

“Mission Critical Power – What and How

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Agenda

- **Introduction**
- **Mission Critical Areas**
- **Threats**
- **System Elements**
- **System Architecture**
- **Data Centers as an Example**

“Mission Critical Power” – What and How

- Mission-critical operations demand assurance of 24/7 uninterrupted power availability. Mission critical power systems are highly designed to be fault-tolerant with increased reliability and monitoring functions to maintain facility uptime in the event of a utility outage, an internal fault, or scheduled maintenance.

What is “Mission Critical”?

Mission critical refers to any factor of a system (equipment, process, procedure, software, etc.) whose failure will result in the failure of business operations.

That is, it is critical to the organization's "mission." As a rule in disaster management, if a triage-type decision is made in which certain elements must be eliminated or delayed, e.g. because of constraints, the mission critical ones are excluded from consideration.

Mission Critical systems have four attributes: availability, reliability, performance and security

Where is Mission Critical?

Types of Mission Critical Facilities

Private - Business Continuity

- Business Enterprise Data Centers
- Financial Data Centers and Trading
- Internet Companies



Public Safety

- Emergency Call Centers
- Police & Fire Stations
- Hospitals
- National Security



CFE Media™



← **Telecom**

**Aerospace
Military** →



What is “Mission Critical”?

- **What is the Need?**
 - **Availability**
 - **System MUST function when needed**

 - **Reliability**
 - **System must be resilient if not immune to failure**
 - **If failure does occur, recovery must be fast**

 - **Security**
 - **System must be protected against detrimental influence**
 - **Human**
 - **Natural**

What is “Mission Critical”?

- What is the threat?
 - Natural Disasters
 - Weather
 - Earthquake
 - Flood
 - Fire
 - Improper Maintenance
 - Equipment Failure
 - Human Error
 - Terrorism



What is “Mission Critical”?

- There's no such thing as "set and forget" power protection for mission-critical networks. To be sure, every component of your power protection system is reliable...you wouldn't have it any other way. But how those components work together -- and how power protection grows with your network, and how well the equipment is maintained -- all have an impact on the degree to which you are protected.

What is “Mission Critical”?

- The Elements of Mission Critical Systems
 - Payload Hardware and Software
 - Server Systems
 - Data Switches
 - Control actuators
 - Infrastructure Hardware and Software
 - Power Generation
 - Power Conversion and Management
 - Energy Collection and Storage
 - Power Distribution
 - Heating and Cooling

Mission Critical Power

Power Generation

Power Conversion and Management

Energy Collection and Storage

Power Distribution

Thermal Management



**Monitor, Control,
& Maintenance**

Mission Critical Power

- Power Conversion and Management
 - AC/AC
 - AC/DC
 - DC/DC
 - DC/AC
 - Asset Management – can extend to other assets-DCIM for example

Mission Critical Power

● Energy Collection and Storage

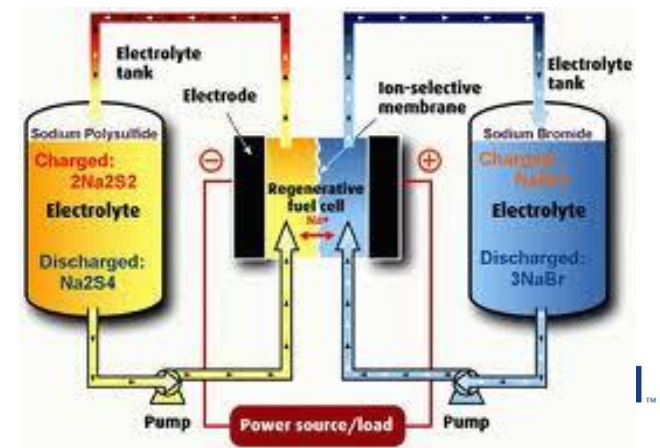
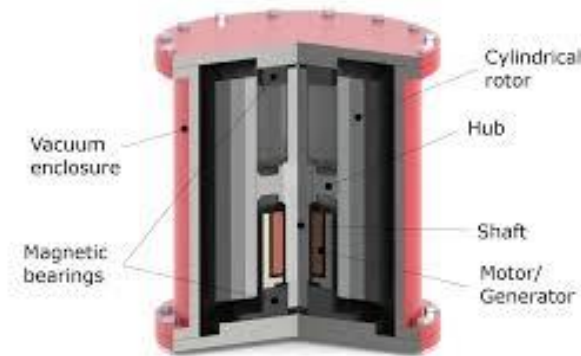
– Battery

- Lead Acid
- Lithium
- Sodium
- Zinc

– Flywheel

– Super-Cap

– Flow Battery



Mission Critical Power

- Power Distribution
 - AC
 - DC
 - Centralized
 - Distributed
 - Transfer Switches
 - PDUs
 - Electro-mechanical
 - Solid State



Mission Critical Power

- Thermal Management
 - Natural Convection
 - Forced Air
 - Fluid
 - Heat Pump
 - Immersion
 - Conduction
 - “Free” Air

Mission Critical Power

- Mission Critical Power
 - Uses some or all of the listed elements, coupled with a power architecture design approach to yield:

Availability

Reliability

Security

Mission Critical Power

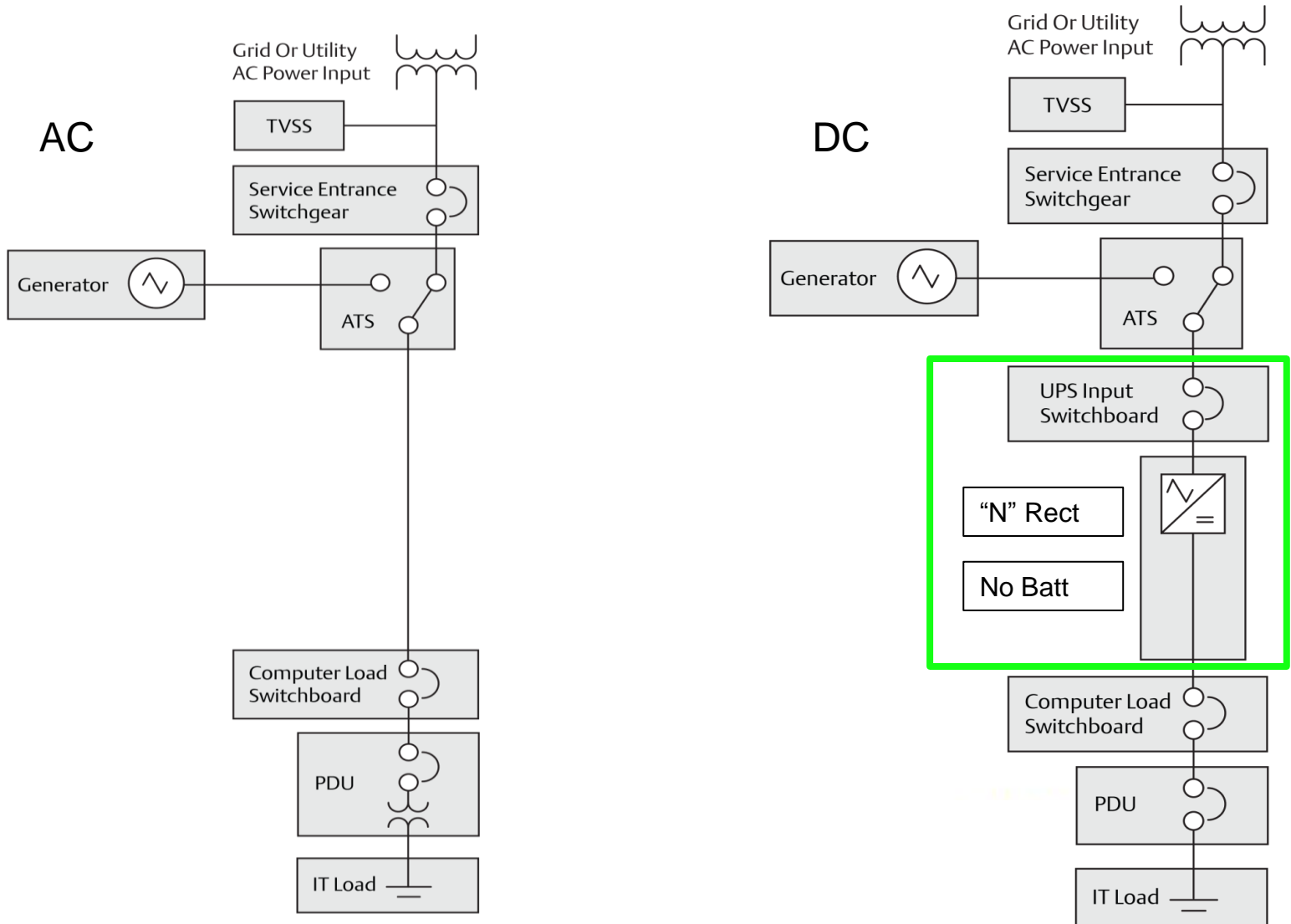
- Architectures
 - Single power chain
 - Single power chain with Energy back-up
 - Single power chain with Parallel Elements (N+N)
 - Single power chain by-pass capability
 - Multiple Power chain systems

Mission Critical Power

Data Centers as Examples

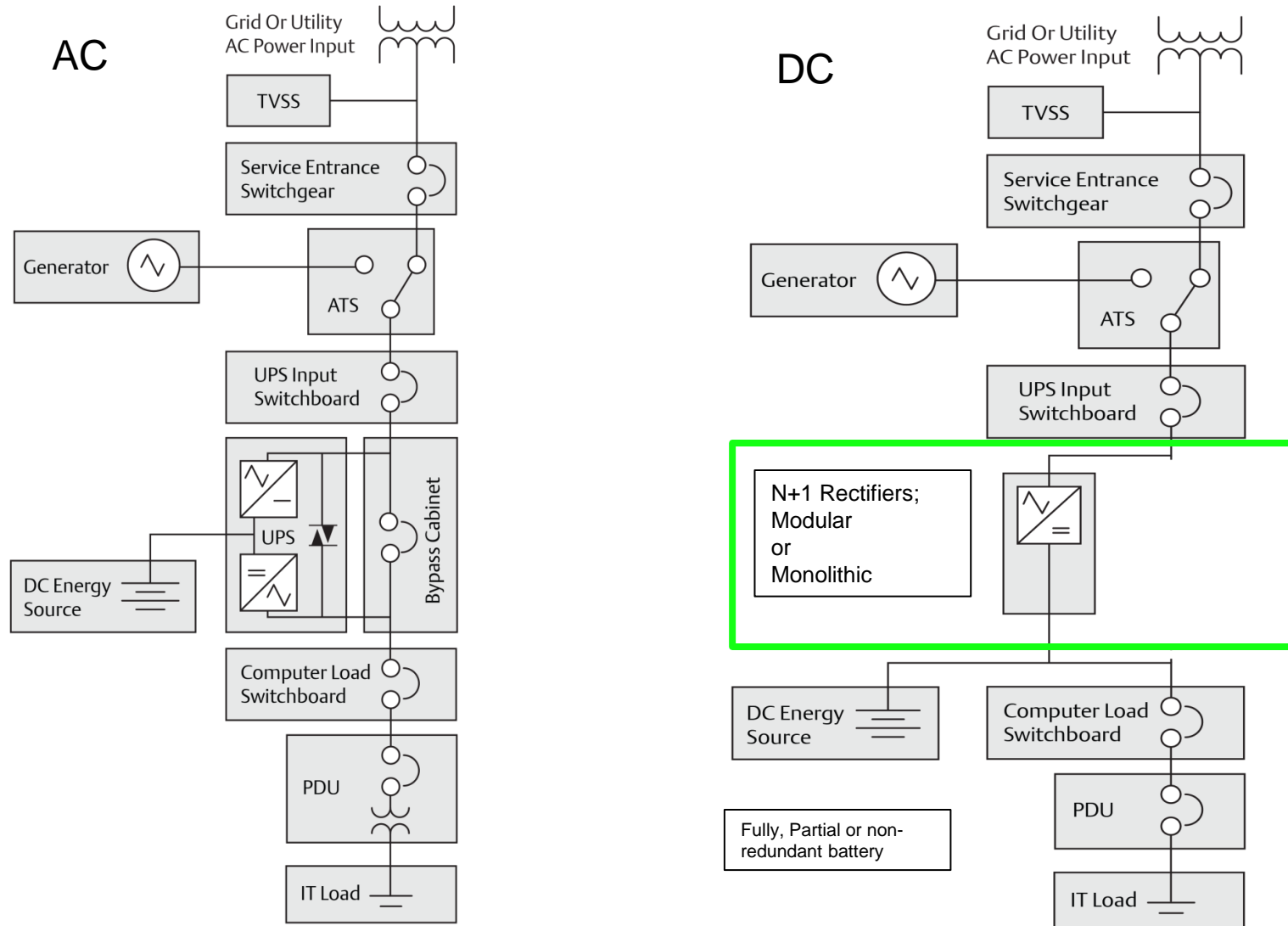
Class F0 Basic Data Center

Class F0 – Single Path; No UPS



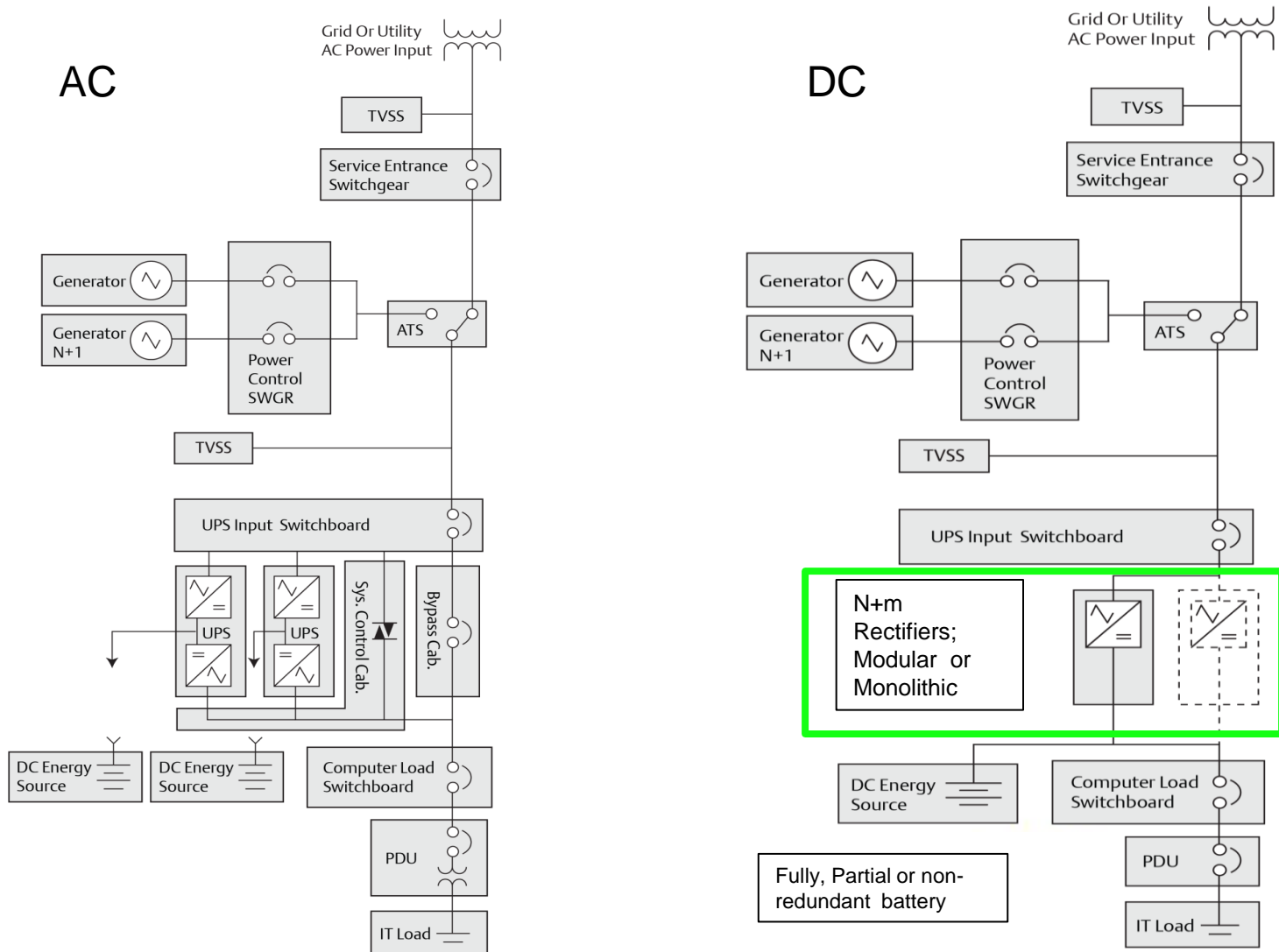
Class F1 Basic Data Center

Class F1 – Single Path with UPS



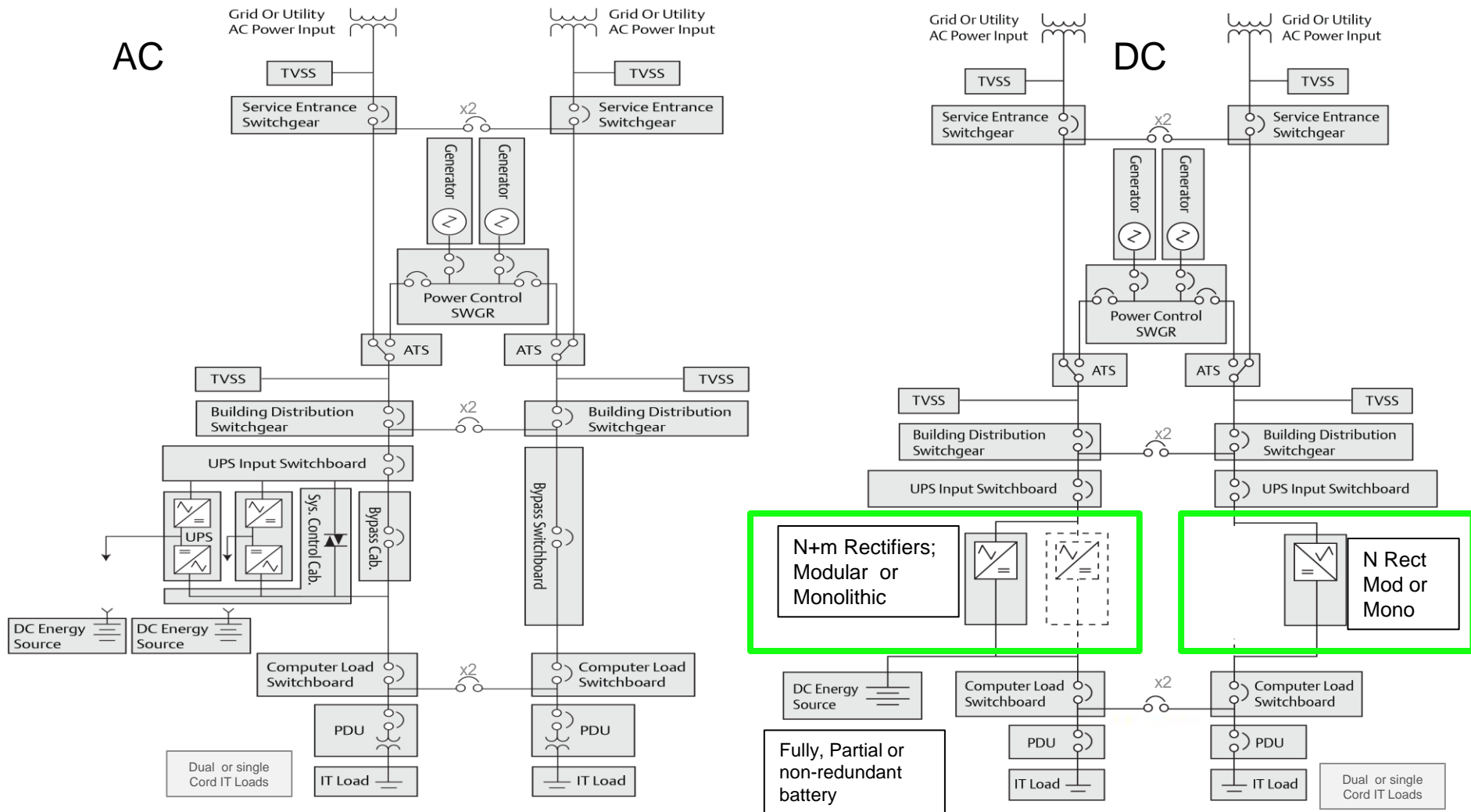
Class F2 Redundant Components

Class F2 – Single Path UPS with Redundant Components



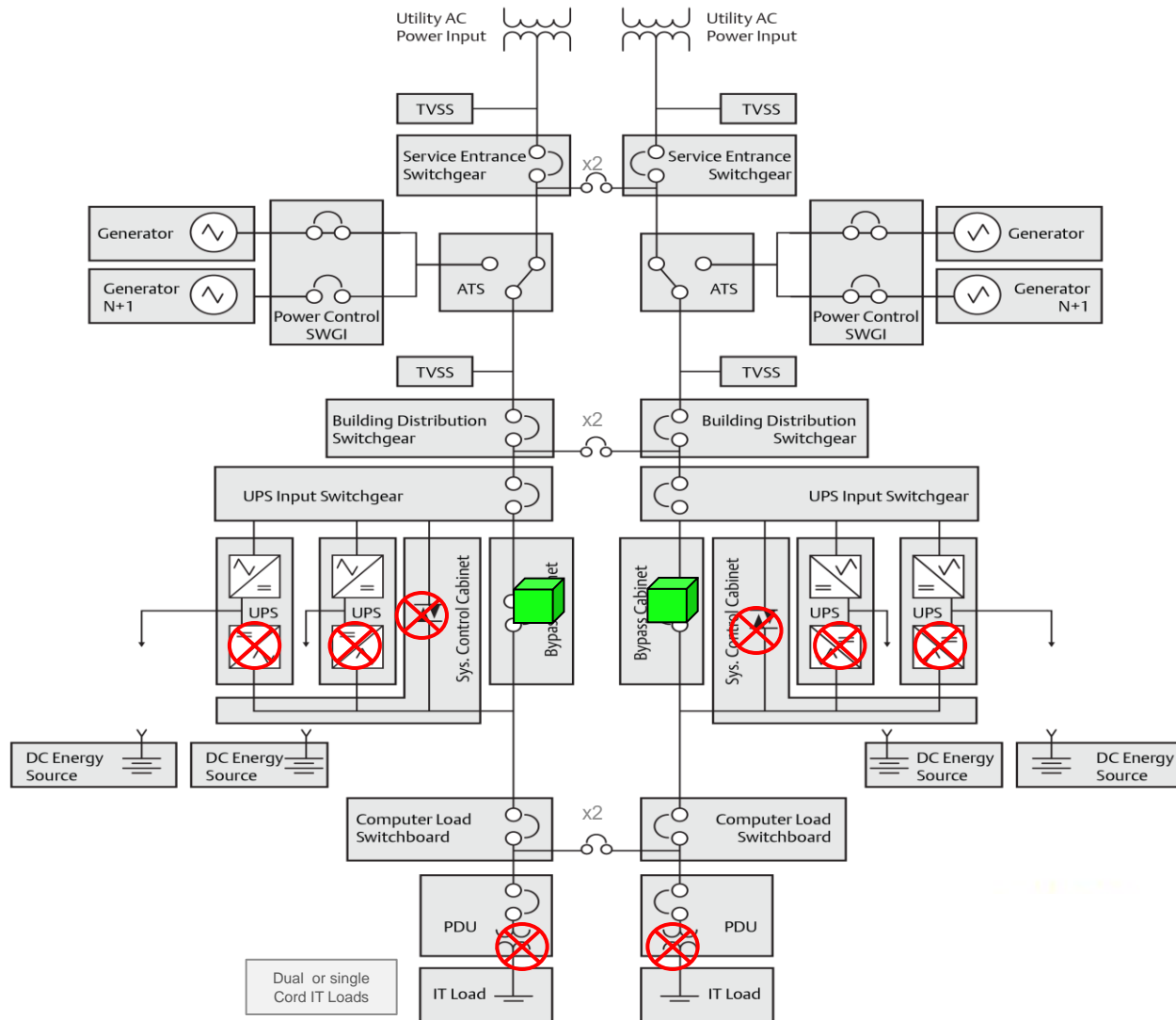
Class F3 Concurrently Maintainable

Class F3 – Dual Path; Concurrently Maintainable



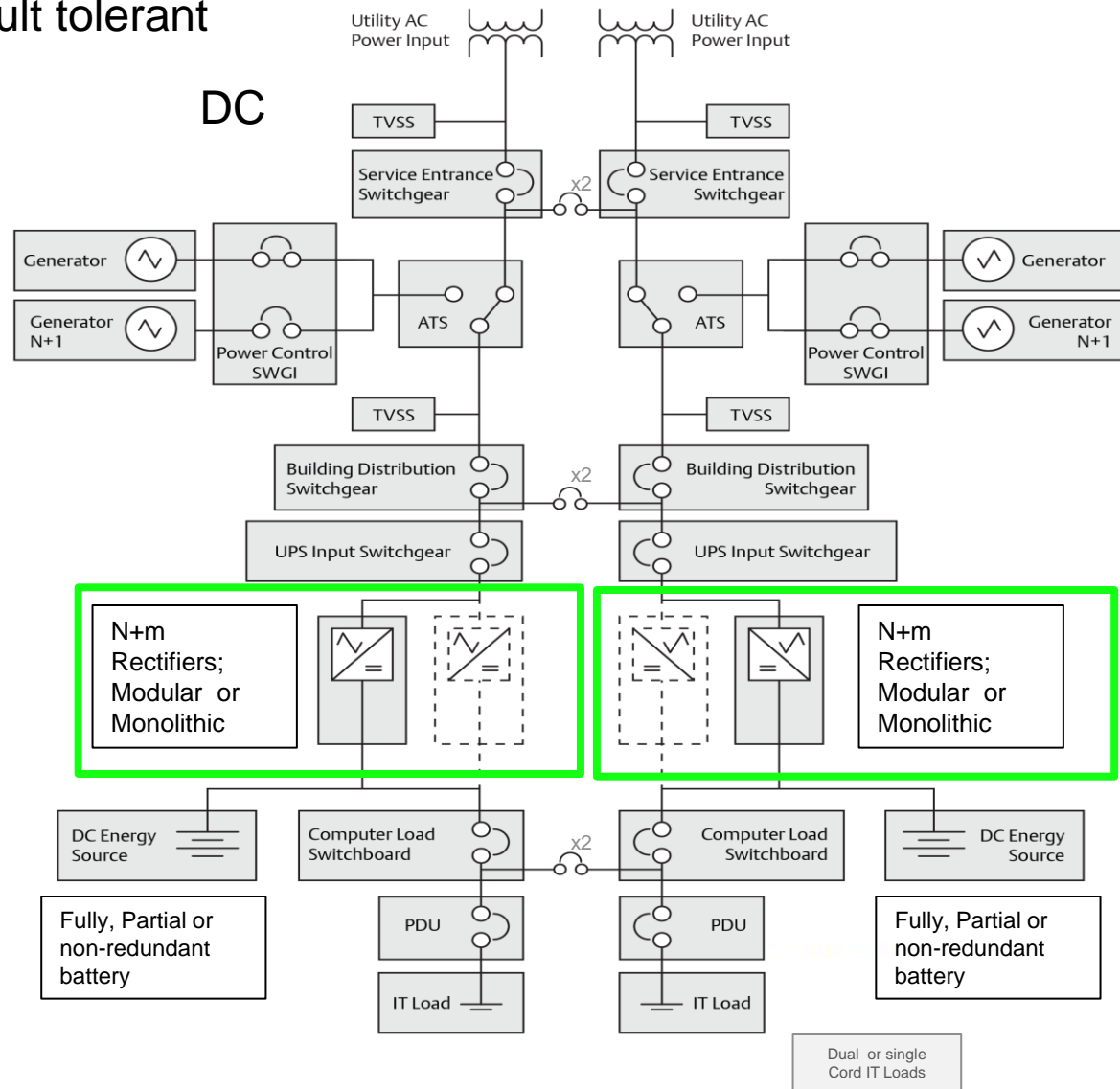
Class F4 Fault Tolerant

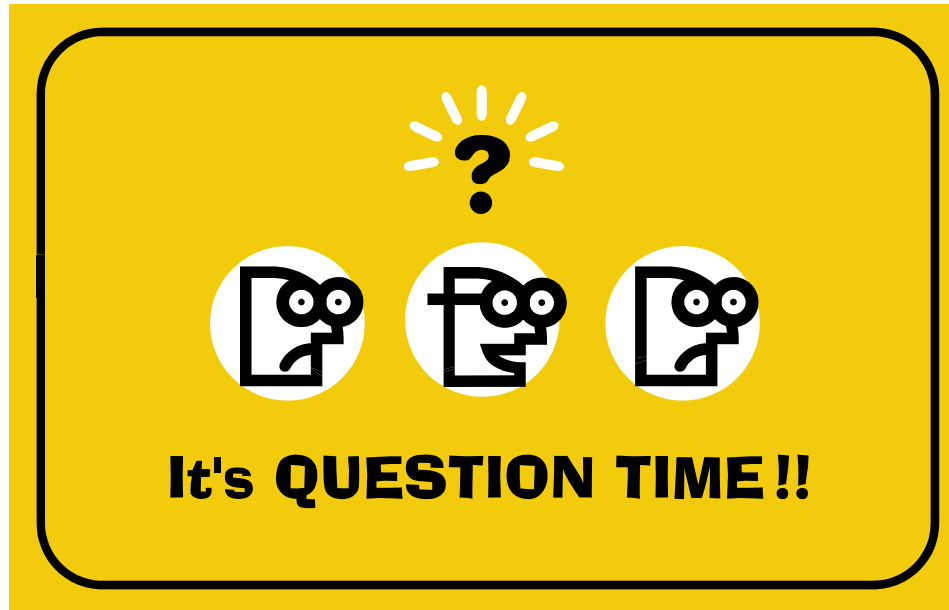
Class F4 – Dual Path; Fault tolerant



Class F4 Fault Tolerant

Class F4 – Dual Path; Fault tolerant





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