Critical Power Applications

AWC 500

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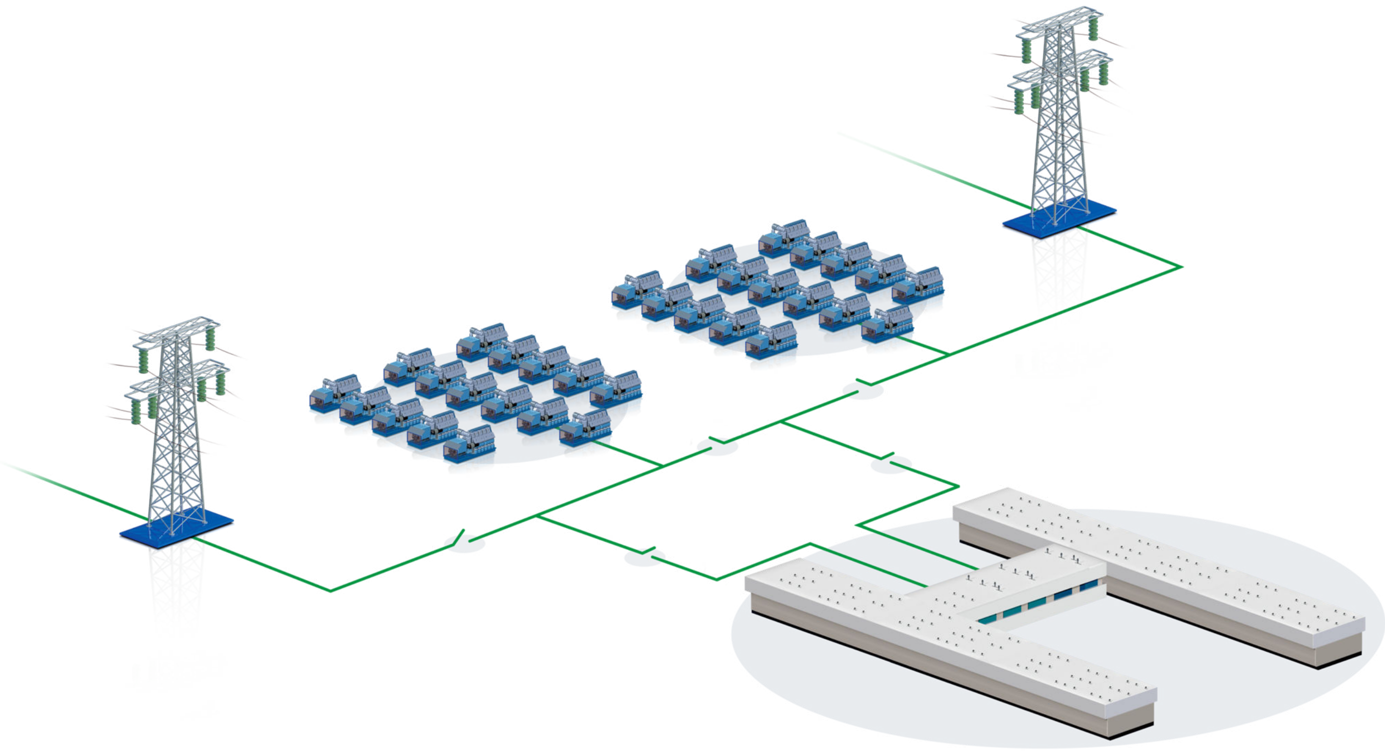
1. Introduction

Data centres, hospitals and many other businesses require a dependable backup power supply to ensure they can always deliver their services. The Tier Standard assists businesses in selecting the right critical power solution for their business needs. At the highest level (Tier IV) the system is fault tolerant, but this also means the system has a high complexity.

DEIF is able to manage this complexity using a combination of AWC 500, AGC-4 and ALC-4 controllers. The AWC 500 acts as the gateway between the building management system (BMS) and the emergency power system. The AGC-4 and ALC-4 controllers ensure that the emergency power system is ready to provide power to the critical power application when needed.

This document provides a short overview of data centre architecture requirements, and an example of how a DEIF power management solution can satisfy the Tier IV 2N requirements.



2. Data centre architecture

2.1 Uptime Institute tier rating

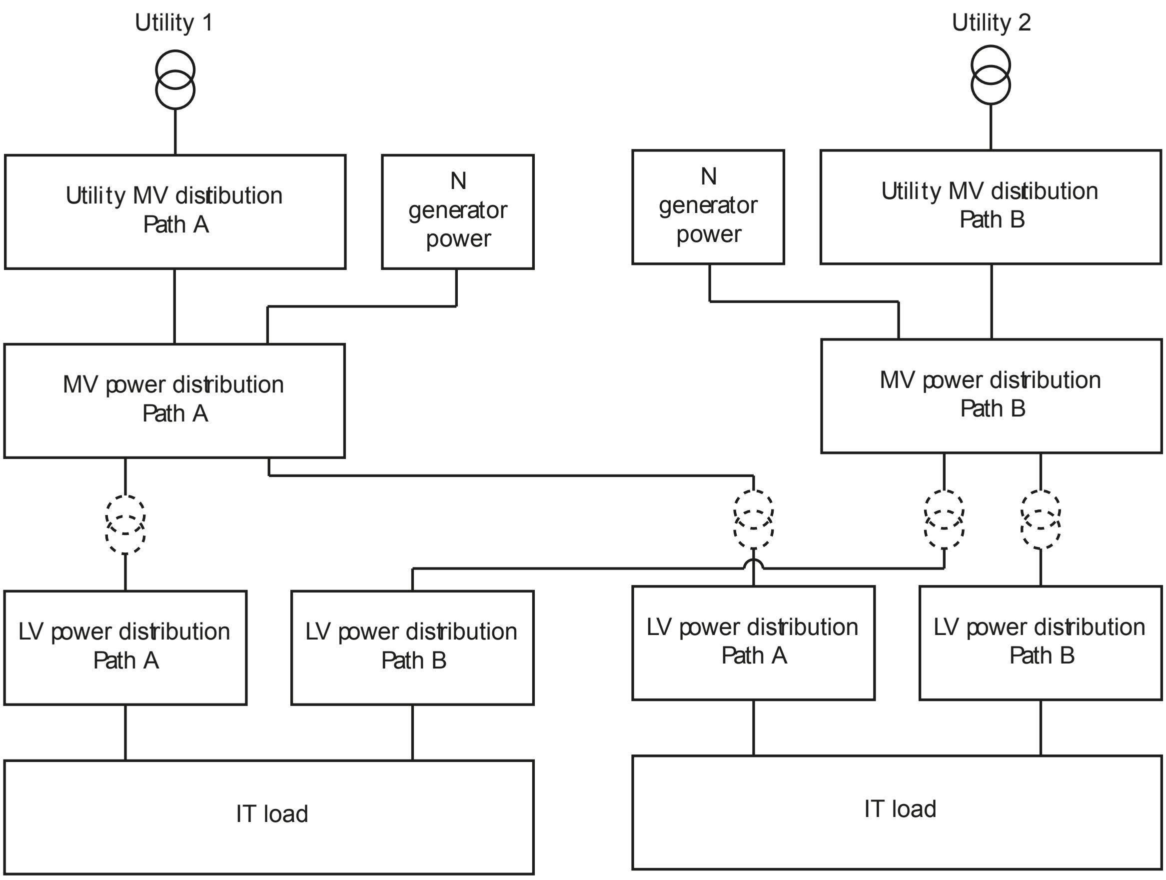
The Tier Standard developed by Uptime Institute Inc. defines four levels of failure protections (tiers) for data centre performance. These tiers can also be used to define requirements when a data storage solution is selected.

Tier level	Description
Tier I	Power and cooling are provided from a single source, and there are few redundant and backup components.
Tier II	Power and cooling are provided from a single source, and there are some redundant and backup components.
Tier III	Power and cooling are provided by multiple sources. The system can be updated and maintained without taking it offline. The number of all critical components in the system must be N + 1. This means that there is at least one more critical component than required by the system.
Tier IV	The system is fault tolerant and automatically responds to failures without the need for operator intervention. The number of all critical components in the system must be 2N. This means that there are double the required critical components required for normal operation.

2.2 2N architecture for Tier IV data centres

2N data centre architecture requires data centres to have double the capacity and number of critical components required for normal operation. The power, cooling and other critical systems are divided into two independent blocks that can fully support the data centre. If a failure occurs the system can isolate the fault and use the remaining block to continue normal operation. Failure response in a 2N system is automatic, ensuring operation without operator intervention in the case of a failure.

Figure 2.1 Example of 2N architecture power system

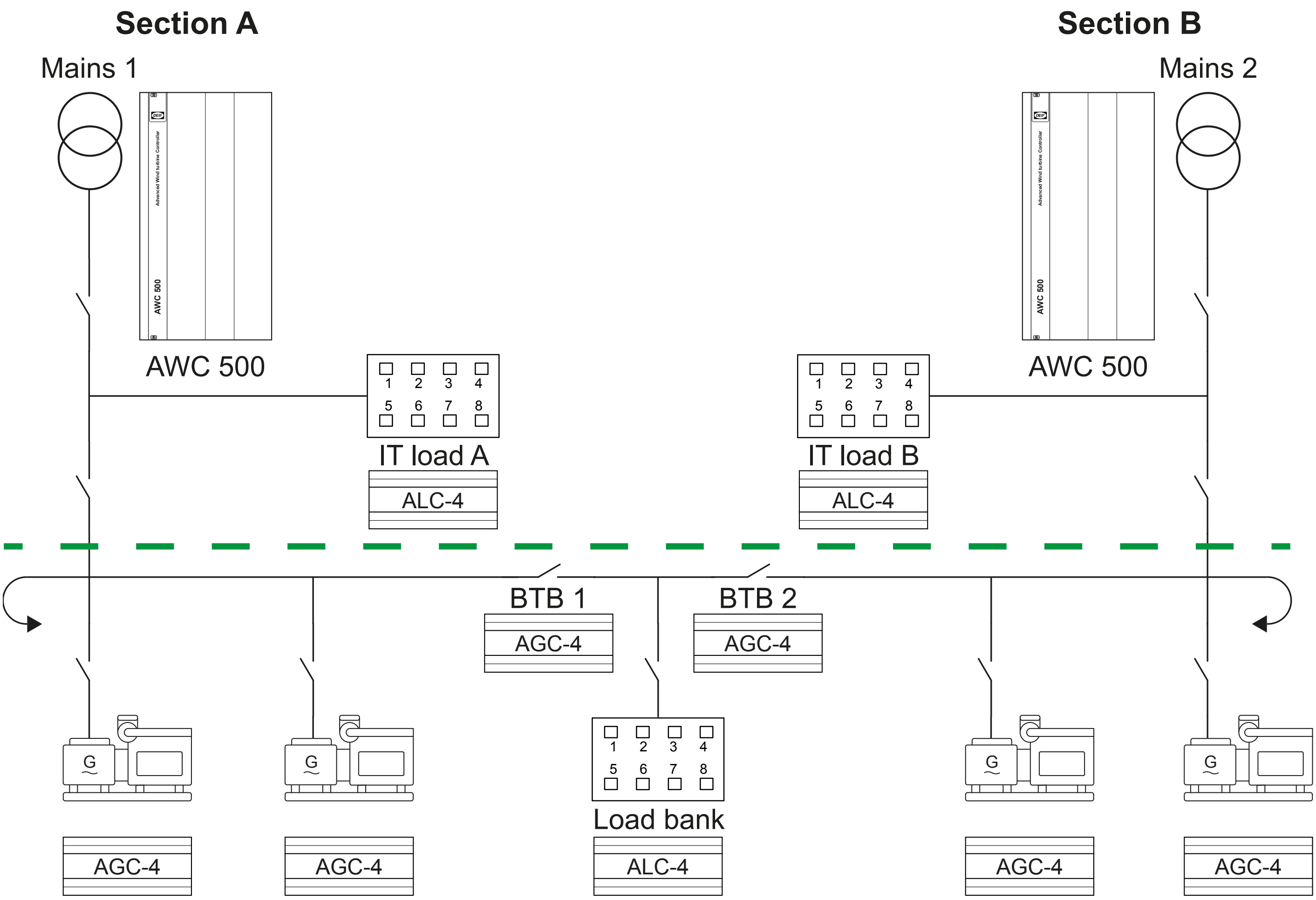


3. DEIF's power management solution

3.1 Overview

DEIF can supply the power management components required to ensure the 2N data centre architecture requirements are met. The power management system for 2N architecture typically consists of two AWC 500 controllers, and the required number of AGC-4 and ALC-4 controllers for the system's needs.

Figure 3.1 Example of a DEIF power management system for 2N architecture



3.1.1 AWC 500 roles

The AWC 500 is the link between the building management system (BMS) and the emergency power system.

The AWC 500 controls the mains power supply and the associated breakers and tie breakers. In the event of a Mains failure the AWC 500 ensures that the emergency power is routed to the IT load. In the event of mains and emergency power failure, the AWC 500 controllers communicate with each other to supply power to the IT load from the working section.

Normally the mains and emergency power are not allowed to run in parallel.

3.1.2 AGC-4 PMS roles

The power supply to the generator ring busbar is controlled by the AGC-4 power management system (PMS). This system can consist of multiple AGC-4 genset controllers, AGC-4 bus tie breaker controllers, and an ALC-4 load controller.

In the event of a mains power failure, the PMS ensures that gensets are started and ready to take over the IT load. Genset load can be shared across the sections if it is required by the system through the use of intelligent bus tie breakers controlled by AGC-4 bus tie breaker controllers.

The AGC-4 PMS supports *Close before excitation (black bus sync.)* feature. Generators with *Close before excitation (black bus sync.)* enabled can deliver power to the load within a short time (< 10 s). *Secure mode (N+1)* always ensures that there is one more genset running than required by the load. *Short circuit limitation* can be used to set a busbar power limit in the system.

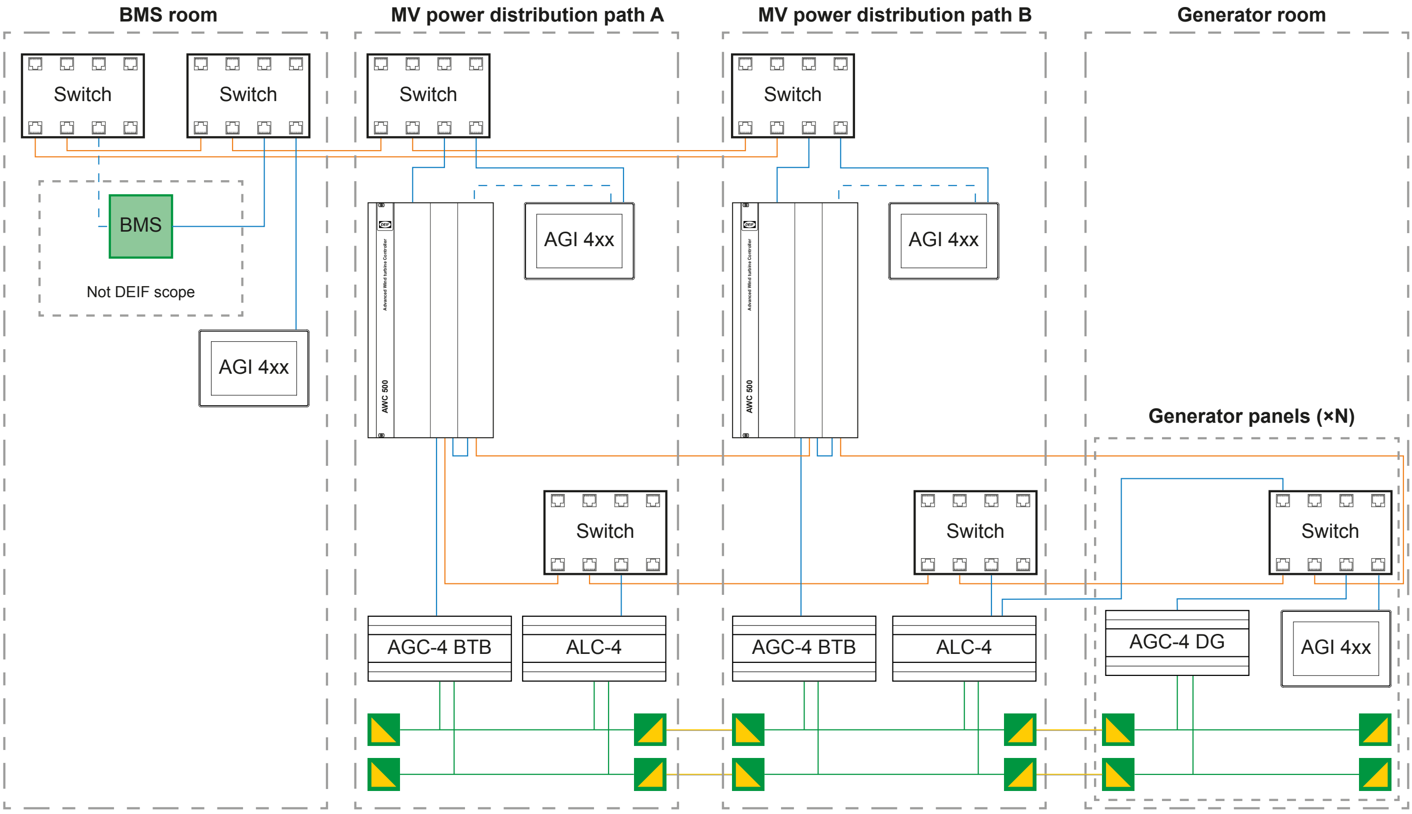
If a load bank is available to test generators, it can be integrated into the AGC-4 power management system using an ALC-4 controller.

3.2 Hardware and communication redundancy

To satisfy the 2N data centre architecture requirements DEIF recommends to install identical hardware systems for every power distribution path.

A typical hardware configuration for a single power distribution path consists of an AWC 500, AGI 4xx, AGC-4 Bus tie breaker controller and ALC-4 controller. The AWC 500 manages communication between the building management system (BMS), the different power distribution paths and the generator room. The AWC 500 also manages the mains breaker and tie breaker states. The AGI 4xx product series are touch screens that provide the HMI interface to the controllers. The AGC-4 Bus tie breaker controller manages the breaker state between the generator ring busbar sections. The ALC-4 controller manages the load requirements for the IT loads.

Figure 3.2 Example of network communication for a 2N system



Line	Colour	Notes
	Orange	Fast Ethernet (100Base FX, fibre optic)
	Blue	Fast Ethernet (100Base TX, twisted pair)
	Green	CANbus (electrical)
	Yellow	CANbus (fibre optic)

The DEIF hardware components separate the system into three network communication layers.

First communication layer

An Ethernet ring network sends and receives data between the BMS room and the MV power distribution sections of the system. This communication layer provides the gateway between the DEIF hardware and the BMS room.

Second communication layer

An Ethernet ring network is used to send start and stop commands to the generators in the generator room. The AWC 500 monitors the status and alarm messages from the AGC power management system (PMS). The information is then sent to the BMS through the first communication layer.

Third communication layer

Redundant CANbus A and CANbus B networks are used as the communication backbone for the AGC PMS. This communication layer sends status and alarm messages between the genset controllers, bus tie breaker controllers and load controllers. To secure fast communication over long distances between different sections in the system, an optic fibre converter for CANbus communication is used.

3.3 System hardware example

In the communication redundancy example, the following DEIF hardware was used to build the system:

Table 3.1 Hardware requirement example

Product	Amount	Notes
AWC 500	2	
AGI 4xx	9	This can be a combination of AGI 407, AGI 410, AGI 415 and AGI 421.
AGC-4 BTB	2	
AGC-4 DG	6	
ALC-4	2 (3)	Three ALC-4 controllers are required if there is an extra loadbank for testing and maintenance.

4. Additional information

For more information about specific products or how DEIF can provide a control solution for your project, please contact:

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