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PowerHour FAQs

Data Center Failure Modes: Common Failure Modes of Data Center Backup Power Systems

Data center and IT professionals know the devastating effects an unplanned outage can have on their organizations. Even though a lot of time and effort is dedicated to the design of systems and components to ensure the continuous operation of a data center, our customers still sometimes experience unplanned power outages that could have been avoided. In this session, we will review a few examples of common failures in data center backup power systems and discuss how we can identify potential risks and effectively prevent these problems from happening.

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Following this PowerHour participants should be able to:

- Identify common data center power systems failure modes
- Understand key design and operating considerations that allow data centers to prevent, prepare for, and manage emergencies
- Discuss pro-active measures that can be taken during project design and implementation to achieve desired system performance and reliability

What are the primary differences between a Cummins data center generator set and an ordinary Cummins generator set? Is there a difference in the ECU programming?

No, there's no difference in the ECU programming — in terms of controls, the products are the same. But the specifications for a data center application are going to vary depending on the special requirements and features like redundant filters, additional sensors for current level alarms, and so on. A data center specification is going to have requirements that do not appear in the specifications for an ordinary generator set.

Are data center loads constant or variable?

Typically, the load is variable. In data centers that utilize four-wire systems, there is an imbalance to the load across the phase as well.

Please explain how to control harmonic content in data centers?

Usually spec requirements define a subtransient reactance requirement to address the issue of harmonics. And today's 3-phase AVR's help the system cope with large amounts of harmonics. I have never seen an issue related to harmonics, although I have seen some pretty ugly wave forms.

Does Cummins offer backup power design review for our end clients? Who should we contact about design review?

Design review is a standard element of our work and our application engineering team is available to do design reviews. I would encourage you to contact your local Cummins application engineering team to review the design, and start working with them early in the design process.

What does the acronym THDV stand for? And is there a generally accepted value of THDV for data centers?

THDV is Total Harmonic Distortion Voltage. On projects I've worked on, the estimated harmonic distortion values haven't been more than about 16-18%. Often the values are lower than that. Cummins generator sets default to the standard limit of 10%; 16% would be an extreme case.

In the earlier slide you depicted the redundant generator as a swing bus. Is this swing bus an N+1 type of redundancy?

Yes, that's correct.

How could a designer catch the failure you mentioned with circuit breaker to ECM? Shouldn't the control system have announced that failure?

It should have. It would be unusual to have a configuration where the generator set didn't

monitor the control system voltage. I was surprised to see the diagnostic in that example, but I'm not familiar with the details of that particular installation.

Do you recommend a four-pole ATS over a three-pole to eliminate GFI conflicts?

It's one of the recommendations we make to avoid that issue, but it's not the only way of mitigating it. We looked at some other ways of avoiding the problem. And actually, in most of the four-wire installations that I've seen, they do not use the four-pole, and they don't have an issue. They just follow the recommendation for single point grounding.

Does Cummins offer a service to validate the proper installation on the new installation, much like commissioning?

This service would be provided by your local Cummins engineering team. Get in touch with your local contact and they'll definitely answer all of your questions.

When do we require an NGR?

An NGR is typically used on medium and high-voltage systems, on the neutral-to-ground connection to limit the fault current. In low voltage systems, we have seen high-resistance ground devices. In both cases, you have sensing to detect a ground fault current.

Is there a typical limit to fuel belly tank size volume before it must ship separately from the generator for field assembly?

I've primarily been working with the large, high horsepower systems and in general, with equipment that size, the belly tank ships separate from the rest of the enclosure. I assume our shipments are like any other shipment, with dimension and weight limits.

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we enter an ambient temperature.
Does this account for the temperature
increase across the alternator and the
engine before the radiator?**

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