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# PowerHour FAQs

## Features of Generator Set Control Based Paralleling

A comprehensive overview of a typical paralleling emergency power system, delving into the fundamental features required for paralleling generator sets. The instructor will review critical control functionality for paralleling systems and compare distributed logic architecture with traditional switchgear paralleling. System reliability will be explored and the instructor will review the ability of paralleling and control strategies to eliminate potential single points of failure.

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Following this PowerHour participants should be able to:

- Identify the advantages of paralleling for overall system reliability, performance and flexibility
- Recognize basic generator set paralleling control components, functions and features
- Describe common strategies employed by paralleling systems using distributed logic architecture
- Discuss the benefits of distributed logic architecture for paralleling, system reliability and eliminating single points of failure

### **Does the Cummins integrated paralleling control work on both low and medium voltage systems?**

Yes. The integrated control is capable of doing the paralleling whether the system is low voltage or medium voltage. So, there is no need for paralleling using the switchgear or a master control. Paralleling can be accomplished via the generator set integrated control panel. As a matter of fact, a case study ([Bulletin 5410854: Peaking Power](#)) reviews medium voltage use at the Cummins Fridley plant. It is a 13.8 kV system using an onboard generator set integrated paralleling control.

### **What was the failure scenario in the Fridley case study? If one of the two power feeds was still available, why were the generator sets activated?**

The sequence of operation varies depends on how you specify the sequence. In a typical sequence, when one side of a utility fails, the entire load switches to the other utility. In this particular case study, there was not a failure. This is an interruptible system and we ran a peak-shave operation, based on the contract with the utility. In exchange for switching to generator power when the utility reaches peak usage, the utility gives the customer a

reduced kW hour rate. When the utility approaches peak usage, the customer receives notification from the utility saying “Please start your generators and take the load off of the utility” or reduce the load on the utility to 300 or 400 kW and use the in-house generators to supply the remaining load.

### **At what sized load should I consider paralleling generator sets?**

When you’re evaluating paralleling, the cost to be considered is not just the cost of the generator set. There is also the cost of the switchgear and power cables as well as system maintenance. Typically, we recommend looking at paralleling at 400 kW and above. At less than 400 kW, paralleling is usually not cost-effective, but this depends on the application and there are multiple factors to consider. The smallest paralleling application I have seen is two 50kW Cummins generator sets with Cummins onboard digital paralleling control.

### **Does optimization include consideration of cumulative running hours among generators?**

Yes, it does. When you have multiple generator sets paralleled, you may want optimize the generator set run hours. So, for example, if you have three generators on site, you may want to balance run hours among the three. Instead, you can have the system cycle through them, starting with the generator with the fewest run hours. Some generator set manufacturers include this functionality in the master control.

For Cummins generators, this function is incorporated into the control as “masterless load demand” and that’s one of the features included in the technology that allows you to balance the run time for service intervals and maintenance. When selecting a generator set, you should confirm with the manufacturer that this function is included.

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### **Can I load one set at 100% and another at 50% for efficiency? For example, fuel burn, operation cost, and the cost of maintenance? Do both generators have to be loaded at the same percentage load with a single 0-5 volt or 40?**

You can accomplish this by using different base loads for one generator versus the other. When you’re doing load sharing, if it’s isochronous, the control can determine the best conditions for load sharing. But if you want to have one generator set running at a higher load than the other, you can specify different base loads.

### **What is arbitration and how does it work?**

When two or more generator sets start and reach their 90% rating of voltage and frequency, and are about to close their electrically operated circuit breakers to a de-energized bus, their phase, voltage and frequency are most likely out of sync. So the first start arbitration comes into play.

This is a control function that is used to prevent multiple generator sets from closing their circuit breakers simultaneously to a de-energized bus since they are out of sync. Initially only one generator set closes to the bus.

Every generator set has an equal chance of winning this arbitration hence this is called random access to the bus.

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