

## Data Centers

## Power Quality Solutions

### Ultimate Stability in Data Center Electrical Networks

#### Features

- ✓ 24/7 Electrical Network Protection
- ✓ Real Time Power Correction
- ✓ Predictive Failure Analytics
- ✓ Advanced Whole Facility Metering

#### Benefits

- ✓ Increased energy density
- ✓ Electrical network stability and reliability
- ✓ Heat reduction through electrical efficiency
- ✓ Ground current elimination
- ✓ Equipment noise elimination
- ✓ Automatic Phase Balancing
- ✓ Dynamic impedance matching for all power sources

A data center electrical network is demanding and dynamic. It contains thousands of power sensitive loads with electricity needs that shift at sub-cycle intervals. Efficiently acquiring sub-cycle data and simultaneously managing a complex real time electrical network is a task that has historically required many different power electronics and sensors from multiple manufacturers that are large and inefficient. Now, everything needed to perfectly manage complex data center electrical network is available from one company in one simple solution.

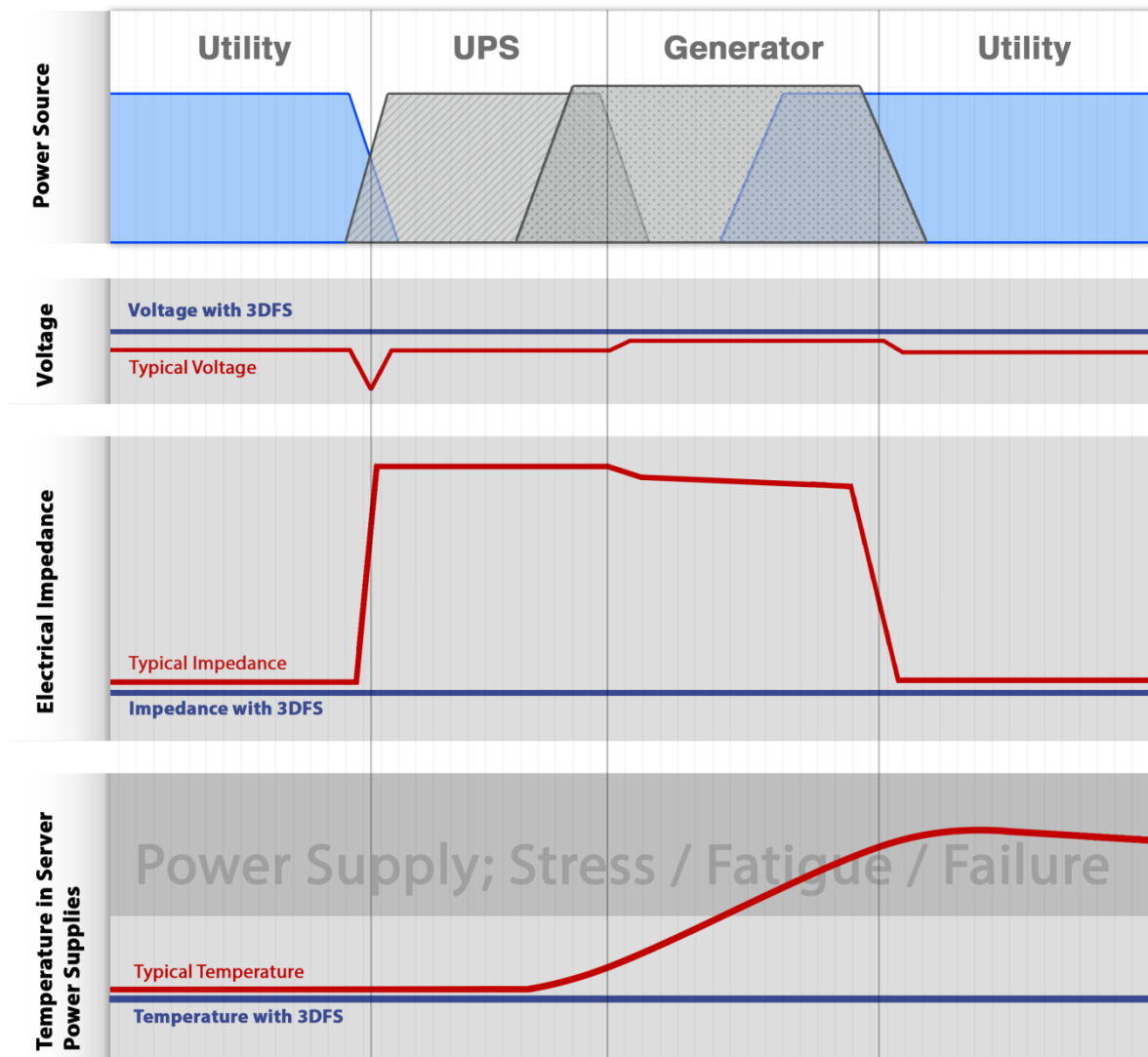
The 3DFS Power Controller Solution provides ideal electrical network quality of service. It optimizes electricity for maximum energy density and instantaneously responds to the network by precisely matching electricity demands at the sub-cycle level for near ideal electrical efficiency.

This real time correction solution ensures optimum electrical network stability with the best power quality possible.

Data centers have advanced power systems in place to sustain service disruption. Uninterruptible Power Supply (UPS) rapidly respond to supply spot power and rely on power from generators to provide long term power. Switching between Utility Power and UPS, Generators and back to Utility Power is a complex process introducing a wide range of impedance changes, in addition to excessive Harmonics as a result of voltage spikes.

Transitions between power sources is when electrical network demand and supply drastically shifts and the energy source impedance affects load performance. The 3DFS Solution keeps Impedance and Power Factor near unity, removes Harmonics and balances phases in real time.

## Data Center Electricity Service Disruption Event



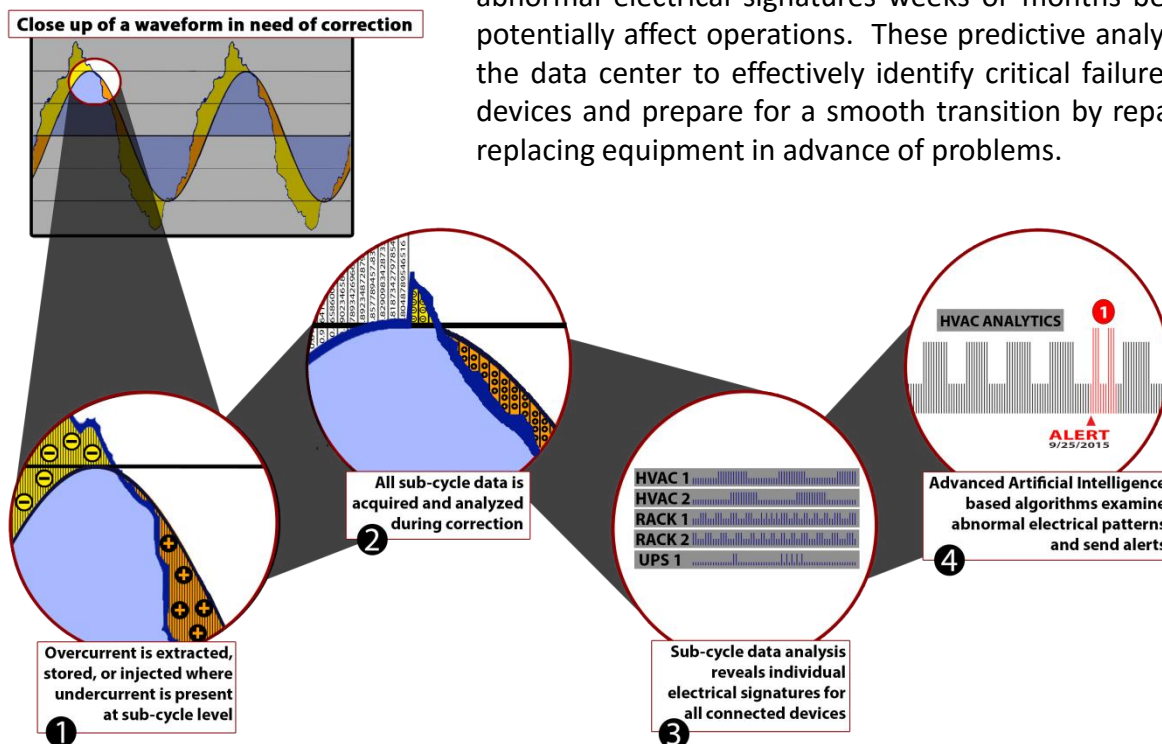
Abrupt and wide impedance changes during transition is common, due to the different nature of power conversions. UPSs generate excessive THD, while higher Impedance ( $Z$ ) is determined by DC/AC conversion circuit. Generators Impedance fluctuates and depends on output voltage, frequency, and load factor, while generating excessive PF which is impossible to control with simple measures. Utilities demonstrate almost zero Impedance almost all time because of the incredible quantity of generators connected in parallel, however it never stays at the same level. This becomes an issue, particularly when returning from local to Utility power, because server power supply components are hot and have low internal resistance which results in catastrophic power supplies failure.

**3DFS Solution** provides real-time correction of Harmonics (THD), Power Factor (PF), Phase balancing, elimination of Neutral wire and Grounding current, and provides precision real-time Impedance match close to theoretical limit.

## The 3DFS Solution gives real time usage and predictive failure analytics for the electrical network.

As the electricity is corrected, all of the sub-cycle data is analyzed to identify the individual electrical signatures of every device connected to the electrical network. Over time, historical sub-cycle signature profiles are analyzed and reveal detailed electrical performance patterns.

Advanced, Artificial Intelligence based algorithms detect abnormal electrical signatures weeks or months before they potentially affect operations. These predictive analytics allow the data center to effectively identify critical failures of their devices and prepare for a smooth transition by repairing and replacing equipment in advance of problems.



CONTINUOUS IDEAL  
IMPEDANCE MATCHING  
IN REAL-TIME



IDEAL ELECTRICAL  
NETWORK QUALITY OF  
SERVICE



INFRASTRUCTURE  
PREDICTIVE ANALYTICS  
AND PROFILES



SEAMLESS SERVICE  
WHEN SWITCHING  
POWER SOURCE

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