Dagostino Electronic Services, Inc.

PREFERRED TECHNOLOGY PROVIDER OF THE **PITTSBURGH STEELERS**

Overview: Fault Managed Power Systems

National Electrical Code (NEC) Releases New Class 4 Fault-Managed Power Category

The National Electrical Code (NEC) is widely regarded as the authoritative standard for safe electrical practices. The code is published and updated every three years by the National Fire Protection Association (NFPA).

Over its 100-plus years of existence, the NEC has defined three classes of electrical power, with each representing a distinct characteristic of a circuit's voltage threshold. In its most recent update, the NFPA has added a new circuit classification: **Class 4 Power**. This distinct category, also referred to as **fault-managed power systems (FMPS)**, is drafted for inclusion in **Article 726** of the 2023 edition of the code.

What is Class 4 Power? And Why Now?

How is Class 4 power distinctly different to the prior classes? What prompted the addition? And why is DES, a low-voltage data communications solution provider, so excited about this development?!

The three classes of electrical power are defined as follows:

- **Class 1 power** is a high voltage circuit with a limit of 600V of power. It must be handled by certified electricians and carries a risk of fire or electrical shock.
- **Class 2 power** is your classic low voltage circuit – think about a laptop, portable fan or doorbell. Voltage is limited and typically much lower, running at around 24V, plus power is capped at 100W. The low power makes this class of wiring safe to handle and poses minimal fire hazard.

- **Class 3 power** is relatively niche. It can handle up to 300V and can cause electrical shock. Because of its additional safeguards, it is not a fire hazard. You see this type of wiring in public address systems or central fire and security systems.

Class 4 wiring can carry up to 450V – that's a 300% increase from Class 2 wiring. Yet, its safety profile resembles Class 2 wiring: It is both safe to handle and poses minimal fire hazard. This unique blend of power and safety is the result of an innovative electrical transmission system, and that's why it has earned its own classification.

As you may remember from grade school, a traditional circuit includes a circuit breaker that disables the circuit when it detects that the circuit is attempting to draw more current than it should. While this safety mechanism is acceptable in low power situations, once you get to higher power levels, the shutdown simply isn't instantaneous and can still cause severe electrical shock with human contact.

Class 4 power is defined by a continuous **fault management system**. One way of achieving this is through **packetized energy transfer**. Each unit of power is packetized and transmitted over a data cable. The result is a steady stream of hundreds of packets per second that is continuously monitoring for faults. If the

transmitter detects a fault, such as improper wiring, a short circuit, or an obstruction, it halts transmission within a fraction of a second! There is no risk of serious shock. In fact, the author of this article touched a live Class 4 wire, and it felt like a pinprick!

To give you a sense of Class 4 power capabilities, the circuit can run 2,000W over the length of a football field, or else, 100W for over 1.2 miles. Once you consider the safety profile, then many applications come to mind. Any large venue, like stadiums, factories, airports, campuses, can benefit from the ability to manage their low voltage circuitry in-house. Additionally, any venue with many dense wireless applications could also benefit, since all those endpoints are backed up on a single UPS, saving you valuable space in your building.

By now, you can probably infer the connection between Class 4 power and DES. Aside from expanding our ability to work on higher voltage systems, Class 4 power plays nice with Power over Ethernet applications. Recently, Belden started offering a hybrid copper-fiber cable which bundles the fault-managed power system with structured cabling.

VoltServer and DES

VoltServer is the mastermind and pioneer of packetized energy transfer. Founded in 2011, their patented **Digital Electricity™** platform has won numerous industry awards, and is deployed in big-name venues such as the Los Angeles Convention Center, Amtrak Headquarters, Navy Pier, and closer to home, Acrisure Stadium (formally Heinz Field).

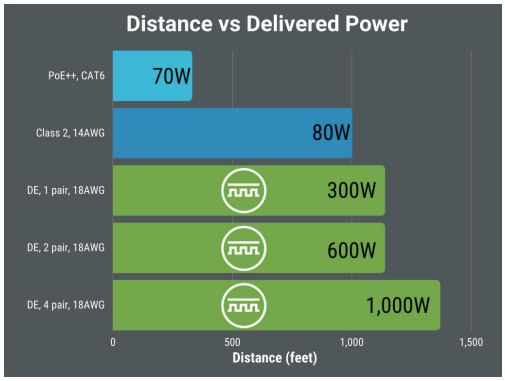

Image source: VoltServer

The Digital Electricity™ platform supports both AC and DC loads, first levelling the power to a DC stream during the packetized transmission, and then at the receiving end, transforming the energy to the requirements of the output destination. The networked system allows for offsite visibility and control of the power system.

More so, VoltServer was instrumental in getting the technology codified in the NEC. "It will speed adoption and drive the development of more DC-powered devices," commented Luke Getto, VoltServer product development manager. He sees plenty of potential for devices like EV chargers, network switches, and large digital displays to integrate fault-managed power receivers and directly connect to a Class 4 power circuit.

DES is a partner with VoltServer and looks forward to deploying Class 4 power across the region.

Summary and Best-Fit Cases for Class 4 Power

To summarize, the new Class 4 power category enables the electrical code to keep on pace with innovation. With the ability to safely transfer higher loads across significant distances, fault managed power systems are a best-fit solution for the following scenarios:

- **Expansive venues:** Manufacturing facilities, hi-rise buildings, college campuses, stadiums
- **Hi-density Wi-Fi venues:** Facilities with many IoT devices, PoE switches, small cell devices, indoor and outdoor Distributed Antenna Systems (DAS).
- **Indoor agriculture facilities:** The drivers are located in a centralized, climate-controlled environment away from humidity which translates to longer fixture life.

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