

REPORT

Maximum Power Transfer System (MPTS) Evaluation on Distribution Circuits

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Purpose

The study evaluated the impact of the Maximum Power Transfer System (MPTS) on commercial and industrial electrical distribution systems and assessed the benefits of large-scale deployment on utility distribution feeders using measured field data and IEEE 13-Node Test Feeder simulations.

Key Findings

- **Reduced electrical demand (kW):** Typical field savings ranged from 2–20% depending on load characteristics. One industrial facility achieved an average 3.9% reduction, while a major hospital recorded current demand reductions of approximately 18–22% during peak HVAC months.
- **Dynamic power factor correction:** MPTS continuously compensates reactive power in real time, improving power factor toward unity and reducing kVA demand.
- **Utility benefits:** Lower feeder loading, reduced transformer loading, improved grid efficiency, lower kVA and kVAR demand, improved voltage support, and enhanced power quality.
- **Large-scale deployment:** Simulations showed power factor improving from 0.918 toward 1.0, approximately 10.4% reduction in substation kVA, dynamic VAR support equivalent to about 1,400 kVAR, and consistent performance regardless of device location on the feeder.

Conclusion

The researchers concluded that widespread deployment of MPTS devices can provide significant benefits to utilities and commercial/industrial customers by reducing kW demand, kVA demand, and reactive power while improving power factor and power quality.

Summary Table

Parameter	Result
Maximum kW Reduction (50% penetration)	3266 → 3037 kW
Maximum kVA Reduction (50% penetration)	3827 → 3555 kVA
Power Factor Improvement	0.918 → 0.973
Additional Benefits	Voltage conservation, power quality improvement, PV voltage support