Agenda Item 4.3
PSPC Meeting 260
May 21, 2009

Historical Peak Hour Availability Versus EFORd Based ICR Modeling[1]

Introduction

An investigation of availability statistics was undertaken for the years 2003 through 2008 which encompasses all of the summer periods under ISO New England's SMD. The top five peak load days were selected for each year and then the performance of the resources were evaluated for the peak hour of those days. This approach provided a sample set of 30 peak load hours that could be used to compare the actual availability performance of generating resources with the EFORd statistic that is used to perform reliability studies and establish ISO New England's ICR.

Under current market rules, the EFORd parameter is used in the calculation of ICR. As part of the process to be implemented in the ISO New England Forward Capacity Market (FCM), a newly proposed concept dependent upon sampling of resource availability based on only shortage hours is envisioned. This is expected to better align the planning statistics with actual performance at times when all the installed capability is needed to ensure peak day reliability.

Introduction & Methodology

This analysis was performed based on resource-specific EFORd and Summer Claimed Capability (SCC) values used in the Westinghouse Reliability Model database for the 2008/2009 Power Year. This data was then used to estimate a normal distribution for each of the five classes of units that are used in the Seasonal Claimed Capability Report. The five classes of units are:

- Combined Cycle
- Fossil Steam
- Hydro (Conventional and Pumped Storage)
- Nuclear
- Combustion Turbines

The normal approximation was then superimposed over a distribution of actual historical availability for the same resources. The hypothesis was that if the EFORd based planning assumptions were consistent with actual performance, the two distributions would be aligned.

An additional step was added which ensured that data used to characterize a resource's ability to produce energy during the peak hour could not exceed its Summer Claimed

[1] Update to 2006 Analysis: http://www.iso-ne.com/committees/comm_wkgrps/relblty_comm/pwrsuppln_comm/mtrls/2006/nov162006/availability_retrospective_2006.pdf

Capability (SCC) rating. It was noted that some classes of resources appeared to have data that suggested that there was an ability to produce energy above the SCC value.

Planning Assumption Data

To develop an estimate of the availability distribution used in the Westinghouse Model, a normal approximation was assumed to be adequate. A normal approximation is most robust with a large sample size of relatively similarly sized resources and less accurate with small sample sizes or large disparities in resource size.

The normal distribution was created by taking the resource-specific EFORd and SCC rating used in the Westinghouse Reliability Model database. The EFORd and unit size were used to estimate a normal distribution. The formula used to estimate the parameters of the normal distribution are defined below from the Westinghouse database:

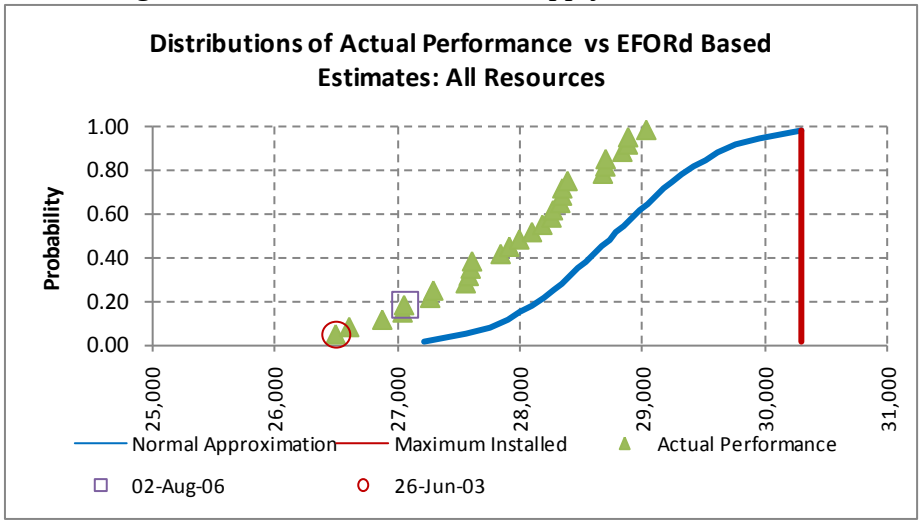
$$\text{Mean} = \text{Sum} [MW_i * (1\text{-}EFORd_i)]$$
$$\text{Variance} = \text{Sum} [MW_i * MW_i * (1\text{-}EFORd_i) * (EFORd_i)]$$
$$\text{Standard Deviation} = [\text{square root (variance)}]$$

These normal distribution approximation curves represent generating unit availability assumptions within the ICR and are plotted via the blue lines within each figure. These distributions were then compared to an actual distribution consisting of the thirty data points based on historical performance. This performance was defined to be the sum of each resource's Operating Maximum Override MW value which is equivalent to an emergency rating. Typically, this value is the same as EcoMax. To ensure comparability across all 30 data points in the historical data, all resources that were not present in all 30 hours were excluded from both the historical data and the EFORd based normal approximation.

Figure 1-1 shows that in aggregate, the estimated normal distribution and the actual performance have similar shapes but the actual was about 900 MW lower.

Two peak load days are highlighted on each of the figures. One of the days highlighted was for August 2, 2006 which is the highest summer peak load. The second day that was highlighted was June 26, 2003, which represents one of the days with the lowest amount of total available capacity resources of any of the summer peak load days investigated. Even though June 26 was a peak load day with the worst resource availability of the days included in this analysis, OP-4 load and capacity relief was not needed.

Figure 1-1: Performance of All Supply-Side Resources



Performance of Different Resource Classes

Inspections of the technology based groupings of resources reveal that the availability assumptions for the Nuclear, Fossil, Combustion Turbine resources (Figure 1-2 through Figure 1-4, respectively) have performed reasonably close to the EFORd based statistic.

The Combined Cycle resources shown in Figure 1-5, has performed slightly worse than would be characterized by the EFORd statistic. The hydro-based resources shown in Figure 1-6 have shown a tendency to have far less capacity available during the sampled hours than the EFORd based statistic would suggest.

The "Hydro Class" of units includes weekly cycle (conventional pondage), daily cycle, run-of-river, and pump storage facilities. This class has the largest measurable difference between actual and ICR modeled availability.

It should also be noted that the sample set for the nuclear resource only contains five units. While the nuclear class contains a significant amount of capacity, the availability statistics based on a five item sample set can be dramatically impacted or skewed by the increase or decrease in performance of any one, single, like-sized unit. The hydro resources, because of the way they were reported as aggregations, had several large groupings which greatly increased the standard deviation of the EFORd based normal approximation.

A comparison of the mean for the EFOR based distributions and the actual data are summarized in the following table.

Resource Class	Difference in Distribution Means
Combined Cycle	405
Combustion Turbine	-34
Fossil	165

Hydro	279
Nuclear	89
Total	904

Figure 1-2: Performance of Nuclear Units

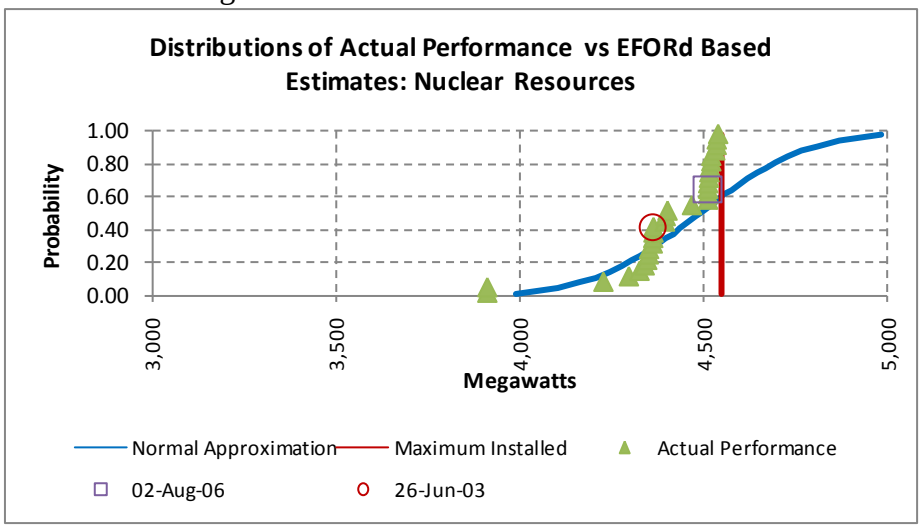


Figure 1-3: Performance of Fossil Units

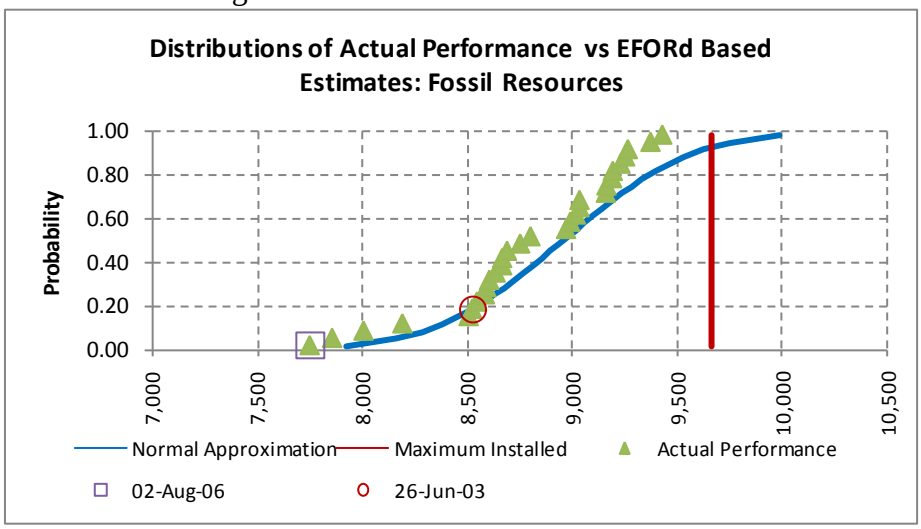


Figure 1-4: Performance of Combustion Turbine Units

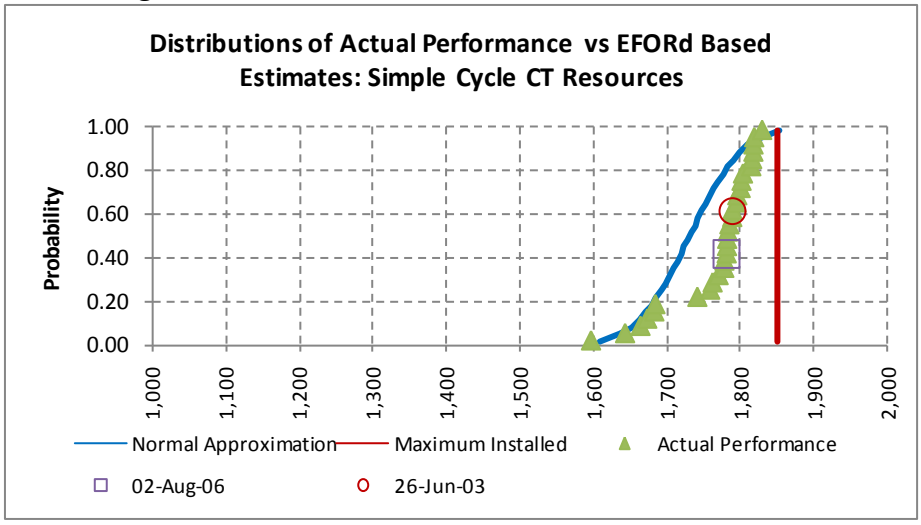


Figure 1-5: Performance of Combined Cycle Units

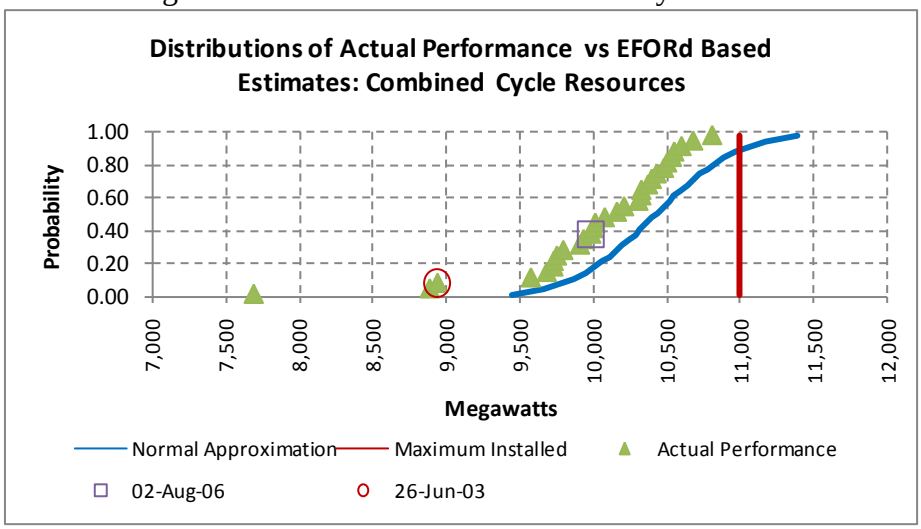


Figure 1-6: Performance of Hydro & Pump Storage Units