Technical Support Document (TSD)

for the Transport Rule

Docket ID No. EPA-HQ-OAR-2009-0491

Capacity Factors Analysis for New Units

U.S. Environmental Protection Agency

Office of Air and Radiation

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This Technical Support Document (TSD) provides information that supports the EPA's determination of default capacity factors for new units in the Transport Rule proposal. Section V.D.4 in the Transport Rule preamble describes the proposed remedy including the use of default capacity factors for new units. This TSD describes how EPA determined the proposed default capacity factors. The TSD is organized as follows:

1. Introduction
2. Determination of default capacity factors

1. Introduction

Section V.D.4 in the preamble of the Transport Rule describes EPA's proposed remedy including the assurance provisions. As described in the preamble, if the assurance provisions in a state are triggered then EPA would apply additional criteria to determine which source owners in the state would be subject to an allowance surrender requirement. In the case where the assurance provisions are triggered in the year that a new unit first operates, in order to apply the additional criteria, EPA would determine a specific surrogate emissions number for the new unit.

As discussed in the preamble, in calculating a new unit's surrogate emissions number EPA would use a default capacity factor specific to the unit type: a new unit's surrogate emissions number would be calculated by multiplying the unit's allowable emissions rate (in lbs/MWe) by the unit's maximum hourly load (in MWe/hr) and the default capacity factor for the unit type.

The proposed default capacity factors for new units – which are provided in preamble section V.D.4.b – are shown below in Table 1. This TSD describes how EPA determined these default capacity factors.

**Table 1. Default Capacity Factors for New Units
for Transport Rule Trading Programs
(Percentage)**

Unit Types	Annual SO_2 & NO_X Programs	Ozone Season NO_X Program
Coal Steam	84	89
Simple cycle combustion turbine	15	22
Combined cycle combustion turbine	66	72

2. Determination of Default Capacity Factors

EPA determined the default capacity factors for new units in Table 1 based on analysis of capacity factors using data reported to EPA by source owners and operators as part of EPA's emissions trading programs. These programs require industry sources to report hourly emissions data each quarter.

Using the reported data, for coal boilers EPA calculated an annual capacity factor for each unit for each full year of operation between the years 2000 and 2009. For combustion turbines, EPA calculated an annual capacity factor for each unit for each full year of operation between 2004 and 2009.[1] For this analysis, we removed any partial years from the data sets.

To determine annual capacity factors, EPA calculated the capacity factor for units reporting in electrical load units (MW) by dividing the gross electrical output (MWhr) by the maximum hourly load times 8,760 hours (the number of hours in a year). For units reporting in steam units (KLBsteam), i.e., coal boilers only, we divided the total mass of steam produced by the maximum steam rate times 8,760 hours. The maximum hourly load or maximum steam rate are reported to EPA.

From these annual capacity factors that EPA calculated, we then determined the 50th, 67th, 75th, 90th, 95th, 99th, and 100th percentile values of capacity factors for each unit type. Table 2, below, shows these percentile values.

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[1] The year 2009 was the most recent full year of data available at the time EPA conducted the analysis. We looked at more years of coal data (2000 through 2009) because there were fewer new coal units to draw on compared to the number of recent combustion turbines (CT). We looked at fewer years of CT data because there were more data points available in the recent data and the more recent data was thought to better represent the present, given that CT operation is more variable.

To determine ozone season capacity factors, EPA performed the same calculations except based on the possible capacity that could be produced during the 3,672 hours of the ozone season control period. Table 3 shows the 50th, 75th, 90th, 95th, and 100th percentile values of ozone season capacity factors for each unit type.

From the values in Table 2, the EPA chose the 95th percentile annual capacity factors for use as default capacity factors for new units in the Transport Rule annual SO_2 and NO_X trading programs. Similarly, from the values in Table 3 we chose the 95th percentile ozone season capacity factors for use as the default capacity factors for new units in the Transport Rule ozone season NO_X trading program. EPA believes that this approach would cover a range of operating conditions for new units.

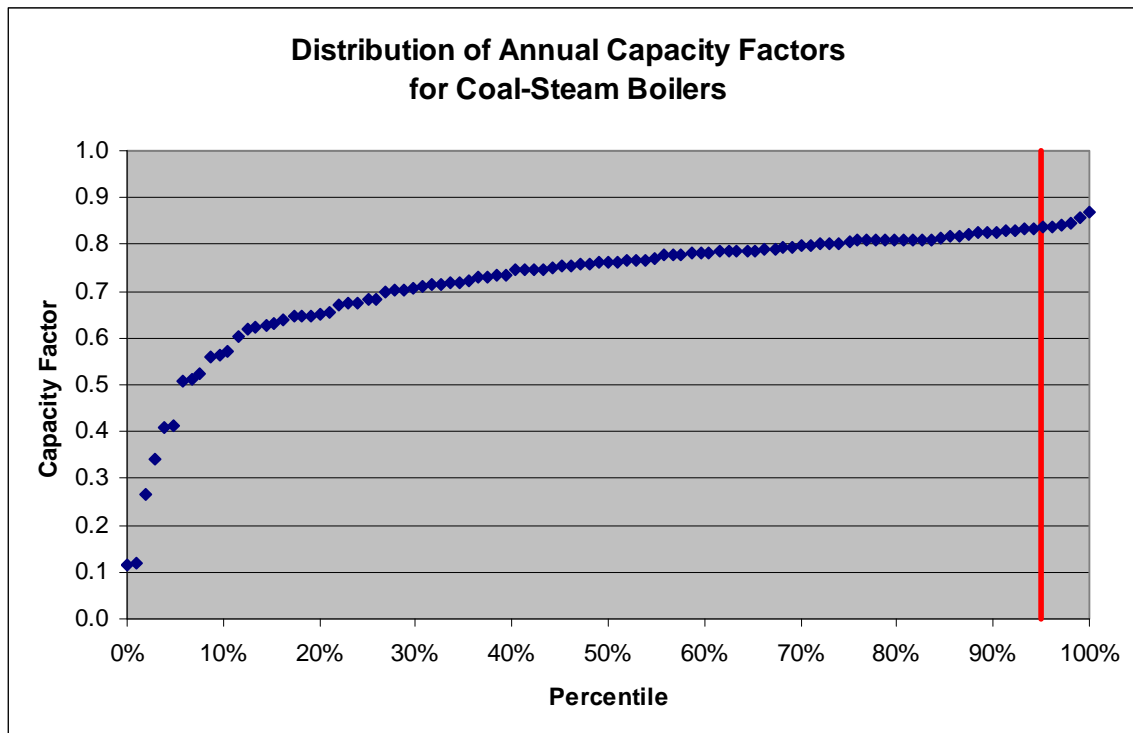**Table 2. Summary of Annual Capacity Factors**

Percentile	Coal Steam Boiler	Simple Cycle Combustion Turbine	Combined Cycle Combustion Turbine
50th	0.76	0.02	0.26
67th	0.79	0.03	0.37
75th	0.80	0.05	0.43
90th	0.83	0.09	0.57
95th	**0.84**	**0.15**	**0.66**
99th	0.86	0.42	0.73
100th	0.87	0.63	0.78

Table 3. Summary of Ozone Season Capacity Factors

Percentile	Coal Steam Boiler	Simple Cycle Combustion Turbine	Combined Cycle Combustion Turbine
50th	0.77	0.03	0.35
75th	0.82	0.08	0.51
90th	0.87	0.15	0.65
95th	**0.89**	**0.22**	**0.72**
100th	0.92	0.93	0.92

Figures 1, 2, and 3, below, show the distribution of annual capacity factors for coal-fired units, simple cycle turbines, and combined cycle turbines, respectively, based on the annual data EPA analyzed (the data is summarized in Table 2). Figures 4, 5, and 6 show the distribution of ozone season capacity factors for coal-fired units, simple cycle turbines, and combined cycle turbines, respectively, based on the ozone season data EPA analyzed (the data is summarized in Table 3).

Figure 1. Distribution of Annual Capacity Factors for Coal-Steam Boilers

Figure 2. Distribution of Annual Capacity Factors for Simple Cycle Turbines

**Distribution of Annual Capacity Factors
for Simple Cycle Turbines**
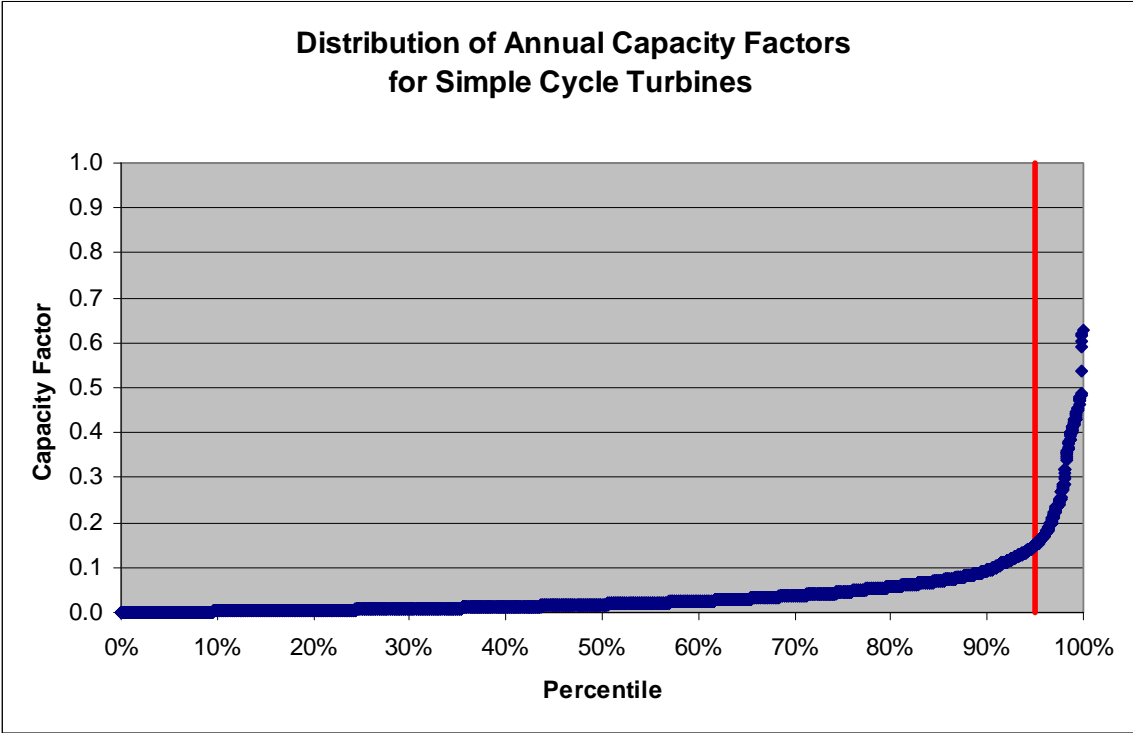
Figure 3. Distribution of Annual Capacity Factors for Combined Cycle Turbines
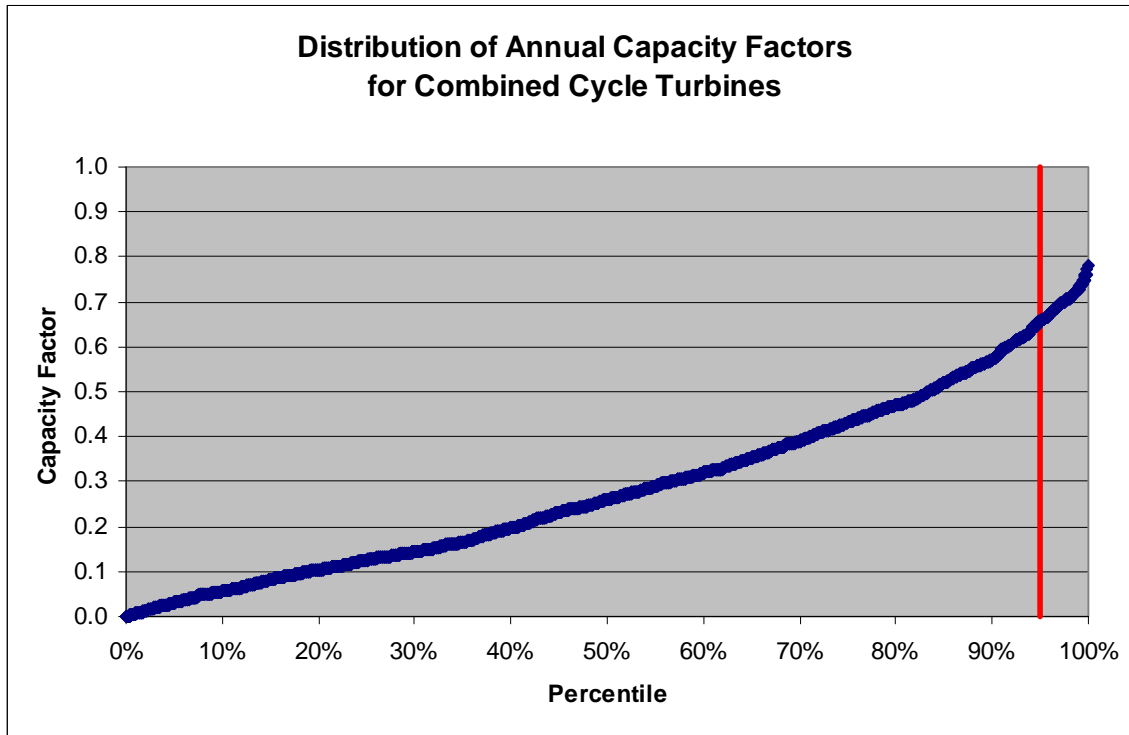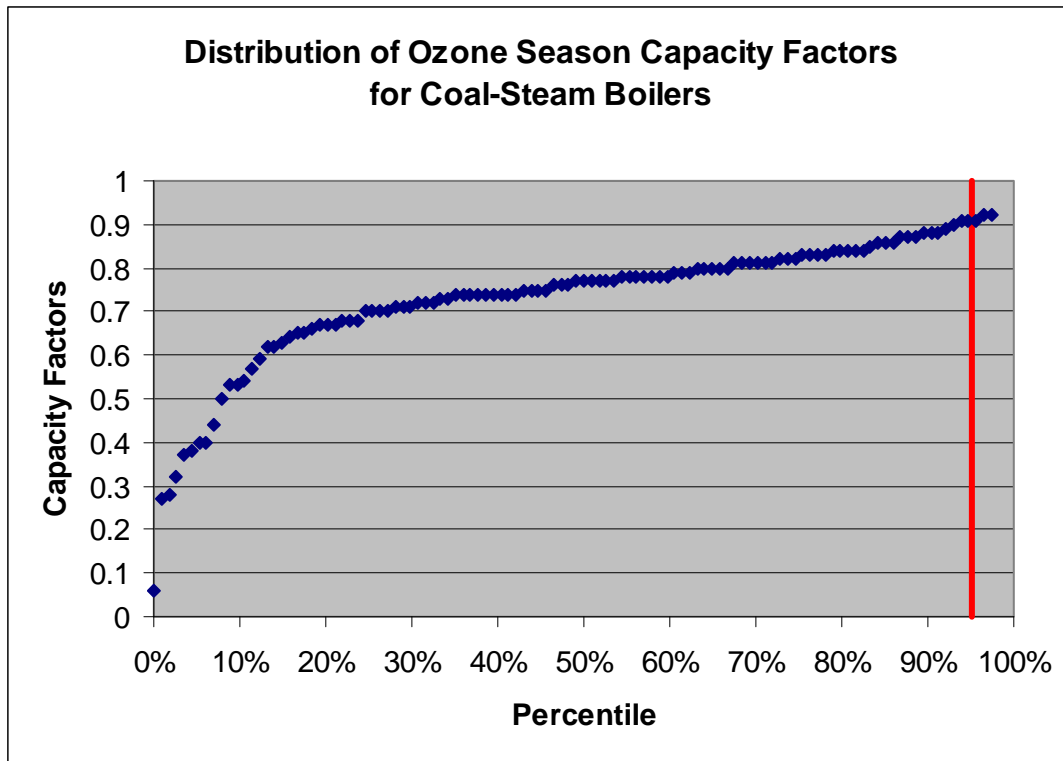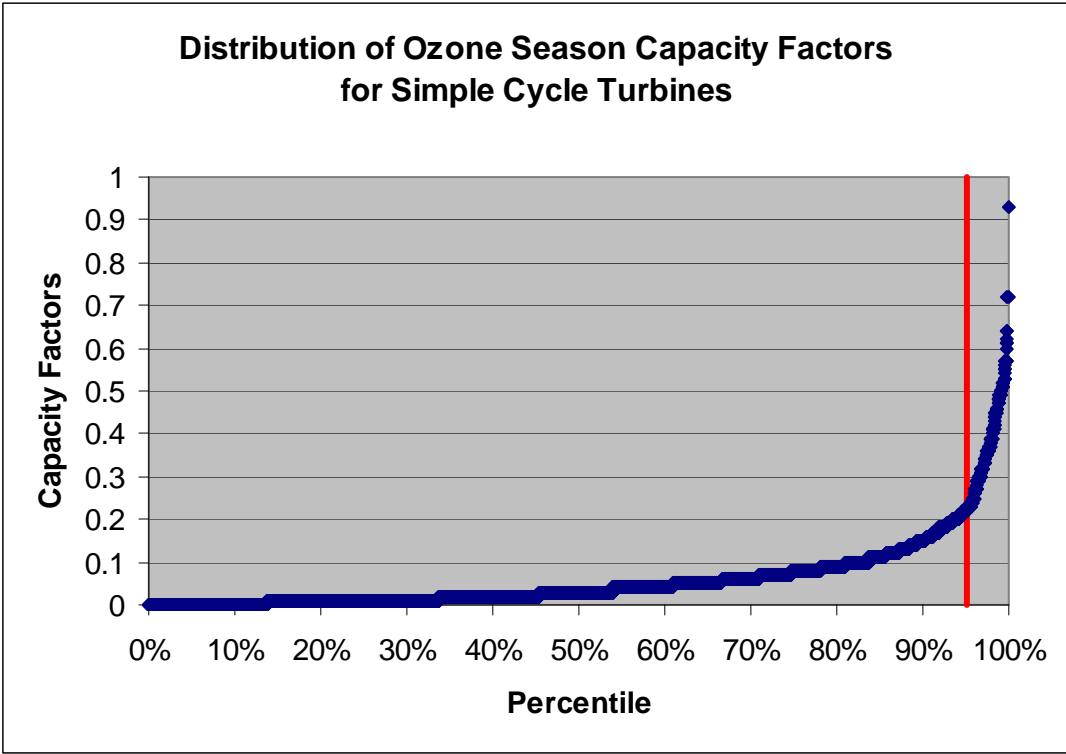

Distribution of Annual Capacity Factors
for Combined Cycle Turbines

Figure 4. Distribution of Ozone Season Capacity Factors for Coal-Steam Boilers

Distribution of Ozone Season Capacity Factors for Coal-Steam Boilers

Figure 5. Distribution of Ozone Season Capacity Factors for Simple Cycle Turbines

Distribution of Ozone Season Capacity Factors
for Simple Cycle Turbines

Figure 6. Distribution of Ozone Season Capacity Factors for Combined Cycle Turbines

Distribution of Ozone Season Capacity Factors
for Combined Cycle Turbines