POWER QUALITY TECHNOLOGY COMPARISON

Traditional PFC Capacitor Banks

vs.

MPTS True Power Factor (TPF) Correction

Conventional capacitor banks have been the standard tool for power factor correction for decades, but they only solve part of the problem. Maximum Power Transfer Solution (MPTS), a Power Management Control System (PMCS), takes a fundamentally different approach: a patented, UL-listed, solid-state system that delivers True Power Factor by simultaneously eliminating harmonics, reactive energy, and imbalance in real time at 20,000 cycles per second.

MPTS — VERIFIED PERFORMANCE BENCHMARKS

0.95–0.99	10–30%	90%	20%+
True Power Factor achieved under dynamic loads	Total energy consumption reduction	Reactive power eliminated	Hidden electrical capacity released

WHAT EACH TECHNOLOGY ACTUALLY DOES

TRADITIONAL APPROACH **PFC Capacitor Banks**	NEXT GENERATION **MPTS True Power Factor**
Passive reactive power compensation. Fixed or switched capacitors inject leading reactive current to offset the lag caused by inductive loads such as motors, transformers, ballasts. This corrects displacement power factor only: the phase angle between voltage and current. It does nothing to address harmonic distortion. In facilities with modern non-linear loads (VFDs, LED drivers, UPS, computers), capacitor banks can amplify harmonic resonance and actively degrade power quality rather than improve it.	Active, solid-state power management. MPTS corrects both displacement power factor and distortion power factor simultaneously using patented mathematical algorithms processed at 20,000 cycles per second (50 microseconds). It eliminates harmonics, stabilizes voltage, reduces reactive energy, and balances load, all in one cabinet, without capacitors. The result is True Power Factor of 0.95–0.99 guaranteed even under dynamic, mixed, and non-linear load conditions. Guaranteed and UL-certified.

HEAD-TO-HEAD COMPARISON

Factor	PFC Capacitor Banks	MPTS True Power Factor
What it corrects	✗ Displacement PF only (voltage/current phase angle). Distortion PF from harmonics is untouched.	✓ Both displacement PF and distortion PF: the two components of True Power Factor, addressed simultaneously.
Harmonic distortion (THD)	✗ No harmonic correction. Can create resonant circuits at 5th, 7th, and 11th harmonics, amplifying THD and damaging connected equipment.	✓ Actively mitigates THD across the full harmonic spectrum in real time. No separate harmonic filter needed.
Dynamic load response	✗ Switched banks react slowly to load changes. Fixed banks cannot adapt. Transients occur at each switching event.	✓ Responds continuously at 20,000 corrections/sec (50 microseconds). No switching transients. Always current with actual load conditions.
Real kW demand reduction	✗ Reduces kVA but does not reduce real kW consumption. Utility billing formulas may still penalize depending on rate structure.	✓ Reduces kW, kVA, kVAr, and current simultaneously. Measured 15–25% current and demand reduction in installations.
Voltage stabilization	✗ No active voltage regulation. Capacitors can cause voltage overshoot at light loads, risking equipment damage.	✓ Stabilizes voltage in real time. Reduces surges, transients, and instability across all three phases continuously.
Equipment compatibility	✗ Problematic with VFDs, UPS, LED drivers, and non-linear loads. Can require expensive detuning reactors to prevent resonance.	✓ Designed for modern mixed-load environments. Solid-state, no capacitors, no resonance risk. Works with all load types.
Electrical capacity release	✗ Limited. Reduces kVAr demand but total current and thermal loading in cables, panels, and transformers may remain high.	✓ Releases 20%+ of trapped capacity in transformers, panels, UPS, GenSets, BESS, and Solar, without hardware upgrades.
Maintenance burden	✗ Capacitors degrade with age, heat, and harmonic stress. Contactors wear from switching cycles. Replacement every 5–10 years typical.	✓ Solid-state, no moving parts, no capacitors. 24/7 AI predictive monitoring. Fail-safe design; no load interruption if service is needed.
Monitoring & visibility	✗ Limited or no real-time data. Reactive power meters show post-correction PF but cannot verify root cause or harmonic content.	✓ Continuous kW, kVA, kVAr, TPF, current, and harmonics monitoring across all three phases. Simultaneous before/after data reported 20,000×/sec.
Environmental impact	✗ Minimal CO_2 benefit. Does not reduce real energy draw, only reactive power penalty fees.	✓ 22% average carbon emissions reduction. Approximately 220–330 lbs CO_2 reduced per kVAr compensated annually.
ROI profile	Low upfront cost. Narrow savings limited to reactive demand charges. ROI depends entirely on utility penalty structure.	Broader savings: kW reduction, demand charges, Maintenance, Repair, Ops and equipment life extension. OPEX ROI: 1.5–3.5 years. CAPEX ROI: 1–2 years.
Third-party validation	Industry-standard, decades of field data. No single certifying body for performance claims.	✓ UL-certified. Government-tested at NORAD and GSA federal facilities. 18-month controlled side-by-side school district study.

THE CRITICAL LIMITATION OF TRADITIONAL PFC

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In facilities dominated by linear inductive loads, capacitor banks were adequate. Today's buildings run on non-linear loads: variable frequency drives (VFD), LED systems, UPS devices, computer equipment, and inverter-based renewables, all of which generate harmonic distortion. A standard PFC capacitor bank not only fails to correct distortion power factor; it creates resonant conditions at harmonic frequencies, amplifying current distortion and causing overheating, nuisance tripping, and premature equipment failure. This is a core problem MPTS is engineered to solve.

MPTS — VERIFIED REAL-WORLD DEPLOYMENTS

NORAD - Cheyenne Mountain **Near-perfect power factor** Mission-critical military facility. Performance gains verified by 721st Civil Engineering Squadron across high-load compressor systems. YTD CAPEX ROI +$5.0M vs $0.5M cost. Repeatable results.	**GSA Federal Pumping Station** **< 1 year ROI** Federal Center Building 8, Denver. Cut idle energy waste and achieved sub-one-year payback - one of the fastest measured ROIs in the deployment record.	**Morgan County Prison, CO** **30% peak demand reduction** 377,000 sq. ft. correctional facility. Significant carbon emissions reduction alongside measurable demand savings across the full facility. Maintenance down +40%
Douglas County Schools, CO **18-month controlled study** Two nearly identical high schools compared side-by-side. The MPTS campus showed meaningful peak demand +14% & consumption +8% reductions across HVAC, lighting, and mechanical systems.	**Casas Church, Tucson AZ** **50% HVAC demand reduction** Large community church with expansive facilities and year-round HVAC demand. Significant operational cost savings documented post-installation.	**Underwriters Laboratories** **UL certification — unit retained for benchmarking** Tested & certified across multiple configurations. Results were repeatable and consistent. - UL retained a unit for ongoing vendor benchmarking. A rare independent endorsement.

CONCLUSION

BOTTOM LINE

Traditional PFC capacitor banks correct one dimension of a three-dimensional problem and are increasingly counter-productive in modern facilities. MPTS delivers True Power Factor by addressing all three simultaneously: displacement, distortion, and imbalance, using solid-state, real-time technology that is UL-certified, government-validated, and guaranteed. For any facility with non-linear loads, harmonic penalties, high demand charges, or deferred infrastructure upgrades, MPTS represents a fundamentally different category of solution; not an upgrade to capacitor banks, but a full replacement of the legacy approach.