U.S. capacity factors: Staying around 90 percent

BY E. MICHAEL BLAKE

A small decline in the median three-year capacity factor is mainly an indication that 90 percent may now be the fleet's "normal" performance level.

FOR THE BETTER part of a decade, the message of this survey has been that the dramatic performance improvements of the 1980s and 1990s could continue for only so long, and that maintaining the level that had been reached by about 2000 would be a formidable and praiseworthy feat any time that it is accomplished. The reader has always been cautioned not to attach great significance to any specific number (such as 90), or to see the placement of specific reactors in this survey's tables as indicating special merit (or deficiency), because the performance of nearly every reactor in commercial operation is far better now than had been expected when the reactors were being built. With this in mind, the following statement should simply be taken in stride: The median three-year design electrical rating (DER) net capacity factor of the 104 power reactors in the United States in 2008–2010 was 89.67 percent; in 2005–2007 it was 90.61 percent.

We see no reason to dwell on the fact that this is the first decline in about 30 years, because we have noted all along that the past few increases were in roughly the same range. We are confident that *Nuclear News* readers can do the math, look at the tables and graphs, and draw their own conclusions. Further, because we shrugged when in previous surveys the median factor rose by a point or so, we are being consistent by shrugging again, now that it has fallen less than a full percentage point. If the most recent change were to be repeated later and emerge as a clear trend, we would not shy away from pointing it out.

The median factors of the last three three-year periods are so close as to be barely distinguishable, and depending on one's view of the statistics, the three-year period prior to those three could also be included. Medians of 88.38 (1999–2001), 89.77 (2002–2004), 90.61 (2005–2007), and 89.67 (2008–2010) appear to show long-term consistency, lending support to the notion that a median factor of 90 is a "normal" value for the way that power reactors are currently being operated in this country.

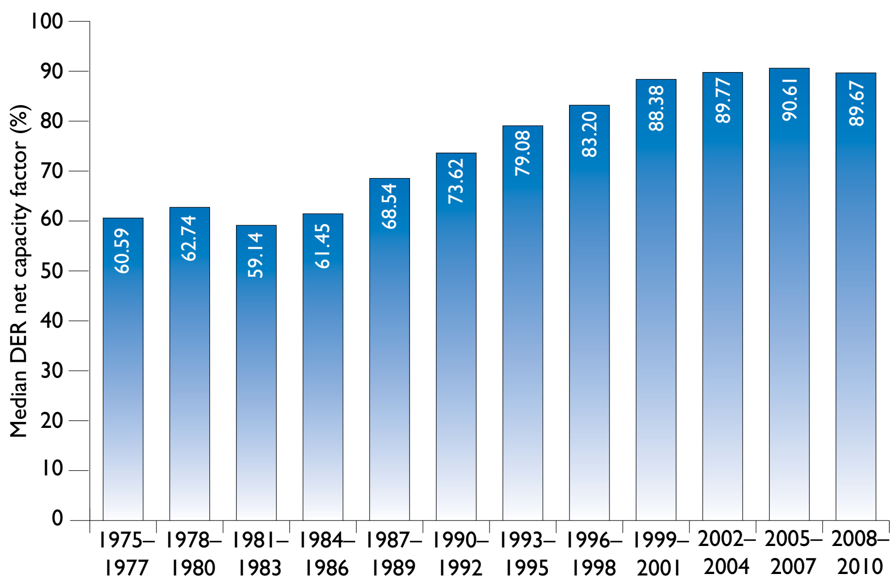

Fig. 1: All reactors. The median capacity factor has been in a range of about two and a quarter percentage points over the past four three-year periods. The chart shows only reactors that are still in service; there were 32 such reactors in 1975–1977, and in each succeeding period there were were 49, 55, 65, 85, 99, 102, 103, and 104 in each of the last four. If closed reactors were included in the periods during which they operated, no median would change by as much as one percentage point.

This doesn't mean that there can't be still more improvement, and some of the reactors in the upper part of Table I reach or exceed 95 percent fairly often. Even so, every nuclear power plant has unique circumstances—perhaps advantages in some areas and challenges in others. For example, steam generator replacements were completed at both San Onofre reactors during 2008–2010, adding more time to refueling outages than is normally required, and their three-year factors are lower, *comparatively,* than those of most other reactors, and are also lower than their own factors in 2005–2007 (as shown in Table II).

At the same time, unexpected problems that lead to excessive downtime show up fairly clearly here. In another steam generator replacement, at Crystal River-3, the cutting of an opening in the containment for the transfer of equipment caused a delamination of concrete that has kept the reactor off line through the end of 2009, all of 2010, and into 2011 (see page 30, this issue). Complications from an electrical fire have limited Robinson-2, and the reduced output from these two reactors is reflected in Progress Energy's showing in Table IV. Cook -1's factor still includes downtime following a 2008 turbine mishap, and the need to replace (yet again) the reactor vessel head at Davis-Besse brought about an outage sooner than had been expected.

The three-year period just ended is the first in which Browns Ferry-1 was available for service the entire three years (at least, the first since 1982–1984, when this survey was not so extensive). Its three-year factor was just shy of 85 percent, although it could have been higher if the Tennessee Valley Authority had not been the first power reactor licensee to be substantially affected by an emerging issue in the climate-change era: effluent temperature. Last summer, TVA frequently had to run one or more of the Browns Ferry reactors at reduced output—Unit 1 to a greater extent than the others—in order to avoid excessive heating of the Tennessee River.

TVA has responded with a commitment to add cooling capability to the plant in phases from now until 2013. New low-rise cooling towers are intended to allow the plant to generate as much electricity as possible, keep the river temperature at an acceptable level, and avert excessive evapo-

TABLE I.
2008–2010 DER NET CAPACITY FACTORS OF INDIVIDUAL REACTORS

Rank	Reactor	Factor[1]	Design Electrical Rating (DER), MWe[2]	Type	Owner[3]
1.	Comanche Peak-1	99.21	1150	PWR	Luminant
2.	Comanche Peak-2	98.06	1150	PWR	Luminant
3.	South Texas-1	98.01	1250.6	PWR	STPNOC
4.	Calvert Cliffs-2	97.97	845	PWR	Constellation
5.	South Texas-2	96.97	1250.6	PWR	STPNOC
6.	Dresden-2	96.90	867	BWR	Exelon
7.	Nine Mile Point-1	96.77	613	BWR	Constellation
8.	Quad Cities-1	96.52	866	BWR	Exelon
9.	Calvert Cliffs-1	96.47	845	PWR	Constellation
10.	Surry-2	96.42	788	PWR	Dominion
11.	Byron-2	96.28	1155	PWR	Exelon
12.	LaSalle-2	95.35	1154	BWR	Exelon
13.	FitzPatrick	95.28	816	BWR	Entergy
14.	Byron-1	95.06	1187	PWR	Exelon
15.	Surry-1	95.01	788	PWR	Dominion
16.	Pilgrim	94.67	690	BWR	Entergy
17.	Braidwood-2	94.56	1155	PWR	Exelon
18.	Peach Bottom-3	94.43	1138	BWR	Exelon
19.	Quad Cities-2	94.27	871	BWR	Exelon
20.	Hope Creek	94.17	1228.1	BWR	PSEG
21.	Indian Point-3	93.79	1048	PWR	Entergy
22.	Catawba-2	93.59	1145	PWR	Duke
23.	Clinton	93.24	1062	BWR	Exelon
24.	Nine Mile Point-2	93.18	1143.3	BWR	Constellation
25.	Ginna	93.12	585	PWR	Constellation
26.	Beaver Valley-1	93.00	911	PWR	FENOC
27.	Susquehanna-2	92.91	1235	BWR	PPL
28.	Vermont Yankee	92.80	617	BWR	Entergy
29.	Peach Bottom-2	92.77	1138	BWR	Exelon
30.	Dresden-3	92.74	867	BWR	Exelon
31.	Vogtle-1	92.47	1169	PWR	Southern
32.	Limerick-2	92.39	1191	BWR	Exelon
33.	Salem-1	92.34	1169	PWR	PSEG
34.	Three Mile Island-1	92.33	819	PWR	Exelon
35.	Braidwood-1	92.19	1187	PWR	Exelon
36.	Kewaunee	92.01	574	PWR	Dominion
37.	North Anna-1	91.90	913	PWR	Dominion
38.	Catawba-1	91.85	1145	PWR	Duke
39.	Vogtle-2	91.84	1169	PWR	Southern
40.	Farley-2	91.82	855	PWR	Southern
41.	Waterford-3	91.70	1173	PWR	Entergy
42.	Farley-1	91.57	854	PWR	Southern
43.	Oconee-3	91.52	886	PWR	Duke
44.	LaSalle-1	91.42	1175	BWR	Exelon
45.	Beaver Valley-2	91.26	904	PWR	FENOC
46.	Prairie Island-2	91.08	536	PWR	NSP
47.	Limerick-1	90.81	1191	BWR	Exelon
48.	Palisades	90.66	805	PWR	Entergy
49.	Millstone-3	90.40	1229	PWR	Dominion
50.	Harris-1	90.05	941.7	PWR	Progress
51.	ANO-2	89.74	1032	PWR	Entergy
52.	Salem-2	89.68	1181	PWR	PSEG

Rank	Reactor	Factor	Design Electrical Rating (DER), MWe	Type	Owner
53.	ANO-1	89.67	850	PWR	Entergy
54.	Sequoyah-2	89.45	1151	PWR	TVA
55.	Sequoyah-1	89.42	1173	PWR	TVA
56.	McGuire-2	89.38	1180	PWR	Duke
57.	Grand Gulf-1	89.38	1279	BWR	Entergy
58.	Diablo Canyon-1	89.37	1138	PWR	PG&E
59.	Indian Point-2	89.27	1035	PWR	Entergy
60.	Point Beach-2	89.21	522	PWR	FPL
61.	Watts Bar-1	90.19	1155	PWR	TVA
62.	Oconee-2	88.96	886	PWR	Duke
63.	St. Lucie-2	88.82	856	PWR	FPL
64.	River Bend-1	88.77	967	BWR	Entergy
65.	Callaway-1	88.73	1228	PWR	Ameren
66.	Arnold	88.70	621.9	BWR	FPL
67.	Seabrook	88.67	1248	PWR	FPL
68.	Browns Ferry-2	88.53	1120	BWR	TVA
69.	Turkey Point-3	88.43	720	PWR	FPL
70.	Summer-1	88.08	972.7	PWR	SCE&G
71.	Palo Verde-1	87.99	1333	PWR	APS
72.	Turkey Point-4	87.75	720	PWR	FPL
73.	McGuire-1	87.61	1180	PWR	Duke
74.	Millstone-2	87.39	883.5	PWR	Dominion
75.	Prairie Island-1	87.34	536	PWR	NSP
76.	North Anna-2	87.30	913	PWR	Dominion
77.	Cooper	87.25	815	BWR	NPPD/Entergy
78.	Wolf Creek	87.18	1170	PWR	WCNOC
79.	Fort Calhoun	86.95	502	PWR	OPPD
80.	Monticello	86.92	600	BWR	NSP
81.	Cook-2	86.88	1107	PWR	IMP
82.	Palo Verde-3	86.71	1334	PWR	APS
83.	Perry	86.60	1268	BWR	FENOC
84.	Hatch-1	86.49	885	BWR	Southern
85.	Brunswick-2	86.37	980	BWR	Progress
86.	St. Lucie-1	86.31	856	PWR	FPL
87.	Point Beach-1	86.04	522	PWR	FPL
88.	Oconee-1	85.70	886	PWR	Duke
89.	Susquehanna-1	85.43	1287	BWR	PPL
90.	Browns Ferry-1	84.94	1120	BWR	TVA
91.	Palo Verde-2	84.76	1336	PWR	APS
92.	Brunswick-1	84.57	983	BWR	Progress
93.	Hatch-2	84.11	908	BWR	Southern
94.	Diablo Canyon-2	83.67	1151	PWR	PG&E
95.	Oyster Creek	83.33	650	BWR	Exelon
96.	Columbia	82.91	1153	BWR	Northwest
97.	Davis-Besse	82.84	908	PWR	FENOC
98.	Browns Ferry-3	82.44	1120	BWR	TVA
99.	Fermi-2	81.97	1150	BWR	Detroit
100.	San Onofre-3	81.55	1080	PWR	SCE
101.	Robinson-2	77.03	765	PWR	Progress
102.	San Onofre-2	76.76	1070	PWR	SCE
103.	Crystal River-3	54.76	860	PWR	Progress
104.	Cook-1	48.08	1084	PWR	IMP

[1] These figures are rounded off. There are no ties. McGuire-2 is in 56th, with 89.3839, and Grand Gulf-1 is in 57th, with 89.3788.

[2] The rating shown is effective as of December 31, 2010. 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, 2010. In most cases this also means the reactor's operator, but Entergy is the contracted operator of Cooper.

Table II.
Capacity Factor Change, 2005–2007 to 2008–2010

Rank	Reactor	Change (percentage points)	Rank	Reactor	Change (percentage points)	Rank	Reactor	Change (percentage points)	Rank	Reactor	Change (percentage points)
1.	Browns Ferry-1	+69.02	27.	Byron-1	+2.31	53.	Harris-1	-0.32	79.	Braidwood-1	-3.17
2.	Palo Verde-1	+27.28	28.	LaSalle-2	+2.26	54.	Clinton	-0.32	80.	Millstone-2	-3.35
3.	Kewaunee	+16.82	29.	Calvert Cliffs-2	+2.25	55.	ANO-1	-0.36	81.	Hatch-1	-3.41
4.	Palo Verde-3	+10.27	30.	Limerick-2	+2.20	56.	Millstone-3	-0.40	82.	Ginna	-3.43
5.	St. Lucie-2	+9.07	31.	Waterford-3	+2.05	57.	Oconee-2	-0.51	83.	Seabrook	-3.48
6.	Quad Cities-1	+8.81	32.	Surry-1	+2.05	58.	Nine Mile Point-2	-1.00	84.	Three Mile Island-1	-3.51
7.	Hope Creek	+8.29	33.	Beaver Valley-1	+1.98	59.	Point Beach-1	-1.22	85.	ANO-2	-3.59
8.	Perry	+7.44	34.	McGuire-1	+1.87	60.	Palo Verde-2	-1.23	86.	Susquehanna-1	-3.59
9.	Vogtle-2	+6.51	35.	Comanche Peak-2	+1.86	61.	Salem-1	-1.28	87.	Summer-1	-3.73
10.	Comanche Peak-1	+6.19	36.	Vogtle-1	+1.81	62.	Beaver Valley-2	-1.32	88.	St. Lucie-1	-3.85
11.	Susquehanna-2	+6.10	37.	Indian Point-3	+1.68	63.	Arnold	-1.33	89.	Brunswick-1	-4.13
12.	Nine Mile Point-1	+5.60	38.	Quad Cities-2	+1.50	64.	Calvert Cliffs-1	-1.35	90.	Diablo Canyon-1	-4.35
13.	Dresden-2	+5.45	39.	Peach Bottom-3	+1.45	65.	FitzPatrick	-1.40	91.	Hatch-2	-4.39
14.	Fort Calhoun	+4.86	40.	Browns Ferry-2	+1.41	66.	Sequoyah-1	-1.49	92.	Oyster Creek	-5.05
15.	Turkey Point-4	+4.77	41.	South Texas-1	+1.13	67.	Grand Gulf-1	-1.51	93.	North Anna-2	-5.06
16.	Watts Bar-1	+4.75	42.	South Texas-2	+1.11	68.	Columbia	-1.84	94.	Prairie Island-1	-5.28
17.	Pilgrim	+4.10	43.	Turkey Point-3	+1.07	69.	Braidwood-2	-1.89	95.	Indian Point-2	-5.32
18.	Oconee-3	+3.84	44.	Surry-2	+0.98	70.	Sequoyah-2	-1.99	96.	Wolf Creek	-5.64
19.	Palisades	+3.72	45.	Catawba-1	+0.92	71.	North Anna-1	-2.29	97.	Davis-Besse	-6.68
20.	Prairie Island-2	+3.58	46.	Farley-1	+0.89	72.	Cook-2	-2.70	98.	San Onofre-3	-7.24
21.	Catawba-2	+3.11	47.	Fermi-2	+0.61	73.	Dresden-3	-2.77	99.	San Onofre-2	-8.60
22.	Point Beach-2	+2.75	48.	Farley-2	+0.45	74.	LaSalle-1	-2.78	100.	Browns Ferry-3	-8.88
23.	McGuire-2	+2.50	49.	Oconee-1	+0.31	75.	Limerick-1	-2.82	101.	Diablo Canyon-2	-9.34
24.	Brunswick-2	+2.45	50.	River Bend-1	+0.16	76.	Peach Bottom-2	-2.91	102.	Robinson-2	-12.26
25.	Callaway-1	+2.44	51.	Vermont Yankee	-0.16	77.	Salem-2	-3.01	103.	Crystal River-3	-33.63
26.	Byron-2	+2.36	52.	Monticello	-0.22	78.	Cooper	-3.11	104.	Cook-1	-41.37

ration of river water. TVA has applied for extended power uprates at all three Browns Ferry reactors, which would raise the plant's peak output by about 500 MWe, and so additional cooling capacity is needed.

By the numbers

For those who may not be familiar with this survey, here's how it's done. Each year *NN* compiles power reactor capacity factors for the previous three-year period, based on U.S. reactors' DER net, which in our judgment is the most accurate indicator of reactor performance and is the most equitable across the entire sample of U.S. reactors. The use of a three-year period helps show sustained performance, and to some extent evens out differences in fueling cycles. The raw data on electricity production are taken from the Nuclear Regulatory Commission's quarterly collections of monthly operating reports. When a DER changes—generally because of a power uprate—the capacity factor is computed with appropriate weighting. During 2010, DERs changed at LaSalle-1 (from 1154 MWe to 1175 MWe), Seabrook (from 1246 MWe to 1248 MWe), and Susquehanna-1 (from 1235 MWe to 1287 MWe, completing a 13 percent uprate that was approved by the NRC in 2008 and was phased in by PPL Susquehanna).

The small reduction in the median of the entire sample generally carries through to the other quantities tracked in this survey. The average capacity factor in 2008–2010 was 89.35; in 2005–2007 it was 89.04, but Browns Ferry-1 had been back in service for only about seven months. The top quartile in 2008–2010 was 92.95 and the bottom quartile was 87.06, down slightly from 92.99 and 87.31 in the previous three-year period.

Boiling water reactors as a group showed a gain in the median (90.81, compared with 90.19 in 2005–2007), and the average was 89.85, up from 87.50 in 2005–2007; this change resulted mostly from the full availability of Browns Ferry-1. The top and bottom quartiles in 2008–2010 were 94.17 and 86.37, compared with 92.98 and 87.14 in the previous period. The quartiles are included here because they've been computed in other categories, although it is not clear to the author whether quartiles are statistically significant in a total sample of 35.

Among the 69 pressurized water reactors, the median in 2008–2010 was 89.67, down

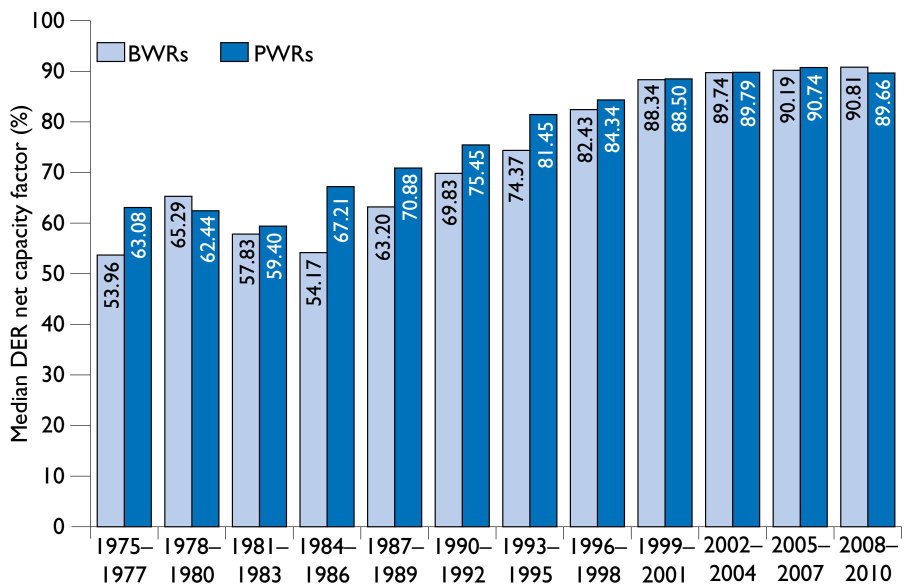

Fig. 2: Reactors by type. All of the changes from 2005–2007 to 2008–2010 are fairly small, but the swing in the differential between boiling water reactors and pressurized water reactors was almost two percentage points, with the BWR median going from more than a half a point below the PWR median to more than a point above. The chart shows only reactors in service now; if closed reactors were included, the only change greater than two points would be for BWRs in 1990–1992 (67.10). There were 13 BWRs in the first period, and since then 20, 21, 23, 30, 34, and 35 in the last six. There were 19 PWRs in the first period, followed by 29, 34, 42, 55, 65, 67, 68, and 69 in the last four.

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

Rank	Site	Factor	Owner	Rank	Site	Factor	Owner
1.	Comanche Peak	98.63	Luminant	19.	ANO	89.71	Entergy
2.	South Texas	97.99	STPNOC	20.	North Anna	89.60	Dominion
3.	Calvert Cliffs	97.22	Constellation	21.	Sequoyah	89.44	TVA
4.	Surry	95.72	Dominion	22.	Prairie Island	89.21	NSP
5.	Byron	95.66	Exelon	23.	Millstone	89.13	Dominion
6.	Quad Cities	95.39	Exelon	24.	Susquehanna	89.12	PPL
7.	Dresden	94.82	Exelon	25.	Oconee	88.73	Duke
8.	Nine Mile Point	94.43	Constellation	26.	McGuire	88.49	Duke
9.	Peach Bottom	93.69	Exelon	27.	Turkey Point	88.09	FPL
10.	LaSalle	93.38	Exelon	28.	Point Beach	87.63	FPL
11.	Braidwood	93.36	Exelon	29.	St. Lucie	87.57	FPL
12.	Catawba	92.72	Duke	30.	Diablo Canyon	86.50	PG&E
13.	Vogtle	92.15	Southern	31.	Palo Verde	86.49	APS
14.	Beaver Valley	92.14	FENOC	32.	Brunswick	85.47	Progress
15.	Hope Creek/Salem	92.07	PSEG	33.	Browns Ferry	85.30	TVA
16.	Farley	91.70	Southern	34.	Hatch	85.29	Southern
17.	Limerick	91.60	Exelon	35.	San Onofre	79.17	SCE
18.	Indian Point	91.55	Entergy	36.	Cook	67.69	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 2008–2010 factor of 94.70. 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 2008–2010 factor of 91.01.

from 90.74 in 2005–2007. The average also declined, from 89.83 to 89.10. The top and bottom quartiles in 2008–2010 were 92.34 and 87.37, compared with 93.01 and 87.31 in the previous period.

Table II follows the main trend. Fifty reactors had higher factors in 2008–2010 than in 2005–2007, and 54 had lower factors. To the extent that there is a difference, however, it lies among the reactors with the smallest changes in either direction. Between five points gained and five points lost (reactors ranked 14 through 91 in Table II), there were 37 above zero and 41 below, the same difference of four as in the entire sample of reactors. It is true, however, that the 13 that gained more than five points are not quite comparable with the 13 that lost more than five points, since heading the list is Browns Ferry-1, which improved vastly against having operated for only a few months in 2005–2007. All the same, the overall change—as is shown by all of these numbers—is small and within what may be emerging as the "normal" range for reactor performance.

The median for multireactor sites (see Table III) was 90.63 in 2008–2010, compared with 90.94 in 2005–2007. As has been the case in nearly every three-year period, this median is higher than the median for single-reactor sites, which was 88.70 in 2008–2010. Among the 11 licensees with reactors at multiple sites (shown in Table IV), the median in 2008–2010 was 89.90, up from 89.01 in 2005–2007, but the author believes that the comparison between the two periods has little meaning because of both the small sample size and the fact that the ownership of some reactors changed during the period. It may be worth noting that the median in Table IV was slightly higher than the median for all 104 reactors, and this has not always been the case.

A major reason for the use of DER net in this survey is that it changes less often (and, in our view, less capriciously) than other reactor metrics, such as maximum dependable capacity. The DER should change, however, when a licensee has altered a reactor's capability specifically in order to produce more electricity, especially through a power uprate. Regrettably, we still find it necessary to point out that some reactors have undergone uprates of 4 percent or more that are not reflected fully in their DERs. They are Calvert Cliffs-1 and -2, FitzPatrick, North Anna-1 and -2, Surry-1 and -2, and Wolf Creek. Because their DERs have not been revised (as those for all other uprate recipients have been), their factors show up here as a few points higher than they probably should be.

Into the fifth decade

No power reactor has yet logged three full years of operation entirely within the period of license renewal, defined here as beyond the end of the original license expiration. (In legal terms, as soon as the NRC approves renewal, the reactor is considered to be operating under a renewed license, regardless of the original expiration date.) It is still worthwhile, however, to look at the performance of the oldest reactors to see whether changes are in the works. Based on the data for 2008–2010 and 2005–2007, the oldest reactors as a group appear to be performing about the same as the newer reactors.

The last time we put a special focus on the oldest reactors (*NN,* May 2009, p. 29), we attempted to gauge each reactor's performance as it reached and passed certain ages, regardless of when the milestones were reached. This time, every reactor in the sample was observed in the same time frames. There are 40 reactors that had completed 35 years or more of commercial operation at the end of 2010. Here is a brief look at how they did in 2008–2010, and how those performances compare with what they did in 2005–2007. The short answer: Their performance was pretty much the same.

The median capacity factor of this group was 89.47 in 2008–2010, about one-fifth of

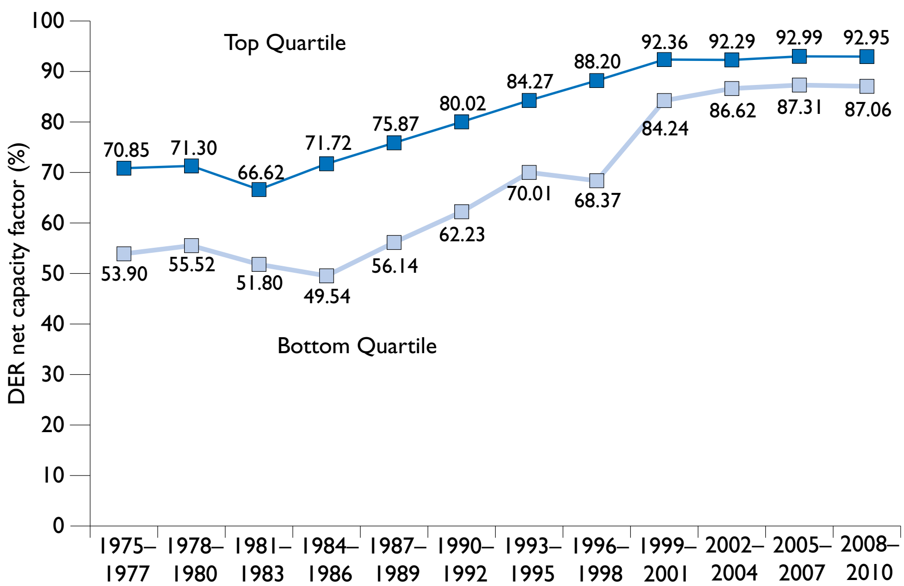

Fig. 3: All reactors, top and bottom quartiles. One indication of the improvement of the overall fleet, even in the past decade (in which the statistical changes generally have been small), has been the rise of the bottom quartile. In 2008–2010, the bottom quartile took a slight dip, but remained within six points of the top quartile. It should be seen as a significant achievement that strong performance among power reactors is so widespread: 70 of the 104 reactors had 2008–2010 capacity factors between 85 and 95. Only reactors now in service are included in the graph above; if closed reactors were added, none of the figures would change by as much as one percentage point.

a percentage point lower than the median for all 104 reactors, and almost certainly of no statistical significance. The average factor of the 40 oldest reactors was 88.94, about two-fifths of a percentage point below the average of all 104, and again, statistically insignificant. The top and bottom quartiles of the 40 oldest reactors were 93.69 and 87.10, both of which were higher than those for all 104. That appears to make the comparison a mixed bag, with neither the newest nor the oldest reactors clearly superior.

As for how the performance of the oldest reactors compares with how they had done in 2005–2007, there was a slight dropoff in 2008–2010. This change, however, was smaller than that in the entire sample of 104. The 40 oldest reactors had a median of 89.96 in 2005–2007, so the median for the later period is about half a percentage point lower. As noted earlier, the median for all 104 reactors was not quite a full point lower in 2008–2010 than in 2005–2007.

The other comparisons also show small and mixed differences. The 2005–2007 average for the oldest 40 was 87.69, but to a great extent the increase of a point and a quarter in 2008–2010 can be attributed to Browns Ferry-1, which is in the oldest group despite having been off line from 1985 to 2007. The top quartile in 2005–2007 was 92.97, so the 93.69 in the later period showed an improvement; the bottom quartile in 2005–2007 was 87.20, so the 87.10 in the later period showed a slight decline.

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

Rank	Owner/Operator	Factor
1.	Constellation Energy	95.41
2.	Exelon	93.38
3.	Dominion Energy	91.26
4.	Entergy Nuclear	91.21
5.	Southern Nuclear Operating Co.	89.91
6.	Duke Power	89.90
7.	Northern States Power–Minnesota	88.39
8.	FirstEnergy Nuclear Operating Co.	88.26
9.	FPL/NextEra	88.04
10.	Tennessee Valley Authority	87.34
11.	Progress Energy	79.17

[1] Entergy is the contract operator of Cooper, but not its owner; Entergy with Cooper is 90.92.

On a reactor-by-reactor basis, the 40 oldest reactors split almost exactly. There were 20 with higher factors in 2008–2010 than in 2005–2007, and 20 with lower factors. Five reactors improved by more than five points, and another five declined by more than five points. True, the top gainer was Browns Ferry-1, but the bottom decliner, Cook-1, was sidelined by a turbine problem that had nothing to do with the age of the turbine or of the plant in general.

While the previous look at the oldest reactors had shown the possibility of a downward trend, the current survey does not appear to reinforce that possibility. What showed up two years ago may have been a short-term fluctuation, and it was noted as such at the time. At this point, there appears to be no reason to conclude that the performance of the oldest reactors is poorer than that of the rest of the fleet.

Seven reactors are already into their fifth decade of commercial operation, and two more will cross that threshold by the start of next year. The licensees of all of the others in the group of 40 intend to join them, although not all of them may get the chance. At this writing, the licenses of five of these reactors—Indian Point-2, Kewaunee, Pilgrim, and Prairie Island-1 and -2—had not yet been renewed. (Indian Point-3 is also awaiting renewal, but it has not been in commercial operation long enough to be included in our 35-and-older group.) Vermont Yankee's license was renewed in March, but Entergy faces different challenges to its plans to operate the reactor past March of next year (see page 34, this issue). Whatever else might be said about the 40 oldest reactors, their performance as electricity producers cannot be counted as a demerit in the discussion of their fitness for license renewal. NN