# XECO Solution Overview

Xeco Energy is a fully integrated energy management and power quality company with over twenty years of research and field testing on its patented products. Xeco's solution is revolutionary in that it has ***applied radio frequency engineering principles to control the frequency of power on the wires of an electrical distribution network.***

Xeco's patented technology maintains the flow of current at 50 or 60Hz on every circuit between a building's main switch gear and consumption point itself. The effect of this is a 10-20% reduction in energy consumed by devices receiving electrical current in its purest form without distortion or degradation from harmonics.

Xeco's platform samples and evaluates the line impedance conditions at a rate of 20,000 times a second and dynamically adjusts the narrow band tuning and dynamic harmonic filtering to the conditions. This creates improved resistance levels (impedance) and reduced reactive power levels and kVA consumption for all inductive loads. This solution is an integration of patented technology fully integrated into an information reporting system that provides access to 'real-time' power consumption and Total Harmonic Distortion "THD" data at the circuit level.

It's installed base has evolved from small to midsize commercial facilities to large complex industrial facilities with installations in the U.S., Mexico, China, Belgium, and the Netherlands for such customers as Rubbermaid, Flextronic, Novant Medical Systems, Toyota, HCA/Health Trust, Indorama and the Dallas Cowboys.

All products are manufactured by Xeco and are ETL and/or UL and CE Listed.

Xeco's Historical Deployment:

- *1,062 units in 105 buildings on 3 continents*
- *± 9.66% average annual savings*
- *± $26,579,000 cumulative savings value*
- *± 45,755,000 operational hours*
- *± 1,906,000 operational days*
- *± 5,200 operational years*

**System Components**

- **XECO Line Filter**
  - The proprietary 50 and 60 hertz line filter is used for narrow band tuning the SUPPLY harmonic levels. The additional waste then gets shunted to earth ground of the electrical network and the main transformers neutral line using the XECO Power Filter.

- **XECO Power Filter**
  - The XECO Power Filter is a software controlled to shunt up to 51 levels of upstream harmonics to earth ground by up to 95%. The XECO Power Filter automatically adjust its filtering capabilities based on the current load and will adjust up or down in order to not add additional load to the electrical network.

- **XECO Switch Gear Booster**
  - The proprietary switch gear booster is specifically designed to manage and stabilize voltage while also having the ability to increase power factor levels to 98% and above reducing the need for additional kVAR like traditional capacitor banks and other legacy electrical solutions.
- **Radio Controls/3-Phase Power Meter/Gateway/Hardened Server Appliance**
  - Each XECO component includes a radio control device for managing the on and off controls for performance and validation purposes. A 3-phase power quality meter with a wireless data link for collecting real-time data to measure the results in real time, to allow for additional electrical network tuning under load is also incorporated into the deployment when necessary. Wireless gateways sync data to a hardened server appliance which is used for storing historical data with real-time EM and V tracking for proof positive savings through full scale reporting functions.

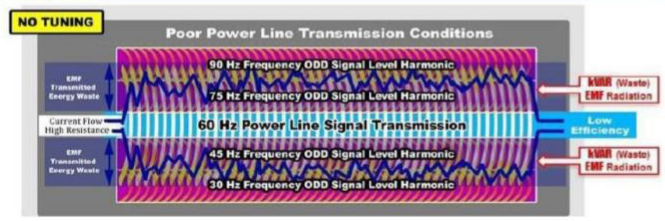
**Xeco Power Quality and Current Balancing System**

- Problem Solved
  - Every building experiences loss of energy efficiency as power moves through its distribution system. Elements of the building system (air handlers/water pumps/HVAC systems/compressors) along with the systems that support a building's functional use (refrigeration, elevators, servers, kitchens, production, distribution, IT systems etc.) all draw power at different amps/volts and on/off frequencies. Many of these systems have DC controls or inverters and variable frequency drives which compound the problem effectively creating "noise" which degrades the harmonic flow of energy.
  - Improving energy efficiency requires more than just Power Factor Correction which has been the historical approach with technologies like power capacitors. Power Capacitors are the most prevalent solution used to increase Power Factor Efficiency, but they don't address Demand-Side efficiency decreasing KW usage due to increasing voltages. Capacitor banks only service the MAIN to Transformer and add more resonance to the MAIN and cause equipment failures.
  - Capacitor banks improve the energy quality by adding kVAR to the electrical system effectively "adding load" to smooth out gaps in the flow of current and voltage.
  - Installation, maintenance, and replacement of capacitor banks also introduces operating risk to the electrical system as they bear live load.

## Addressing Harmonics within an Electrical System

XECO's technology optimizes the current flow within a building's electrical circuit resulting in measurable and sustained electricity consumption reduction

**Example of Poor Power Quality Conditions without XECO**




- Issues include higher kW consumption, higher kVAR, and higher level of heat

**Example of Superior Power Quality Conditions with XECO**


- Benefits include lower kW consumption, lower kVAR, and lower heat level

- Solution:
  - Xeco's advanced electricity management solution is designed to optimize the consumption of electricity through narrow band radio frequency tuning principles and software versus adding kVAR and load to an electrical system.
  - This provides for a reduction in kW and kWh consumption, elimination of harmonic distortion due to DC loads from VFD's, inverters, and other DC regulating equipment, and the stabilization of voltage across the electrical network.
  - Deployment of Xeco's technology will also result in a reduction in the temperature of the windings in inductive motors extending their useful life.
  - IEEE engineering study found harmonic currents alone increase operating temperatures of inductive motors by 39.20 to 42.80 degrees Fahrenheit.
  - Xeco's electrical current technology is passive and does not bear live load so it introduces no operating risks to the electrical system.

- The system is designed to literally be turned "on and off" via software to substantiate its impact anytime from a portal that the customer has access to.

- Because no components of the system bear live load it does not have the ability to interfere, disrupt or negatively affect the buildings electrical performance in any way.

- Customer Scoping Requirements:
  - Most recent 12 months of power bills and a one-line electrical diagram to identify circuit configuration.

- Implementation Time:
  - Building Inspection / Staff Interviews 1 Day
  - Calibration of Xeco Equipment 45 – 60 days
  - Implementation of system 1 to 2 weeks

- Impact:
  - 8 – 20%+ Reduction in Total Energy Consumption
  - Negate harmonics, impedance, resistance, and noise within power circuitry.
  - Lowers consumption, reduces heat from electrical motors and transformers extending useful life and reducing maintenance/repair costs

- How it Xeco Works Videos: Click for Video Link (best viewed on Chrome or other browsers other than Safari)

- Competitive Alternatives:
  - None and Xeco's system is fully patent protected.

  - All other solutions in market are derivatives of electrical engineering.

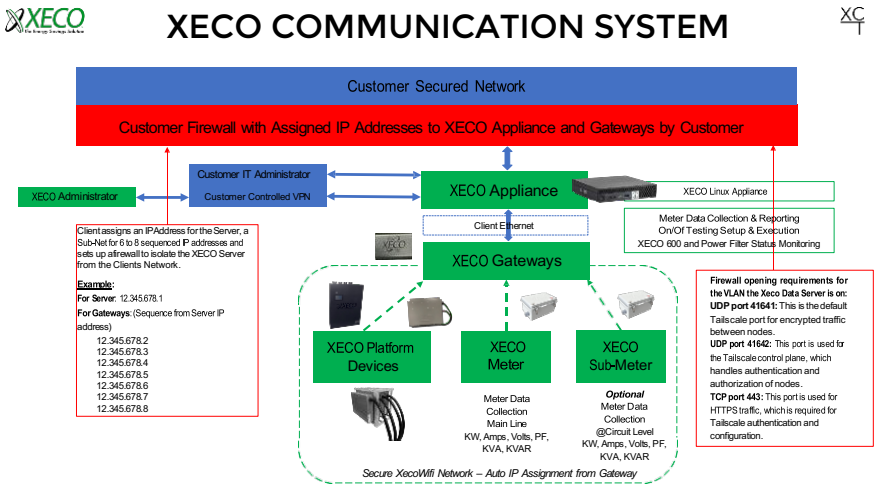
  - Schneider, ABB, Honeywell and Siemens have offer hundreds of SKU's in the traditional power capacitor category, load bearing power filters at fixed amps/frequencies but nothing like Xeco's patented solution.

  - Xeco is the only solution in the market that addresses all frequencies and harmonics via a software-controlled platform dynamically tuning everything from a singular narrow band RF based system.

  - In a recent RFP and POC process Schneider validated Xeco's impact via their M&V audit at a site where each company's technologies were deployed. Xeco reduced the total power load in that industrial site by 40+% while the customer maintained the same level of unit production.

| | Traditional Power Capacitor | XECO |
|---|---|---|
| Power Factor Improvement | 95% - 98% | 96% - 100% |
| Equipment Lifecycle | 3 Years | 15+ Years |
| kVAR Added to Lines | Yes | No |
| Maintenance Required | Yes | No |
| Hazard Level | High – Occasionally Blow Up | None – No Direct Load |
| kW Peak Savings | None | Yes 15 – 35% |
| Harmonic & Voltage Reductions | None | Yes 95% & (+/- 1 VAC) |
| Power Factor Cost Savings | +/- 35% | +/- 35% |
| Motor Heat Reduction and Life Expectancy Impact | None | ~30 degrees F and +50% Longer Life |
| Operational Installation Interference | Yes – System Shut Down Required | None |

- Common Questions & Answers:
    - ***What is minimal amount of data you need to provide a quote and scope?***
        - Utility Bill Month
        - kW Peak
        - Total kWh
        - Billing Days that Month
        - Bill Cost
        - Facility Voltage (480?)
        - Number of Meters on Bill
    - ***Does your platform/technology have any size or infrastructural limitations?***
        - Yes, we only serve devices that are served by 3-phase/600 volts or less.
    - ***Does the radio frequency used in tuning affect any other building equipment or network performance?***
        - Our signal is a carrier current signal that does not radiate as it parallels the energy signal in the opposite direction of its flow within the electrical circuits.
    - ***How much power does your APF consume?***
        - Between 75 to 90 amps depending on the configuration required to address harmonic presence.
    - ***What is the amp load capacity of your APF?***
        - The Xeco APF tunes in 100 amp increments and is fully cascadeable
    - ***Does your system require me to shut anything down for installation?***
        - Our system will use its own independent breakers (spare breakers where available) and will not connect to any equipment or motors. Our system is designed to be on the "line side" of equipment operating in the facility.
    - ***Do you require access to a customer's IT network?***
        - It is ideal but not imperative:
            - Plan A – Yes, Customer Network
                - We use a proprietary 2.4 gigahertz mesh software defined network that runs on top of 802.11 that ties our line conditioners, power filters and meters to our onsite control appliance via gateways.
                - Authentication to all devices is DOT1X
                - This appliance and the associated gateway access is firewalled by the customer with fixed IP addresses defined for data flow.
                - VPN access by XCT/Xeco is required to monitor performance, perform system updates/maintenance and billing. All customer security protocols will be followed.
                - Our system design and security protocols have been vetted and approved by the nation's largest telecommunication and health care provider for use in their environments.
                - Our system has also been installed in a Flex high-tech manufacturing environment with over 10,000 2.4 gigahertz bluetooth devices active with no interference.
            - Plan B – Industrial Hotspot or Starlink Service directly to Xeco/XCT from Onsite Appliance
                - No Customer Network Interface




- ***We have already invested in capacitor banks do we need your platform?***
  - Yes
  - Our platform uses Circuit Tuning and Power Filtering to optimize power quality and efficiency in a completely independent way.
  - Capacitor banks absorb and release power and require replacement every few years. Our system tunes and filters power without needing repairs or replacements for 15 years.
  - Capacitor banks only serve the network between the main switch gear and the transformer having no effect on the flow (supply) and use (demand) of energy within the building network.
  - Capacitor banks are focused on supplying additional (kVAR) into a network to improve power factor at the transformer – not within a building's electrical network/demand side.
  - There is no focus or effect on reducing the energy consumption of the infrastructure drawing power on the demand side of the network.

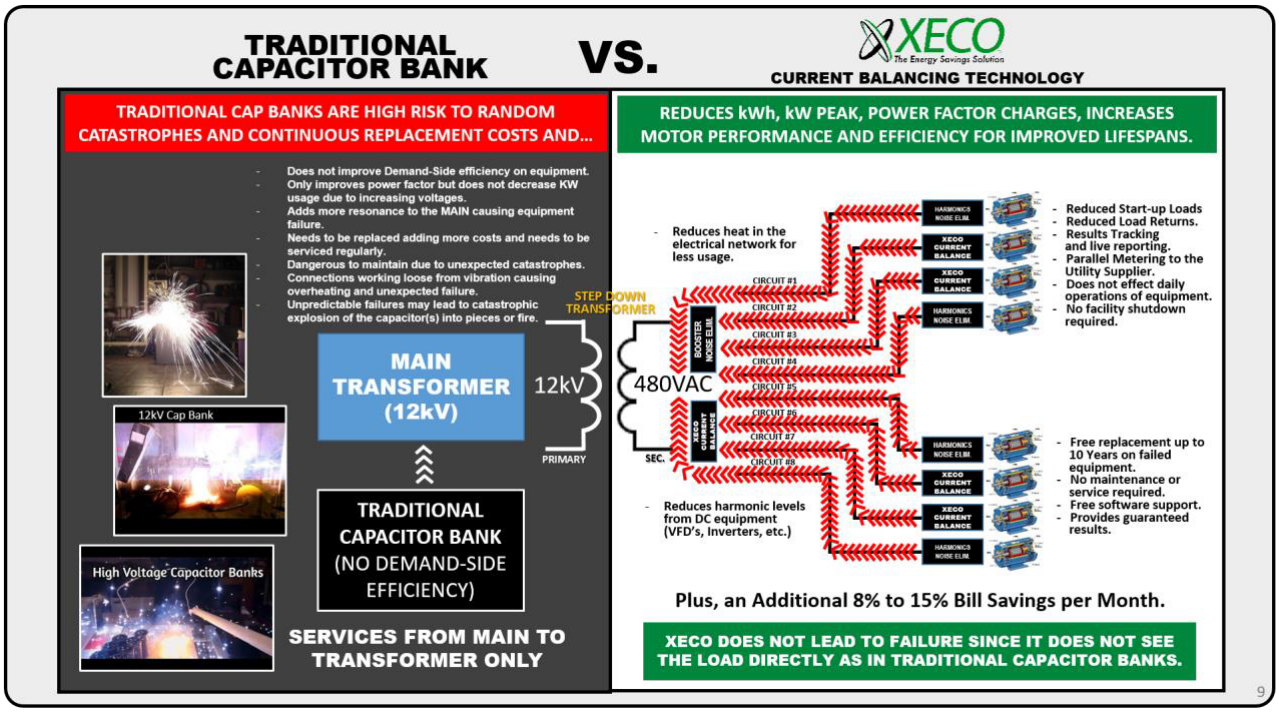
- ***We have already invested in harmonic filters why would we need your platform?***
  - Harmonic Filters address upstream harmonics but are specific to load and fixed frequencies they are designed for.
  - Harmonic filters are limited to capacity and draw a constant load associated with their target frequency.
  - When a motor is shut off that filter still draws its designed load.
  - Harmonic filters have no adjustability for the fluctuation in harmonic presence within the network as the components of the network change.
  - Our device is a "Power Filter" because it mitigates reactive distortion of 60 Hz while reducing the upstream harmonics. Our power filter adjusts to the load that the circuit is drawing substantially reducing up to 51 odd-level harmonics by sweeping them to the transformer's neutral and earth ground.
  - Our power filter reduces wasted energy in the form of 51 odd-level of harmonics the utility meter would otherwise record as consumption thereby reducing costs.
  - Further our power filter mitigates 51 odd-level of harmonics from recirculating within network compounding the frequency distortion of the energy supply.

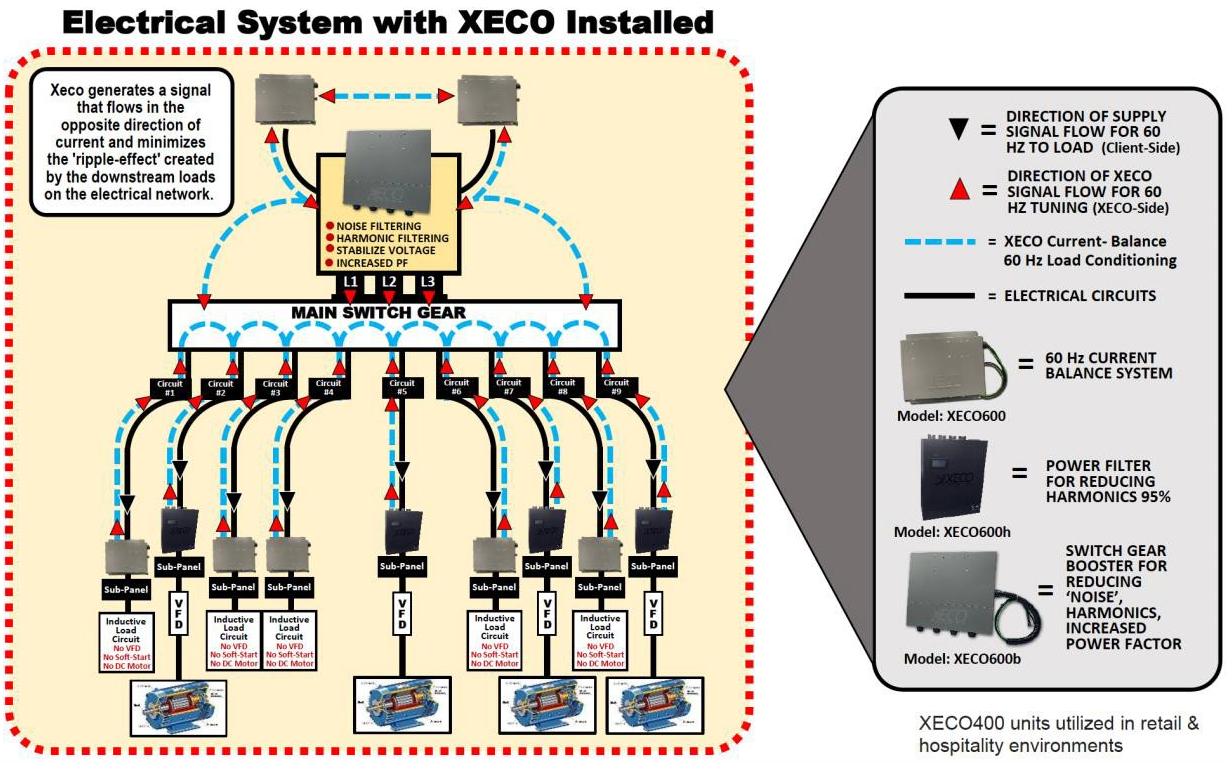
- ***How is Xeco different than power factor correction equipment?***
  - Improving power factor conditions is a Utility facing effort to demonstrate that the amount of power being supplied is consistent with the amount being utilized. This is done historically by capacitor banks which release energy in form of kVAR to smooth out fluctuations in usage to show a consistent relationship between

energy supply and consumption to the utility. Xeco's platform does yield a 99-100% "power factor" reading for the utility but it is achieving that by optimizing the flow, use and function of energy on the "demand side" of the network not the transformer or "supply side". By tuning the energy to 60Hz before a motor receives it and significantly reducing all upstream harmonics that flow out of the return side of the circuits the amount of energy consumed is aligned with actual need and wasted energy in form of harmonics eliminated. This reduces the amount of energy used within the demand side of the network and creates savings in form of reduced consumption which power factor correction equipment does not. The net effect of optimized power quality within the demand side provides for consistent draw and the highest power factor.

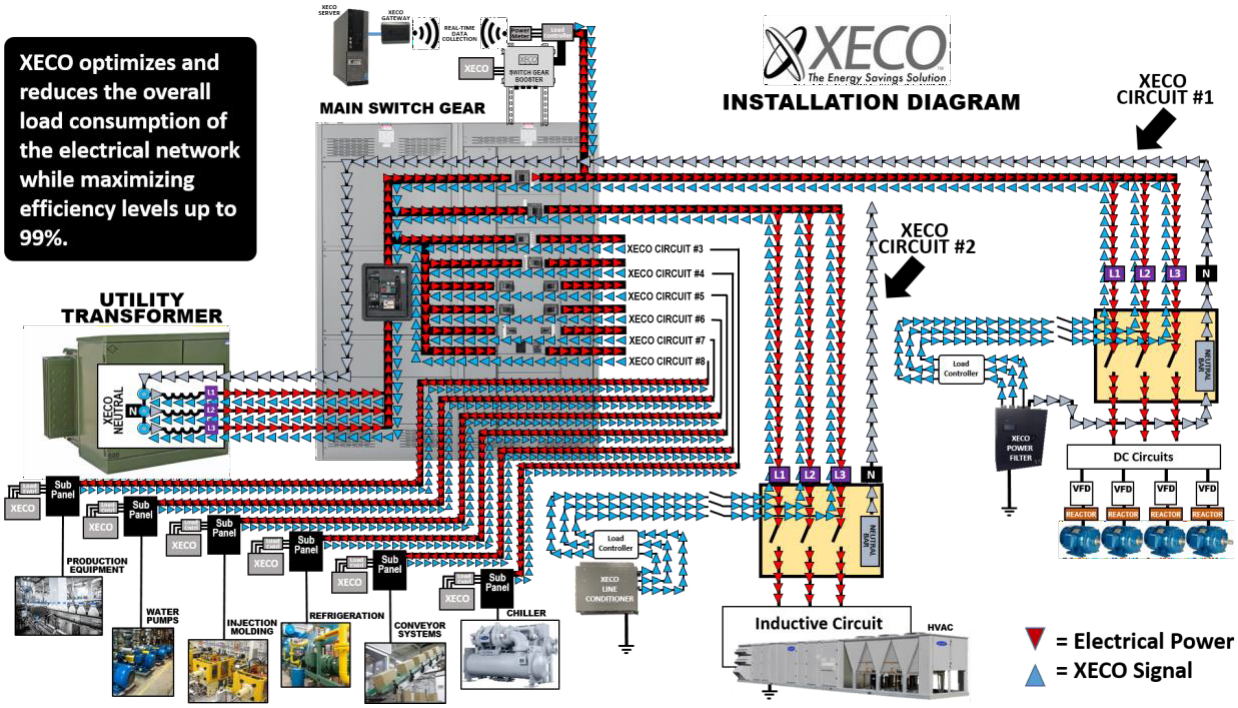
- ***Does installation require building shutdown or equipment downtime?***
  - We never do building shutdowns. We install on the line side of building infrastructure. In a rare case where there are no spare breakers or fuse disconnects an individual piece of equipment or circuit may need to be briefly powered down but only for a few minutes. We never shut down any equipment without customer approval and if it is not acceptable then we will modify the installation plan to identify another location within the network. Otherwise, we do not require any system power offs or other shutdown/interference.

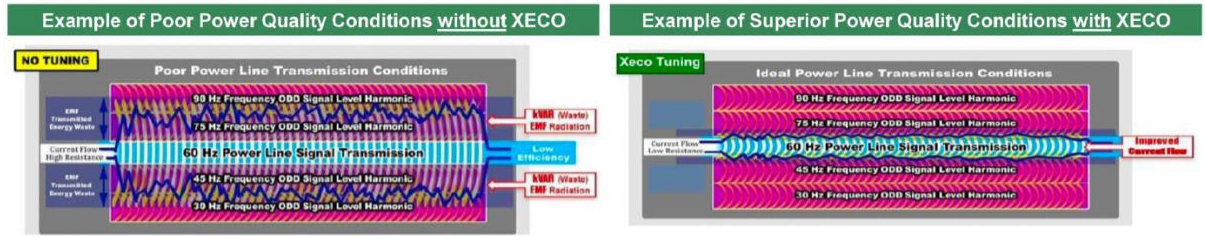
- **Hardware / Installation Overview:**



XECO optimizes and reduces the overall load consumption of the electrical network while maximizing efficiency levels up to 99%.

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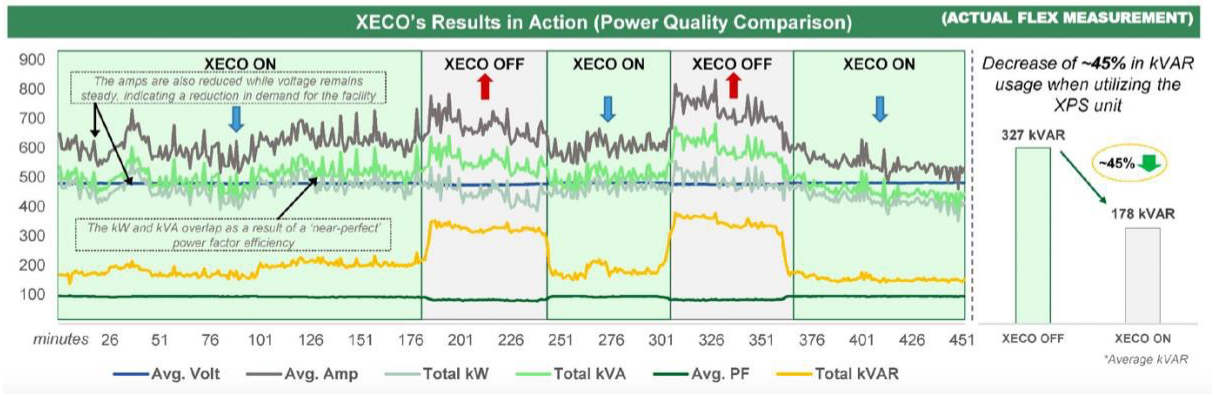

- **Software Portal Overview**