from 86.70 percent).

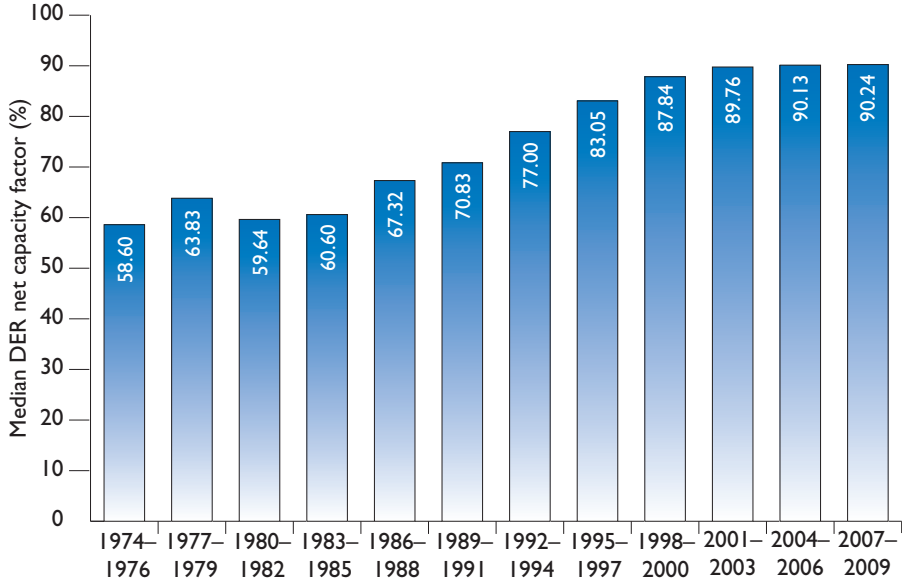

Fig. 1: All reactors. The median DER net capacity factor for the 104 operating reactors has effectively leveled off, with the medians of the past three three-year periods within half a percentage point. The chart shows only reactors that are still in service now; there were 20 such reactors in 1974–76, and in each succeeding period there were 43, 53, 60, 77, 97, 102, 103, and 104 in each of the last four. If closed reactors were included in the periods during which they operated, the median would differ by more than one percentage point in only one period: 1980–1982, when it was 57.57.

A few declines can be found as one cuts the data into smaller sets, but they are as slight as the upward movements for the fleet as a whole. The median capacity factor for boiling water reactors in 2007–2009 was 90.28 percent, down from 90.51 percent in 2004–2006. The BWR average was 89.10 percent, up from 87.00 percent, with the restart of Browns Ferry-1 having a more noticeable effect on a data set that includes 35 reactors. (With every licensed reactor now in full-scale operation, the difference between the median and the average has shrunk considerably.) The BWR top quartile was 93.60 in 2007–2009, up from 92.56 percent, and the bottom quartile was 84.33 percent, down from 86.94 percent.

Pressurized water reactors, as a group, gained on the BWR median but did not quite catch up. The median capacity factor among the 69 PWRs was 90.20 percent in 2007–2009, up from 90.13 percent, and the PWR average was 89.77 percent, up from 89.47 percent. The top quartile was 93.27 percent, down from 93.97 percent, and the bottom quartile was 88.20 percent, up from 85.39 percent. There can be comparatively wide swings in the bottom quartile—if one

can think of three percentage points as "wide"—because the kind of long downtime that could place a reactor in the lower reaches of Table I leaves more separation than the tight bunching in most of the table.

A repeat performance

To enlarge upon what has already been stated, our other usual ways of examining the data tend to show that 2007–2009 was essentially a repeat of 2004–2006 in terms of overall performance. As one might expect, with such a small change in the median, there was roughly an even split in Table II between reactors that did better in 2007–2009 than in 2004–2006, and those that did not. There were 53 reactors with higher factors in the most recent three-year period, and 51 with lower factors. The edge is even smaller if one takes into account that Browns Ferry-1 couldn't help doing better, after not having operated at all in 2004–2006 (or at any time since the mid-1980s).

Table II also shows a fairly close split between gains and losses when the numbers are broken down further. There were 34 reactors that gained from zero to five points, and 35 that lost in that range; 14 that gained between five and 10 points, and 13 that lost by that amount; and, omitting Browns Ferry-1, four that gained by more than 10 points and three that lost more than 10.

There are always fluctuations from one three-year period to the next, especially for reactors on a 24-month refueling cycle. The reactors that are refueled every 18 months

TABLE I.
2007–2009 DER NET CAPACITY FACTORS OF INDIVIDUAL REACTORS

Rank	Reactor	Factor[1]	Design Electrical Rating (DER), MWe[2]	Type	Owner[3]	Rank	Reactor	Factor	Design Electrical Rating (DER), MWe	Type	Owner
1.	Calvert Cliffs-1	100.49	845	PWR	Constellation	53.	Millstone-3	90.20	1229	PWR	Dominion
2.	South Texas-1	99.37	1250.6	PWR	STPNOC	54.	Watts Bar-1	90.19	1155	PWR	TVA
3.	South Texas-2	98.51	1250.6	PWR	STPNOC	55.	Oconee-3	90.16	886	PWR	Duke
4.	FitzPatrick	97.89	816	BWR	Entergy	56.	Diablo Canyon-1	89.99	1138	PWR	PG&E
5.	Surry-2	97.00	788	PWR	Dominion	57.	Indian Point-3	89.86	1048	PWR	Entergy
6.	Comanche Peak-2	96.95	1150	PWR	Luminant	58.	Wolf Creek	89.82	1170	PWR	WCNOC
7.	Quad Cities-2	95.90	871	BWR	Exelon	59.	Callaway-1	89.81	1228	PWR	Ameren
8.	Dresden-3	95.77	867	BWR	Exelon	60.	Limerick-2	89.80	1191	BWR	Exelon
9.	Calvert Cliffs-2	95.69	845	PWR	Constellation	61.	Kewaunee	89.60	574	PWR	Dominion
10.	Peach Bottom-2	95.69	1138	BWR	Exelon	62.	Salem-2	89.43	1181	PWR	PSEG
11.	Comanche Peak-1	95.53	1150	PWR	Luminant	63.	Arnold	89.42	621.9	BWR	FPL
12.	Braidwood-1	95.49	1187	PWR	Exelon	64.	McGuire-2	89.23	1180	PWR	Duke
13.	Clinton	95.31	1062	BWR	Exelon	65.	Oconee-2	89.11	886	PWR	Duke
14.	Braidwood-2	94.98	1155	PWR	Exelon	66.	Susquehanna-2	89.07	1182	BWR	PPL
15.	Surry-1	94.96	788	PWR	Dominion	67.	San Onofre-3	88.99	1080	PWR	SCE
16.	Indian Point-2	94.95	1035	PWR	Entergy	68.	Palisades	88.72	805	PWR	Entergy
17.	Beaver Valley-1	94.45	911	PWR	FENOC	69.	Brunswick-1	88.71	983	BWR	Progress
18.	Nine Mile Point-2	94.10	1143.3	BWR	Constellation	70.	Grand Gulf-1	88.56	1279	BWR	Entergy
19.	Byron-1	94.06	1187	PWR	Exelon	71.	Millstone-2	88.56	883.5	PWR	Dominion
20.	Byron-2	94.01	1155	PWR	Exelon	72.	Vogtle-2	88.54	1169	PWR	Southern
21.	Limerick-1	93.98	1191	BWR	Exelon	73.	Fort Calhoun	88.54	502	PWR	OPPD
22.	North Anna-1	93.91	913	PWR	Dominion	74.	Turkey Point-4	88.43	720	PWR	FPL
23.	Hope Creek	93.70	1228.1	BWR	PSEG	75.	Seabrook	88.27	1246	PWR	FPL
24.	Dresden-2	93.60	867	BWR	Exelon	76.	North Anna-2	88.13	913	PWR	Dominion
25.	Davis-Besse	93.55	908	PWR	FENOC	77.	Summer-1	88.05	972.7	PWR	SCE&G
26.	Nine Mile Point-1	93.48	613	BWR	Constellation	78.	Cooper	88.02	815	BWR	NPPD/Entergy
27.	Prairie Island-2	93.46	536	PWR	NSP	79.	Cook-2	87.86	1107	PWR	IMP
28.	Quad Cities-1	93.45	866	BWR	Exelon	80.	Robinson-2	87.66	765	PWR	Progress
29.	LaSalle-2	93.34	1154	BWR	Exelon	81.	Turkey Point-3	87.32	720	PWR	FPL
30.	Ginna	93.09	585	PWR	Constellation	82.	Palo Verde-1	86.66	1333	PWR	APS
31.	LaSalle-1	93.06	1154	BWR	Exelon	83.	Browns Ferry-3	86.60	1120	BWR	TVA
32.	Salem-1	92.86	1169	PWR	PSEG	84.	Oyster Creek	86.10	650	BWR	Exelon
33.	Catawba-1	92.46	1145	PWR	Duke	85.	Prairie Island-1	85.72	536	PWR	NSP
34.	Three Mile Island-1	92.38	819	PWR	Exelon	86.	Oconee-1	85.28	886	PWR	Duke
35.	Vermont Yankee	92.17	617	BWR	Entergy	87.	Point Beach-1	85.04	522	PWR	FPL
36.	Peach Bottom-3	92.05	1138	BWR	Exelon	88.	Browns Ferry-2	84.33	1120	BWR	TVA
37.	Farley-2	91.73	855	PWR	Southern	89.	Crystal River-3	84.26	860	PWR	Progress
38.	Vogtle-1	91.53	1169	PWR	Southern	90.	River Bend-1	84.22	967	BWR	Entergy
39.	Farley-1	91.36	854	PWR	Southern	91.	Fermi-2	83.85	1150	BWR	Detroit
40.	Harris-1	91.35	941.7	PWR	Progress	92.	McGuire-1	83.79	1180	PWR	Duke
41.	Beaver Valley-2	91.27	904	PWR	FENOC	93.	Monticello	83.73	600	BWR	NSP
42.	Susquehanna-1	91.20	1235	BWR	PPL	94.	Diablo Canyon-2	83.52	1151	PWR	PG&E
43.	Catawba-2	91.18	1145	PWR	Duke	95.	Brunswick-2	83.04	980	BWR	Progress
44.	ANO-1	90.90	850	PWR	Entergy	96.	Palo Verde-2	82.78	1336	PWR	APS
45.	St. Lucie-1	90.84	856	PWR	FPL	97.	Hatch-2	81.42	908	BWR	Southern
46.	Hatch-1	90.74	885	BWR	Southern	98.	San Onofre-2	81.26	1070	PWR	SCE
47.	Sequoyah-2	90.62	1151	PWR	TVA	99.	St. Lucie-2	79.64	856	PWR	FPL
48.	Point Beach-2	90.58	522	PWR	FPL	100.	Columbia	79.17	1153	BWR	Northwest
49.	Waterford-3	90.49	1173	PWR	Entergy	101.	Perry	79.11	1268	BWR	FENOC
50.	ANO-2	90.42	1032	PWR	Entergy	102.	Palo Verde-3	78.75	1334	PWR	APS
51.	Sequoyah-1	90.38	1173	PWR	TVA	103.	Browns Ferry-1	73.24	1120	BWR	TVA
52.	Pilgrim	90.28	690	BWR	Entergy	104.	Cook-1	53.15	1084	PWR	IMP

[1] These figures are rounded off. There are no ties. Calvert Cliffs-2 is in 10th, with 95.6947, and Peach Bottom-2 is in 11th, with 95.6899.

[2] The rating shown is effective as of December 31, 2009. If the reactor's rating has changed during the three-year period, the capacity factor is computed with appropriate weighting.

[3] As of December 31, 2009. In most cases this also means the reactor's operator, but Entergy is the contracted operator of Cooper.

TABLE II.
CAPACITY FACTOR CHANGE, 2004–2006 TO 2007–2009

Rank	Reactor	Change (percentage points)	Rank	Reactor	Change (percentage points)	Rank	Reactor	Change (percentage points)	Rank	Reactor	Change (percentage points)
1.	Browns Ferry-1	+73.24	27.	Peach Bottom-2	+3.52	53.	Cooper	+0.19	79.	Limerick-2	-3.06
2.	Palo Verde-1	+23.77	28.	FitzPatrick	+3.46	54.	Waterford-3	-0.08	80.	San Onofre-2	-3.19
3.	Kewaunee	+19.15	29.	Hatch-1	+3.34	55.	St. Lucie-1	-0.20	81.	Browns Ferry-3	-3.33
4.	Hope Creek	+15.24	30.	South Texas-2	+2.85	56.	Vermont Yankee	-0.20	82.	Calvert Cliffs-2	-3.61
5.	Davis-Besse	+12.44	31.	Catawba-1	+2.80	57.	Farley-2	-0.23	83.	McGuire-1	-3.76
6.	Quad Cities-2	+8.96	32.	Harris-1	+2.66	58.	Point Beach-1	-0.45	84.	Peach Bottom-3	-4.00
7.	Fort Calhoun	+8.28	33.	McGuire-2	+2.34	59.	Braidwood-1	-0.69	85.	Seabrook	-4.46
8.	Quad Cities-1	+7.81	34.	Brunswick-1	+2.27	60.	Salem-2	-0.77	86.	Brunswick-2	-4.60
9.	Callaway-1	+7.09	35.	Turkey Point-3	+2.23	61.	Catawba-2	-0.84	87.	Pilgrim	-4.73
10.	San Onofre-3	+7.04	36.	Fermi-2	+2.14	62.	Oyster Creek	-0.85	88.	Diablo Canyon-2	-4.77
11.	Dresden-2	+6.89	37.	Diablo Canyon-1	+2.10	63.	Prairie Island-1	-0.98	89.	Arnold	-5.01
12.	Watts Bar-1	+6.68	38.	Limerick-1	+2.09	64.	North Anna-1	-1.04	90.	River Bend-1	-5.20
13.	Susquehanna-1	+6.49	39.	Nine Mile Point-2	+2.03	65.	Beaver Valley-2	-1.06	91.	Grand Gulf-1	-5.54
14.	Clinton	+6.10	40.	Surry-2	+1.81	66.	Palo Verde-3	-1.31	92.	Ginna	-6.06
15.	Calvert Cliffs-1	+5.78	41.	Comanche Peak-2	+1.53	67.	Millstone-3	-1.46	93.	Three Mile Island-1	-6.28
16.	Oconee-3	+5.63	42.	ANO-1	+1.24	68.	Cook-2	-1.46	94.	Perry	-6.49
17.	Turkey Point-4	+5.51	43.	Farley-1	+1.24	69.	Robinson-2	-1.56	95.	North Anna-2	-6.73
18.	Point Beach-2	+5.28	44.	Comanche Peak-1	+1.20	70.	Braidwood-2	-1.61	96.	ANO-2	-6.83
19.	Dresden-3	+5.27	45.	LaSalle-1	+0.97	71.	Millstone-2	-1.66	97.	Crystal River-3	-6.84
20.	South Texas-1	+4.68	46.	Nine Mile Point-1	+0.92	72.	Susquehanna-2	-1.68	98.	Indian Point-3	-7.43
21.	Prairie Island-2	+4.65	47.	Sequoyah-2	+0.91	73.	LaSalle-2	-1.72	99.	St. Lucie-2	-7.91
22.	Oconee-2	+4.41	48.	Surry-1	+0.81	74.	Wolf Creek	-2.15	100.	Columbia	-8.38
23.	Beaver Valley-1	+4.32	49.	Vogtle-2	+0.61	75.	Palo Verde-2	-2.25	101.	Monticello	-8.66
24.	Palisades	+4.14	50.	Vogtle-1	+0.30	76.	Byron-2	-2.44	102.	Browns Ferry-2	-10.10
25.	Indian Point-2	+4.10	51.	Oconee-1	+0.29	77.	Sequoyah-1	-2.53	103.	Hatch-2	-10.23
26.	Salem-1	+4.09	52.	Byron-1	+0.25	78.	Summer-1	-2.76	104.	Cook-1	-36.51

do not change as much, with two full cycles in each three-year period. We use three-year periods in this survey because they help even out such cyclical changes and show sustained performance. As noted in an earlier survey (*NN,* May 2008, p. 28), however, differences in the number of refueling outages in a three-year period generally account for those reactors that fluctuate by a few points from one three-year period to the next, and back again in the period after that.

A comparison of successive six-year periods might eliminate that fluctuation completely, and perhaps the data will be sorted that way in a future survey, but qualitatively it can be stated firmly that performance in 2004–2009 was better than it was in 1998–2003, when the fleet as a whole was in the later stages of its earlier steep improvement and thus starting from a point of less impressive (but still very good) performance.

More often than not over the past three decades, multireactor sites have performed slightly better as a group than single-reactor sites, and the trend has continued in 2007–2009. The median of the multireactor sites shown in Table III was 90.83 percent (up from 90.21 percent in 2004–2006). Among the 28 reactors that are the only nuclear generators at their sites, the median in 2007–2009 was 89.07 percent. Much has been written over the years about the learning-curve benefits of multireactor sites, especially when the reactors are essentially replicates, at least in original equipment. Replacing major equipment, such as a vessel head, on one reactor—and gathering experience—at least makes it possible that the same task can be done more quickly, economically, and safely on collocated and similar reactors.

There may not be any grand conclusions to draw from Table IV, partly because the sample is so small, and partly because the data can be moving targets. This year, we have added Palisades to Entergy's totals, and Point Beach to FPL's, even though the ownership changes took place during 2007. The 88.78 percent median of the 11 fleet operators trails the median of all reactors by about a point and a half. The median for multisite owners in 2004–2006 was 88.54 percent, but there were a number of differences in which organizations owned and operated which reactors.

It may well be asked, why aren't the learning-curve benefits of multireactor sites reflected in multisite owners? It could further be argued that, since all of the multisite owners have at least one multiunit site, the learning-curve benefits should be even more apparent. To some extent, this may be where our use of a median value breaks down. The utilities with the largest fleets, Exelon and Entergy, are in the top half of Table IV; those with the smallest, FirstEnergy and Northern States, are in the bot-

TABLE III.
DER NET CAPACITY FACTOR OF MULTIREACTOR SITES[1]

Rank	Site	Factor	Operator	Rank	Site	Factor	Operator
1.	South Texas	98.93	STPNOC	19.	ANO	90.64	Entergy
2.	Calvert Cliffs	98.09	Constellation	20.	Sequoyah	90.50	TVA
3.	Comanche Peak	96.24	Luminant	21.	Susquehanna	90.14	PPL
4.	Surry	95.98	Dominion	22.	Vogtle	90.04	Southern
5.	Braidwood	95.24	Exelon	23.	Prairie Island	89.59	NSP
6.	Dresden	94.68	Exelon	24.	Millstone	89.50	Dominion
7.	Quad Cities	94.68	Exelon	25.	Oconee	88.18	Duke
8.	Byron	94.03	Exelon	26.	Turkey Point	87.87	FPL
9.	Nine Mile Point	93.88	Constellation	27.	Point Beach	87.81	FPL
10.	Peach Bottom	93.87	Exelon	28.	Diablo Canyon	86.74	PG&E
11.	LaSalle	93.20	Exelon	29.	McGuire	86.51	Duke
12.	Beaver Valley	92.88	FENOC	30.	Hatch	86.02	Southern
13.	Indian Point	92.39	Entergy	31.	Brunswick	85.88	Progress
14.	Hope Creek/Salem	91.98	PSEG	32.	St. Lucie	85.24	FPL
15.	Limerick	91.89	Exelon	33.	San Onofre	85.14	SCE
16.	Catawba	91.82	Duke	34.	Palo Verde	82.75	APS
17.	Farley	91.55	Southern	35.	Browns Ferry	81.41	TVA
18.	North Anna	91.02	Dominion	36.	Cook	70.69	IMP

[1] Because Nine Mile Point and FitzPatrick have different owners, Nine Mile Point is listed here as a multireactor site, but FitzPatrick is not included, even though the plants are on adjacent properties; combined, Nine Mile Point and FitzPatrick would have a 2007–2009 factor of 95.15. Hope Creek and Salem are treated as a single site because they are adjacent and have the same owner; the two-reactor Salem had a 2007–2009 factor of 91.15.

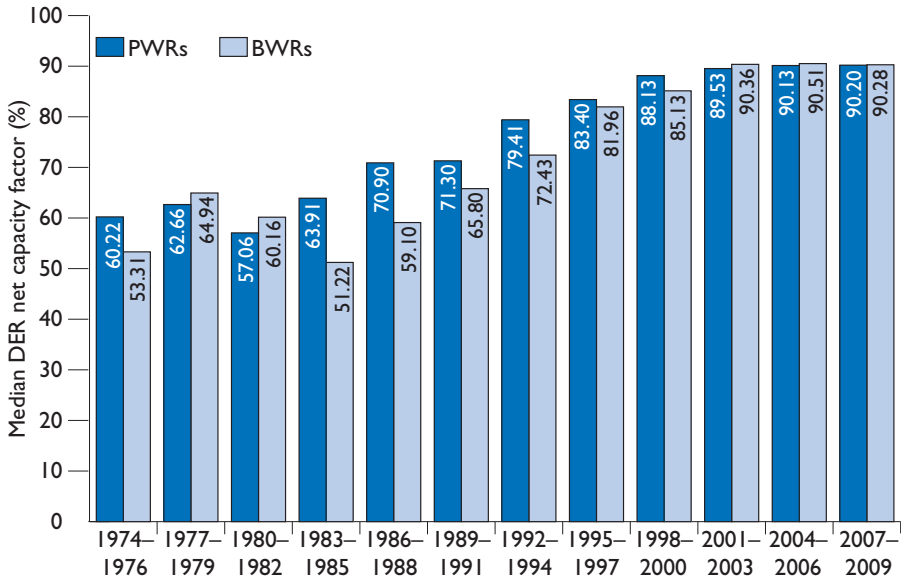

Fig. 2: Reactors by type. Pressurized water reactors recovered more quickly than boiling water reactors from downtime and modifications imposed in the aftermath of Three Mile Island-2, but in the last few periods, BWRs have caught up with PWRs. If closed reactors were included, the amounts would be similar, with only one median difference greater than two percentage points: PWRs in 1974–76, which would have been 63.67.

tom half. Statistically, the 47 reactors owned by the top five should be seen as more significant than the 28 reactors of the bottom five. Table IV mainly shows a performance value for each fleet, and its median has relatively little meaning.

Truth in DER

At this point, it might be helpful to explain what this survey is, how the data for it are obtained, and what is done with that data. This is intended as an analysis of U.S. power reactor capacity factors. The raw data—each reactor's annual electricity output and its DER—came from the quarterly compilation of monthly operating reports on the Nuclear Regulatory Commission's Web site, at <www.nrc.gov>. The author then computed three-year capacity factors for each reactor. The historical material, shown in the figures, includes only reactors that were in service in those earlier time periods and are still in service today. The potential for discrepancies between three-year periods is declining because no reactors have started up since 1996, and none has closed since 1998.

DER has been chosen for each reactor's generating capacity in the belief that it provides the best indication of what a reactor was intended to accomplish. Other surveys may use measures such as maximum dependable capacity, summer peak, or gross electricity generation. This survey draws most of its conclusions from medians within each group, but also computes averages in some cases.

This survey also wouldn't be complete without calling attention to those reactors that may not be adequately reflecting power uprates and heat-rate improvements in their design electrical ratings. We begin by noting those reactors that officially changed their DERs during 2009: Arnold, 621.9 MWe (from 613.5 MWe); Beaver Valley -2, 904 MWe (from 868 MWe); Davis-Besse, 908 MWe (from 893 MWe); Hope Creek, 1228.1 MWe (from 1083 MWe); Millstone-3, 1229 MWe (from 1156.5 MWe); Palo Verde-3, 1334 MWe (from 1339 MWe); Perry, 1268 MWe (from 1273 MWe). The latter two are small downward adjustments to earlier increases. FirstEnergy has made a number of small changes in recent years, and we hope that Davis-Besse and Perry now have DER values that can be kept steady. All told, this makes for a net increase of 267 MWe. The continuing rise in total national nuclear capacity helps explain why the overall capacity factor has stayed about the same for much of the past decade, even as total nuclear electricity production in recent years has frequently set and reset records.

The reactors for which DER changes have not been made, despite uprates of 4 percent or more, are Calvert Cliffs-1 and -2, FitzPatrick, Surry-1 and -2, and Wolf Creek. Last year, the DER of each North Anna reactor was raised 0.7 percent; their uprates had each been 4.2 percent. The capacity factor figures in Table I for these eight reactors should be viewed with this in mind. If their uprates were reflected fully in their DERs, their factors would be a few points lower.

Is anyone distracted?

In addition to providing the usual comprehensive statistics in the first four tables, this survey seeks some insight by deriving more focused results from the raw data. This time, we'll look for signs of whether the pursuit of new reactors is affecting performance at existing reactors.

Because this is a comparison of performance in one rigidly defined three-year period to that in another, the numbers probably lack rigor. For our purposes, it would be nice if there were no new reactor activity at all in 2004–2006, and unanimous full-scale frenzy in 2007–2009, but things didn't work out that way. Even so, most of the new reactor work through 2006 was preliminary, and starting in 2007, work was going on in earnest on reactor model selection, license application preparation, and site-related data gathering. So it is probably true that every organization has devoted more time and resources to new reactor work since 2007 began than before (especially once the requests for additional information were delivered by the NRC and had to be addressed with more detailed site data).

Table V shows the difference in capacity factor, from 2004–2006 to 2007–2009, of the fleet owners that have been involved in new reactors. Six of the nine have seen their overall capacity factors decline. (For TVA, Browns Ferry-1 has been excluded from the numbers in both of the three-year periods. We're almost at the point where we'll stop making special cases of TVA and Browns

TABLE IV.
DER NET CAPACITY FACTORS
OF OWNERS OR OPERATORS
OF MORE THAN ONE SITE[1]

Rank	Owner/Operator	Factor
1.	Constellation Energy	95.53
2.	Exelon	93.61
3.	Dominion Energy	91.66
4.	Entergy Nuclear	90.60
5.	Southern Nuclear Operating Co.	89.25
6.	Duke Power	88.78
7.	FirstEnergy Nuclear Operating Co.	88.60
8.	Northern States Power–Minnesota	87.49
9.	FPL Energy	87.36
10.	Progress Energy	87.01
11.	Tennessee Valley Authority	85.98

[1]Entergy is the contract operator of Cooper, but not its owner; Entergy with Cooper is 90.42.

TABLE V.
DER NET CAPACITY FACTOR CHANGE
FOR MULTISITE OWNERS WITH NEW
REACTOR LICENSING ACTIVITIES

Rank	Owner/Operator	Change, 2007–2009 vs. 2004–2006
1.	Duke Power	+1.33
2.	Exelon	+1.03
3.	Constellation Energy	+0.95
4.	Southern Nuclear Operating Co.	-0.75
5.	FPL Energy	-1.11
6.	Progress Energy	-1.53
7.	Tennessee Valley Authority	-1.61
8.	Dominion Energy	-1.72
9.	Entergy Nuclear	-2.48

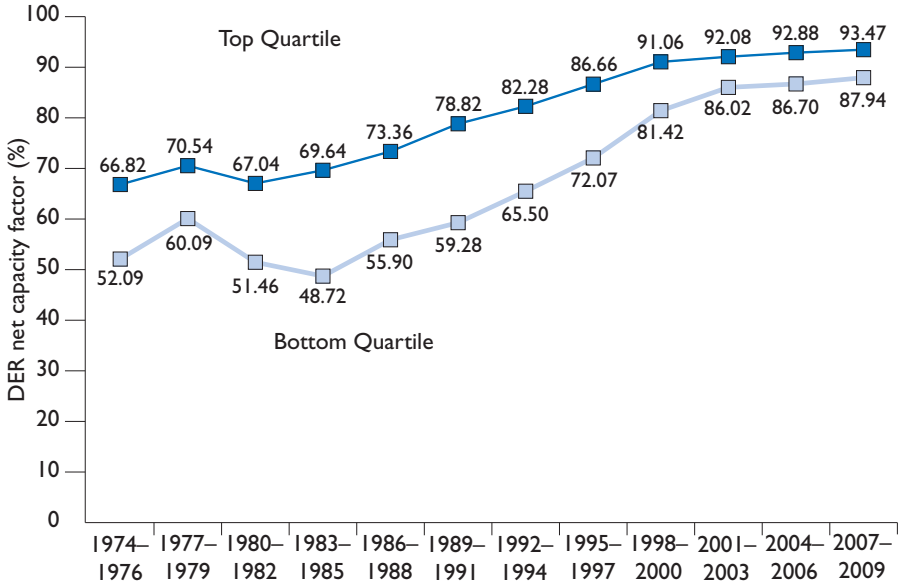

Fig. 3: All reactors, top and bottom quartiles. An indication of the improvement of the fleet as a whole is the narrowing gap between the top and bottom quartiles, from more than 20 percentage points to five and a half. The chart shows reactors still in service today; if closed reactors were included, the only amounts that would differ by more than two percentage points are the bottom quartiles in 1989–1991 (57.08) and 1995–1997 (68.18), the latter reflecting the reduced output of the last reactors to close.

Ferry to adjust for the restart of Unit 1 in 2007, but we're not quite there yet.) None of the gains or losses is more than two and a half points, so this may be no big deal, but every one of these fleets has five or more reactors, and so the slippage, affecting this much generating capacity, might have some significance.

Table VI brings this to the plant level. It's essentially a pared-down version of Table II, with only reactors at or near the sites where new reactors are planned. (Susquehanna is adjacent to Bell Bend; Crystal River is a few miles from Levy County.) In this case, the situation is roughly the reverse of Table V, with 16 of the 24 reactors having higher factors in 2007–2009 than in 2004–2006. The swings cover a wider range—as much as seven percentage points gained or lost—but this is not unusual on an individual-reactor basis. Thus, when the other common causes of capacity factor fluctuation are taken into account—especially the timing of refueling outages—we have a small downward trend among fleet owners and a small upward trend at plant sites.

Rather than try to dream up causes for either of these, we will decide for now that on the whole, there is no obvious trend, and resolve to look again in future years. It may turn out that if there has been distraction-producing activity, much of it so far may be at utility offices, where licensing-related personnel would be participating in the NRC's technical reviews (and hence, perhaps, creating situations that have slight performance effects on entire fleets). After combined construction and operating licenses are issued and on-site work begins in earnest, there may be a clearer influence on the operation of existing reactors. At this stage, however, we see no reason to think that electricity providers' rearrangement of personnel or resources to support new reactor work has affected operating reactors adversely. NN

TABLE VI.
CAPACITY FACTOR CHANGE, 2004–2006 TO 2007–2009, AT SITES WHERE NEW REACTORS HAVE BEEN PROPOSED

Rank	Reactor	Change (percentage points)	Rank	Reactor	Change (percentage points)
1.	Callaway-1	+7.09	13.	Comanche Peak-1	+1.20
2.	Watts Bar-1	+6.68	14.	Nine Mile Point-1	+0.92
3.	Susquehanna-1	+6.49	15.	Vogtle-2	+0.61
4.	Calvert Cliffs-1	+5.78	16.	Vogtle-1	+0.30
5.	Turkey Point-4	+5.51	17.	North Anna-1	-1.04
6.	South Texas-1	+4.68	18.	Susquehanna-2	-1.68
7.	South Texas-2	+2.85	19.	Summer-1	-2.76
8.	Harris-1	+2.66	20.	Calvert Cliffs-2	-3.61
9.	Turkey Point-3	+2.23	21.	River Bend-1	-5.20
10.	Fermi-2	+2.14	22.	Grand Gulf-1	-5.54
11.	Nine Mile Point-2	+2.03	23.	North Anna-2	-6.73
12.	Comanche Peak-2	+1.53	24.	Crystal River-3	-6.84