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Session: May 2019

PowerHour FAQs

Introduction to Generator Set Sizing Software

The ability to select optimally-sized generator sets based on site conditions and load attributes is an integral part of a robust power system design. This course provides a tour of Cummins' GenSize® online generator sizing tool as well an interactive case study demonstrating mitigation strategies for complex loads and stringent performance requirements. GenSize is available in PowerSuite (powersuite.cummins.com) to registered users.

To learn more about the GenSize tool, please join the Cummins PowerHour webinar:

Following this PowerHour participants should be able to:

- Identify the critical attributes of common loads and their impact on electrical power requirements
- Recognize common pitfalls and often overlooked considerations when using generator set sizing software
- List some key considerations for gaseous generator sets installation

Is online registration required to access GenSize? If so, how do I find my user ID?

Yes, online registration is required, however, it is free. During online registration, you are allowed to create your unique username which could also be your email address. If you believe you already have an account but do not remember your login details, PowerSuite has a comprehensive system to enable you recover your username or reset your password.

What is an acceptable voltage and frequency dip limit?

With transient performance requirements, the key word is "requirement." There are no specific acceptable voltage and frequency dip limits; the limits are determined by your system's load requirements. If the data sheet for your UPS specifies a tolerance of +/- 15% of the voltage, then your dip limit should be 15%. If your motor has a 25-30% dip, your dip limit would fall into that range. Of course you don't want your voltage and frequency both to fall to their dip limit simultaneously. Some people assume that using a very stringent voltage and frequency dip limit will get them the best performance but that is a misconception.

Why is the same generator set model shown multiple times in GenSize?

Cummins has multiple configurations of each generator set model; specifically, the same engine with multiple alternator options and sizes. Larger alternators on the same engine have a lot of advantages such as enhanced performance when it comes to voltage transients, short-circuit, and harmonic capability. Gensize thus, allows users to see all these available configurations on the recommendations page and will enable them to see the effects of each alternator under the same Generator set and select accordingly without the need of increasing footprint by upsizing the generator set model as a whole.

What are some common methods GenSize recommends for reducing the size of the generator set?

Active filters for harmonic correction devices are activated using current required for the electrical distribution system. The manufacturer's specification sheet should show the correction units and the distortion limitations, and if you don't have this information, you can limit it to 5% on the sizing program by editing the total amount of harmonic distortion percentage.

When entering the project information under transient dip limits, what is the difference between project level and step level?

When you're entering the transient dip limits, you can choose either project level or step level. If you select project level, you are setting limits for all the load dip requirements at the project level. For example, you may enter 35% for voltage and 10% for frequency. All the loads that are connected to the generator set will be limited to those amounts. But there are some sensitive loads that are classified as step level, such as medical loads and fire pump loads, that have limits specified in the NEC. In those cases, GenSpec will automatically set the limits at 10 % for medical loads and 14% for fire pump loads.

In the project example shown, the generator set was listed as a diesel and the project list configures having a minimum rate capacity of 10%. Wouldn't that cause wet stacking? Is a load bank being considered during this example, thus allowing 10% as a minimum load factor?

The example included a configuration running at 10% to just to show you the complete range of generator sets available using GenSize. The power should actually default to 30% of capacity. You are correct; you don't want to run a diesel engine at 10% because you will have problems with wet stacking. In that scenario, the generator is over-sized for the application.

If you have a situation where the generator might, at times, be running at less than 30%, you would use a load bank to assume the load and get it above 30%. You want to run at the optimal rated capacity to get all of the unburned fuel out of the exhaust and maintain the minimum exhaust gas temperature.

Can you model a UPS when the batteries are charging?

Yes, on Gensize there is an option to enter the battery charge rate as a percentage of the UPS output kVA rating. The battery charging power requirements will be added to the total power kW requirements for the UPS load. If when modeling the UPS, the Input kVA value is entered, it is assumed that the battery charging requirements and system efficiency have already been factored in.

When using GenSize to select a generator based upon the required loads, the list of available generators displayed has some cells highlighted in red and some highlighted in yellow. What do these highlights indicate?

Red means that choice is not recommended. But you can investigate further by clicking on the red cell to see what parameter is outside the range you specified. This allows you to re-examine your input and decide if it might be appropriate to adjust the input. You may be able to eliminate the red warning by selecting a different generator set or by selecting more suitable equipment to optimize the size of your generator set.

It is a common misconception that the yellow highlights are a caution warning. Actually, yellow indicates that although that generator might not meet all of your specifications, it would be suitable for your loads. So we're saying this option will work but it may not be exactly what you want. For example, if you specified a 105°C temperature rise alternator, the yellow highlight might be pointing out that this configuration has an 150°C temperature rise alternator that would be suitable for handling your loads. So you have that option but you may prefer to make a different choice.

In another instance, for example, the starting kW, yellow may be letting you know that your loads are already at 85% or more. So GenSpec is drawing your attention to this fact so you can make a conscious decision about what you should do.

Is it fair to say that you need a separate transfer switch for each load step?

It's more accurate to say you need a separate switching and stepping mechanism for each step. I've seen systems with ten steps, but I would not assume the system included ten transfer switches. Transfer switches are not the only way you can sequence your loads. It could literally be just the timing and controls. You could use breakers; you can use any other type of switching mechanism to ensure that the generator set experiences the transient event of stepping the load on, the voltage dip, the voltage recovery, the frequency dips, the frequency recoveries, during the allotted recovery time, which is shown on your recommendation report. Then the next load can come in, so however you choose to do that is based on your preference and the local code. Of course, if you're trying to try something a little unorthodox in terms of switching, definitely work with your authority having jurisdiction to ensure that your solution is meets code.

Where is the 10% harmonic distortion requirement coming from?

10% is the recommended industry standard – it's not coming from any one manufacturer. This protects not only your generator but also the load that's connected to your generator. Ideally, you should keep the harmonic distortion under 5%, and 10% is the absolute limit. This isn't part of any code, but it is an industry standard.

The generator set can handle more than 10% harmonic voltage distortion but your concern is to protect the load. Voltage distortion greater than 10% can cause load equipment mis-operation. You want to ensure that when you start the generator set, you're getting clean, suitable power for your load. So the 10% limitation is for the benefit of the load, more than the generator set.

Is the generator set range shown in GenSize, such as "standby" and "prime," taking into account ISO 8528?

Yes. Cummins generator sets comply with ISO 8528 ratings. For standby, prime and all other ratings, we adhere to ISO 8528 when rating our generator sets and all the associated parameters.

What do you recommend doing about load diversity and duty factor in sizing a generator? On water and wastewater plants, for instance, I found the actual plant demand load is typically about 50% of the total calculated connected load.

This is a question the power industry struggles with. Load diversity is a problem when you realize you sized the generator set at 90% but it's actually running at 50%. You don't want to undersize the generator set but at the same time, if you select a generator large enough to handle the calculated connected load, when the generator is commissioned you discover that you're not running that much load. The more you know about your actual load, the better you can size the generator. We recommend sizing according to what the load demands. For example, if you have a good understanding of the application, you can enter parameters based on your knowledge of how the loads actually run.

But it's more difficult in situations like wastewater treatment plants where you have motor loads with starting current requirements that are two or three times the running current requirement. You might have to specify a larger generator set to meet the starting requirements. In that case, we recommend using alternative starting methods, such as soft starts and VIPs, to reduce the starting requirement and permit the selection of a smaller generator set more suitable for the running requirements.

Why aren't PMG exciters used on all generator sets?

PMG exciters have many benefits: they can improve circuit performance and help with transient and harmonic performance. But these benefits may not be applicable for your specific application. If you're working with a simple, regular load in a lower kilowatt range that doesn't have many harmonics, you can use a self-exciting generator set. This is definitely the more cost-effective option. At a certain size range or kW node, Cummins includes a PMG as standard. In the lower nodes you have the option for a PMG or a self-exciting generator set. But if you don't need the PMG, going with a self-exciting generator set is definitely less expensive.

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