Power quality improvement and energy efficiency



With MPTS – Maximum Power Transfer Solutions

Features of MPTS

- Decrease the Max current in your network
- Decrease in KVA electrical Demand
- Decrease in peak KW and electrical consumption
- Decrease in KVAR- reactive power
- Decrease in harmonics
  - THD that is damaging your electrical, electronic, computer, lighting and mechanical equipment.
- Provide stable power to the connected loads
- Increase safety and reliability of the electrical network
  - Avoids overload conditions and hot spots in panels and equipment -a function of decrease in I^2R losses, KVAr, and harmonics

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Test Results / Due diligence – MPTS Pre-Install and Post-Install

March 2017	Fluke data	
Clarion - Pilot project		
Voltage	0.48	Pre-Install
Current Average	38.14	Pre-install
Power Factor - Average	0.65	Pre-install
KW	20.689977	Pre-install
KVA	31.709419	Pre-install
KVAR	37.862414	Pre-install
THD	108.92	Pre-install

Voltage	0.48	Post Install
Current Average	21.87	Post Install
Power Factor - Average	0.95	Post Install
KW	17.338985	Post Install
KVA	18.178385	Post Install
KVAR	25.121585	Post Install
THD	21.58	Post Install

Current Reduction	43%	Change
KW reduction	16%	Change
KVA reduction	43%	Change
KVAR Reduction	34%	Change
THD	80%	Change

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Test Results/Due diligence – MPTS Pre-Install and Post-Install Data

	Pre-Install			Post-Install		
	Average			Average		
Parameter	Min	Mean	Max	Min	Mean	Max
Current - Phase A (Amps)	39.66	39.72	39.75	23.66	23.71	23.79
Current - Phase B (Amps)	44.75	44.80	44.86	25.33	25.40	25.50
Current - Phase C (Amps)	29.87	29.91	29.94	16.42	16.46	16.52
	38.09	38.15	38.19	21.80	21.86	21.94
Active Power - Phase A (Watts)	7918.41	7932.78	7945.87	6397.63	6415.49	6436.70
Active Power - Phase B (Watts)	7796.67	7811.11	7827.54	6841.02	6860.98	6886.14
Active Power - Phase C (Watts)	5373.65	5384.29	5394.84	4442.47	4454.93	4468.60
Active Power Total	21103.10	21127.86	21153.81	17697.35	17729.72	17775.91
Reactive Power - Phase A (VAR)	7994.37	8008.57	8021.27	1520.88	1607.21	1689.44
Reactive Power - Phase B (VAR)	10080.24	10099.05	10116.51	1105.53	1220.88	1342.00
Reactive Power - Phase C (VAR)	6630.24	6642.62	6656.90	219.44	373.58	527.21
Reactive Power - Total (VAR)	24721.43	24760.00	24796.19	2947.26	3211.12	3472.74
Power Factor - Phase A	0.71	0.71	0.71	0.96	0.96	0.96
Power Factor - Phase B	0.62	0.62	0.62	0.95	0.95	0.95
Power Factor - Phase C	0.63	0.63	0.63	0.95	0.95	0.95
Power Factor - Average Total	0.65	0.65	0.65	0.95	0.95	0.95
	Input %			**Output %**		
	Min	Avg	Max	Min	Avg	Max
THD - Line A-A	11.05	11.41	13.67	2.29	2.37	2.53
THD - Line A-B	9.83	10.10	10.14	2.26	2.41	2.68
THD - Line A-C	13.95	14.48	16.18	1.90	2.07	3.50
THD - Line A-N	96.01	98.00	131.86	21.13	21.48	22.13

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Test Results/Due diligence – MPTS Energy Savings

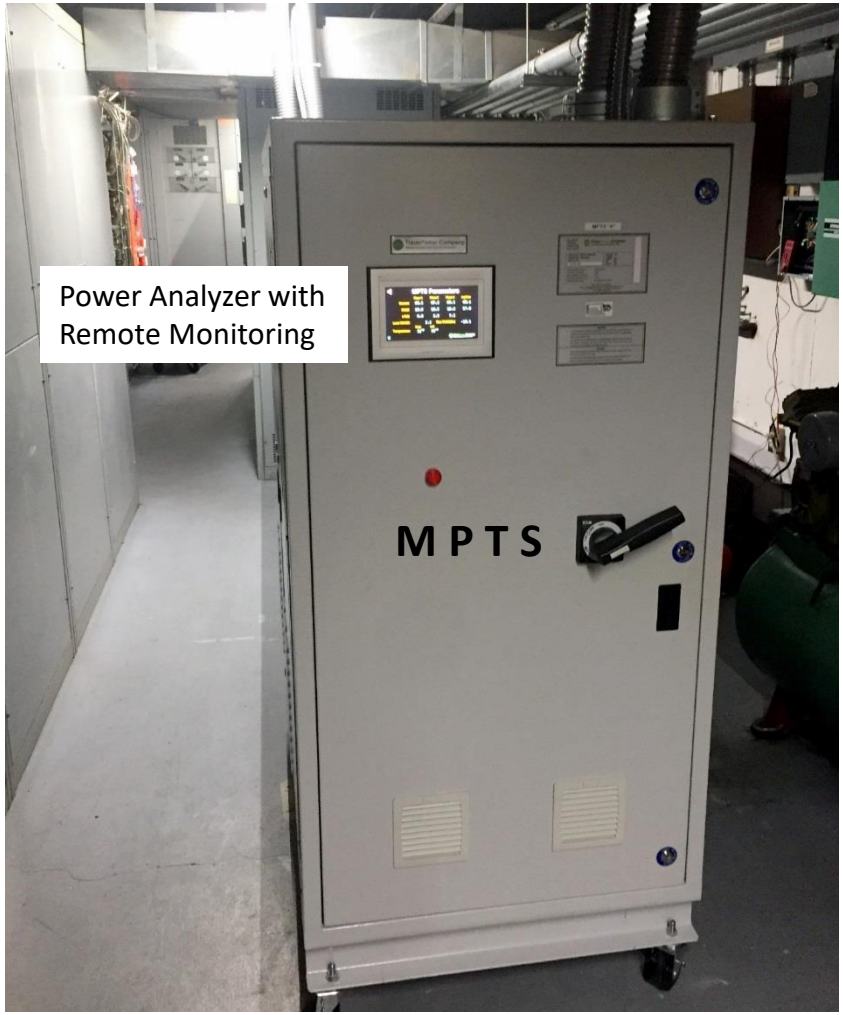
Commercial building - Pilot Project	Summarized values from Fluke Meter Data					
Parameter	Min	%	Mean	%	Max	%
Current - Phase A (Amps)	16.00	40%	16.01	40%	15.96	40%
Current - Phase B (Amps)	19.42	43%	19.41	43%	19.36	43%
Current - Phase C (Amps)	13.45	45%	13.45	45%	13.42	45%
Active Power - Phase A (Watts)	1521	19%	1517	19%	1509	19%
Active Power - Phase B (Watts)	956	12%	950	12%	941	12%
Active Power - Phase C (Watts)	931	17%	929	17%	926	17%
Active Power Total	3406	16%	3398	16%	3378	16%
Reactive Power - Phase A (VAR)	6473	81%	6401	80%	6332	79%
Reactive Power - Phase B (VAR)	8975	89%	8878	88%	8775	87%
Reactive Power - Phase C (VAR)	6411	97%	6269	94%	6130	92%
Reactive Power - Total (VAR)	21774	88%	21549	87%	21323	86%
Power Factor - Phase A Improvement	0.25	36%	0.25	36%	0.25	35%
Power Factor - Phase B Improvement	0.33	54%	0.34	54%	0.34	55%
Power Factor - Phase C improvement	0.32	50%	0.32	50%	0.32	50%
Power Factor - Average Total Improvement	0.30	46%	0.30	46%	0.29	46%
THD - Line A-A Improvement	8.76	79%	9.04	76%	11.14	81%
THD - Line A-B Improvement	7.57	77%	7.69	86%	7.46	74%
THD - Line A-C Improvement	12.05	86%	12.41	78%	12.68	78%
THD - Line A-N Improvement	74.88	78%	77.42	78%	109.73	83%

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Using MPTS – Maximum Power Transfer Solution

Pilot Project

Installed are Two MPTS units on the Main Service Meter



Power Analyzer with
Remote Monitoring



Power quality improvement and energy efficiency

Using MPTS – Maximum Power Transfer Solution

MPTS Devices on the Main Electrical Panel for

Power Quality Improvement,
Energy Efficiency and
Reduction in CO2 Emissions



Building consists of Mixed Loads

Building consists of different equipment

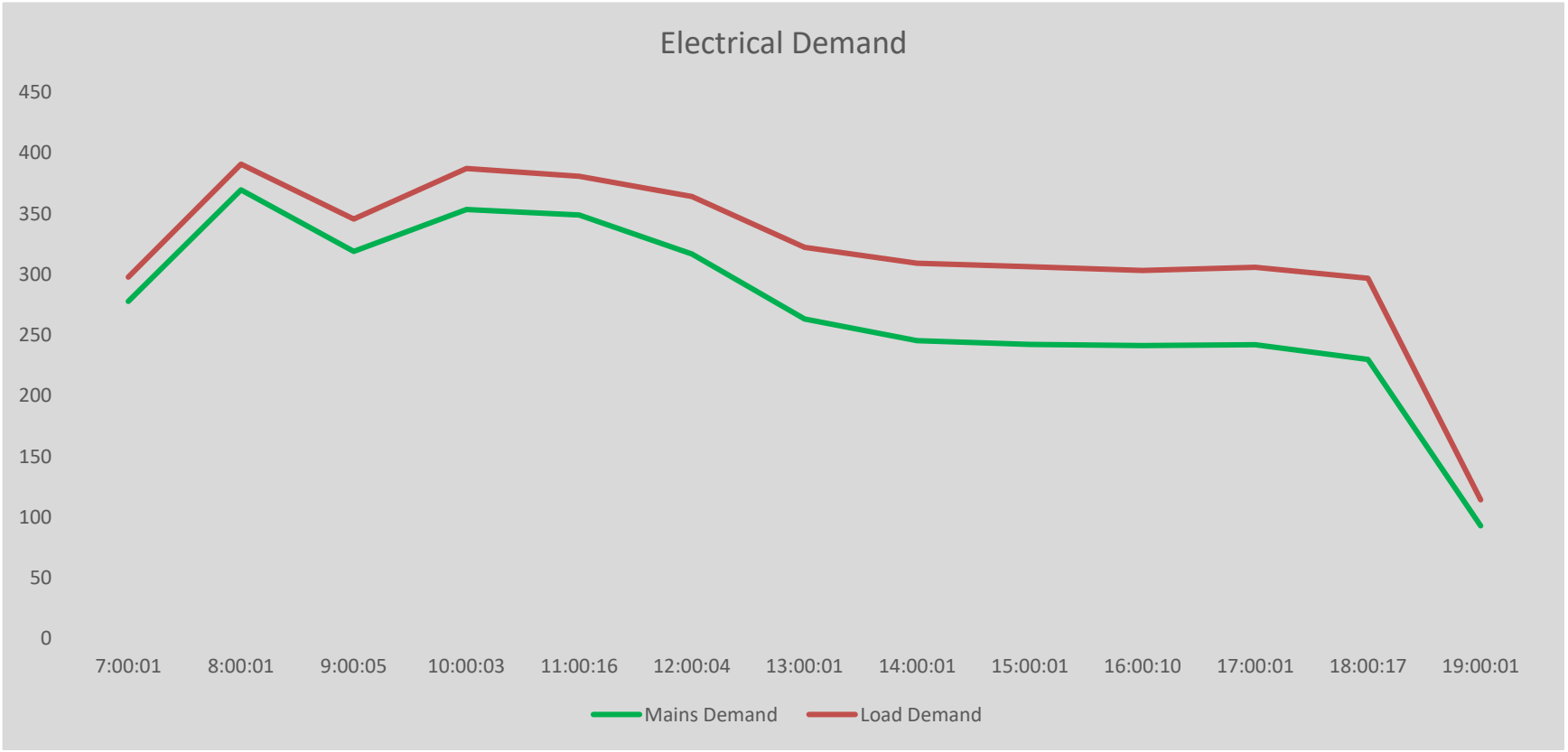
Lighting	LED Drivers- Ballasts
Pumps	VFDs
Motors	Fans
Air Conditioners	RTUs
VAVs	Boilers
Office Equipment	Computers
Monitors	Other equipment

Power quality improvement and energy efficiency

Using MPTS – Maximum Power Transfer Solution

Performance Verification of the MPTS Device

Data Extracted from Logged Data



Power quality improvement and energy efficiency

Using MPTS – Maximum Power Transfer Solution

Performance Verification of the MPTS Device

Utility Billed Data

Charges for electricity services

Cost of electricity you used

Customer account charge	$19.83
Delivery service charge	$27.79
Demand charge - delivery	$8,178.39
Environmental benefits surcharge	$1,104.59
Federal environmental improvement surcharge	$40.42
System benefits charge	$750.22
Power supply adjustment*	$423.87
Metering*	$29.83
Meter reading*	$1.91
Billing*	$2.11
Generation of electricity*	$8,830.90
Demand charge - generation*	$4,113.84
Federal transmission and ancillary services*	$1,450.28
Federal transmission cost adjustment*	$1,143.75
System benefits adjustment	-$129.33
Four-Corners adjustment*	$475.12
Cost of electricity you used	$26,463.52

Taxes and fees

Regulatory assessment	$62.56
State sales tax	$1,515.17
County sales tax	$189.40
City sales tax	$0.00
Franchise fee	$530.52
Cost of electricity with taxes and fees	$28,761.17

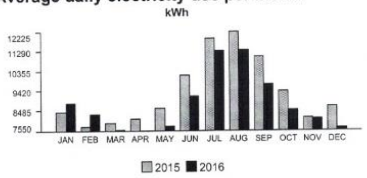
Total charges for electricity services **$28,761.17**

** These services are currently provided by APS but may be provided by a competitive supplier.*

Amount of electricity you used

Meter reading on Dec 20	44931
Meter reading on Nov 17	42405
Read difference is	2526
Multiplier applied to the read difference	100
Total electricity you used, in kWh	**252600**
Demand meter reading	9.15
Multiplier applied to the read	100
Your total demand in kW	915.0
Your billed demand in kW	**915.0**

Average daily electricity use per month



Comparing your monthly use

This month / Last month / This month last year

Billing days

Average outdoor temper

Your total use in kW

Your billed demand in k

Your average daily cost

Without MPTS

Dollar Savings in the Utility bill $4,034/month

Charges for electricity services

Cost of electricity you used

Customer account charge	$72.12
Delivery service charge	$0.00
Demand charge - delivery	$7,909.21
Environmental benefits surcharge	$807.22
System benefits charge	$533.78
Power supply adjustment*	$107.34
Metering*	$44.31
Meter reading*	$0.27
Billing*	$0.90
Generation of electricity*	$6,645.22
Demand charge - generation*	$4,242.91
Federal transmission and ancillary services*	$2,215.64
Federal transmission cost adjustment*	$172.93
Cost of electricity you used	$22,751.85

Taxes and fees

Regulatory assessment	$53.79
State sales tax	$1,302.66
County sales tax	$162.83
City sales tax	$0.00
Franchise fee	$456.11
Cost of electricity with taxes and fees	$24,727.24

Total charges for electricity services **$24,727.24**

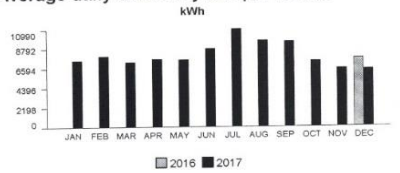
** These services are currently provided by APS but may be provided by*

Amount of electricity you used

Meter reading on Dec 20	74512
Meter reading on Nov 20	72578
Read difference is	1934
Multiplier applied to the read difference	100
Electricity you used, in kWh	**193400**
Total electricity you used, in kWh	**193400**
Demand meter reading	7.12
Multiplier applied to the read	100
Your total demand in kW	712.0
Your billed demand in kW	**772.0**

772 is 80% of the highest kW from the last 6 summer months

Average daily electricity use per month



Comparing your monthly use

	This month	Last month	This month last year
Billing days	30	31	33

With MPTS

With Rate Increase

Electrical Demand-related rates have gone up (a lot) from $15.02/KW to $18.61/KW - an increase of 23.9%
This would equate to a billed amount of $22,836.82 at the old rate,
And the billed dollar savings of $5,924/month

Billed Dollar Savings if rates were the same = $5,924/month

Impact of the MPTS on the Utility Bill

Power quality improvement and energy efficiency

Using MPTS – Maximum Power Transfer Solution

Performance Verification of the MPTS Device

Utility Bill
Comparison of energy used
Without MPTS and With MPTS

Impact of the MPTS on the Utility Bill

Amount of electricity you used

2016

Meter reading on Dec 20	44931
Meter reading on Nov 17	42405
Read difference is	2526
Multiplier applied to the read difference	100
Total electricity you used, in kWh	**252600**
Demand meter reading	9.15
Multiplier applied to the read	100
Your total demand in kW	915.0
Your billed demand in kW	**915.0**

Without MPTS

Amount of electricity you used

2017

Meter reading on Dec 20	74512
Meter reading on Nov 20	72578
Read difference is	1934
Multiplier applied to the read difference	100
Electricity you used, in kWh	**193400**
Total electricity you used, in kWh	**193400**
Demand meter reading	7.12
Multiplier applied to the read	100
Your total demand in kW	712.0
Your billed demand in kW	**772.0**

With MPTS

772 is 80% of the highest kW from the last 6 summer months

Measured Interval Data Maximum shows 712 KW
But Utility billed 772 KW based on their billing practices