



Simplifying Generator Set Ratings

By Armen Kludjian

Choosing a generator for your facility can be a confusing journey. Information about various units' horsepower ratings and power outputs can make for a dizzying array of choices. How can you be sure you picked the correctly rated unit for your specific need?

Generally, the more horsepower generated, the higher the heat generated resulting in shorter service intervals and increased wear.

While at first glance generator set ratings can appear confusing, a few simple techniques will be presented next that will make it much easier to understand. Let's start with some basic terminology.



STANDBY = Standby power 100% of the rating available for the duration of the outage,” normally peaking.” The phrase “normally peaking” means that the load is cyclical and cannot be controlled to achieve constant load.

PRIME = Prime power is not limited to the duration of the outage, but it is also considered a “normally peaking” load but is limited for total hours

CONTINUOUS = Continuous power rating is unlimited and can be a 100% base loaded. This rating is typically only achievable on export to a utility although there are other applications where it may apply.

TABLE 1 shows Caterpillar® ratings and definitions most common of which is the standby power rating. Mission Critical rating and ESP are variations to the standby power rating.

	AVERAGE POWER OUTPUT	LOAD	TYPICAL HOURS/YEAR	MAXIMUM EXPECTED USAGE	TYPICAL PEAK DEMAND	TYPICAL APPLICATION
ESP Rating <i>Power is available for the duration of an emergency outage</i>	70% of ESP rating	Varying	50 hours	200 hours/year No overload available	No overload available	Building Service Standby <i>Not for maintained utility paralleling applications</i>
Standby Power Rating <i>Power is available for the duration of an emergency outage.</i>	70% of standby power	Varying	200 hours	500 hours/year No overload available	No overload available	Standby <i>Not for maintained utility paralleling applications</i>
Mission Critical Standby Power Rating <i>Power is available for the duration of an emergency outage.</i>	85% of standby power	Varying	200 hours	500 hours/year	Up to 100% of standby rated kW available for 5% of the operating time	Data Centers, Healthcare <i>Not for maintained utility paralleling applications</i>
Prime Power Rating	70% of prime power rating	Varying	Unlimited		100% of prime rated kW with 10% overload capability for emergency use for a maximum of 1 hour in 12. Overload operation cannot exceed 25 hours per year.	Industrial, Pumping, Construction, Rental, and Co-Generation
Continuous Power Rating	70-100% of continuous power rating	Non-Varying	Unlimited		100% of continuous rated kW for 100% of operating hours	Base Load, Utility or Co-Generation



TABLE 2 shows how an engine de-rates through the various engine definitions, notice that the C175-20 cylinder is rated at 4,000kW standby and de-rates by 10% to for the prime rating and another 10% for the continuous rating. Another example of the trade-off between heat and wear can be found in Table 1. When looking at standby rating versus mission critical standby rating, the mission Critical rating average power output increases from 70% standby to 85% mission critical standby rating, but the mission critical adds a limiting factor of 100% of power available 5% of the operating time.

MODEL	STBY	MISSION CRITICAL	PRIME	CONTINUOUS
C175 - 20	4000ekW	4000ekW	3600ekW	3250ekW
C175 - 16	3000ekW	3000ekW	2725ekW	2500ekW
3516C-HD	2500ekW	2500ekW	2250ekW	2050ekW
3516C	2000ekW	2000ekW	1825ekW	1650ekW

Other limiting factors that should be considered are your Air Quality Management District (AQMD) permit. The New Source Performance Standard (NSPS) limits total run hours for standby gensets for discretionary use.

In the past de-rating an engine to prime or continuous basically did not change the iron configuration, but as of 2006 Tier 4 Interim Standards requires that gensets above 800kw must add after treatment. These systems are large, expensive, and require extensive additional maintenance.

Most if not all of the genset ratings are based on and comply with ISO Standard 8528 see **TABLE 3** below. While the wording changes you will find that the same concepts repeat. Limiting the hours of usage and percentage of load over time to control the wear factors, which reduces the amount of heat and therefore reduces the amount of maintenance hours.

	OUTPUT	LOAD FACTOR	TYPICAL HOURS/YEAR	TYPICAL PEAK DEMAND	TYPICAL APPLICATION
Isolated from the Utility less than 500 Hours per year <i>(Standby Power)</i>	Output available with varying loads*	Typical: 70%	Less than 500 hours	–	Interruptible utility rates, emergency standby
Parallel with or Isolated from the Utility over 500 Hours per year <i>(Prime Power)</i>	Output available with varying loads for over 500 hours per year*	Typical: 70%	Unlimited	100% of prime plus 10% rating overload capability for maximum of 1 hour per 12 hours (emergency usage). <i>Not to exceed 25 hours per year of overload operation.</i>	Peak sharing, interruptible utility rates, storm avoidance
Parallel with or Isolated from the Utility less than 500 Hours per year <i>(Available for limited models rated at Prime Power)</i>	Output available without varying loads for less than 500 hours per year. Maximum power available for up to 500 hours per year**	Maximum: 100%	200 hours	100% of prime rating	Peak sharing, interruptible utility rates, storm avoidance****
Parallel with or Isolated from the Utility over 500 Hours per year <i>(Continuous Power)</i>	Output available at continuous rating for unlimited time***	Maximum: 100%	Unlimited	100% of continuous rating used 100% of the time	Base load, utility, peak sharing, cogeneration

* Fuel stop power in accordance with ISO 3046/1, AS2789, DIN6271 and BS5514

** Limited-Time running Power (LTP) in accordance with ISO8528, ISO3046/1, AS2789, DIN6271 and BS5514

*** Continuous power in accordance with ISO8528, ISO3046/1, AS2789, DIN6271 and BS5514

**** Note: Prime Power Units operating at 100% Load for <500 hours per will experience shorter oil change intervals and reduced hours to engine overhauls. Refer to the Owning and Operating manual for package specific service intervals and the impact of operating at higher load levels.



Still confused? You're not alone--there is a wealth of additional information available from manufacturers to explain specifics about their products' ratings and performance. While this information can seem confusing, any manufacturers or dealer qualified to earn your business will make reps available to guide you through the journey. You should feel fully empowered to approach these experts with questions about your specific facility or installation. One of the benefits of partnering with an established provider is the depth of experience and product knowledge that these reps bring to the table. If you don't feel that you're getting this attention, move on. Your business deserves it!



AUTHOR:

Armen Kludjian is an Electric Power Generation applications expert with particular emphasis on;

- a) Emergency Standby Power Systems
- b) Hospitals, OSHPD and Seismic Certification
- c) Paralleling Switchgear
- d) Data Centers
- e) BAAQMD Emissions
- f) FlyWheel UPS Systems

Armen has been with Peterson Cat for more than 29 years and is a frequent speaker at the IEEE in San Francisco, a member of 7x24 and a past associate of the Collaborative Process Institute.