2015 New York Internet SP1000 Case Study

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2015 NYI Energy Study

Summary

New York Internet installed 17 SP1000 units in its New Jersey and New York facilities in partnership with American Energy Solutions (AES) in the summer of the 2014 year.

New York Internet has requested an energy study from Power Metrics International to investigate the success and efficiency of the installed SP1000 energy management systems.

The data gathering was done on July 24th and July 27th by Akram Khalis and an electrician selected by New York Internet. The study was done on 16 of the 17 installed units as one of the units was deactivated.

This study investigates, analyzes, and concludes the findings of the SP1000 performance within the New York Internet facilities by the PMI engineering staff, and Chief Technology Officer, Hamid Pishdadian.

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Overview and Exhibits

In the initial data collection stage, Akram Khalis and an electrician selected by New York Internet individually turned off each active SP1000 unit at New York Internet's New Jersey and New York facilities and monitored the data for 10 minutes with a Fluke 1730 device. A Fluke 1730 device is a Three Phase Electrical Energy logger that has the capability to measure and characterize these electrical consumption effects enabling PMI engineers to analyze the results and essentially reduce energy costs.

Akram Khalis photographed meter readings from the Fluke 1730 and recorded voltage, current, and power factor raw data before and after the SP1000 units were shut off. See **Exhibit 1A** and **1B** below:

Ex. 1A

Voltage and Current photographed and recorded on the Fluke 1730

Ex. 1B

Power Factor photographed and recorded on the Fluke 1730

After the meter readings were recorded and photographed, the data was tabulated by Power Metrics International's Chief Technology Officer, Hamid Pishdadian, into two distinct categories; the SP1000 ON table and an SP1000 OFF table. Each table included a first, second, and third electrical phase and specifically voltage, current, and power factor of the 8 panels that the 16 SP1000 units occupy. See **Exhibit 2** below:

Ex. 2

	COLLECTED DATA																	
	SP1000 ON									SP1000 OFF								
Panel name	Phase 1 Voltage	Phase 2 Voltage	Phase 3 Voltage	Phase 1 Amps	Phase 2 Amps	Phase 3 Amps	Phase 1 PF	Phase 2 PF	Phase 3 PF	Phase 1 Voltage	Phase 2 Voltage	Phase 3 Voltage	Phase 1 Amps	Phase 2 Amps	Phase 3 Amps	Phase 1 PF	Phase 2 PF	Phase 3 PF
									NEW JERSEY									
DHPVAC	270.5	269.9	266.2	81.7	81.7	79.1	88.0	86.0	88.0	269.9	269.0	265.9	92.4	93.0	90.0	82.0	80.0	82.0
DP1B	267.2	271.5	270.3	100.5	102.9	102.7	90.0	90.0	89.0	266.4	270.4	269.8	112.5	114.4	115.2	80.0	80.0	79.0
DP2B	267.8	271.8	271.0	97.5	102.4	103.2	88.0	90.0	87.0	267.0	271.5	270.7	110.3	114.5	117.0	80.0	82.0	79.0
DPHVAC3	269.5	268.7	265.7	72.5	72.1	69.2	88.0	86.0	87.0	269.1	268.5	265.2	78.2	79.0	75.4	83.0	80.0	81.0
									NEW YORK									
8th FLR 3 Unit	262.1	265.5	265.6	158.8	168.8	163.5	91.0	92.0	89.0	261.8	265.2	265.1	178.1	187.9	184.4	82.0	83.0	80.0
HA2 3 Units	261.4	265.4	265.8	174.6	184.4	175.1	93.0	93.0	91.0	260.8	264.7	265.1	189.3	200.0	192.2	84.0	84.0	81.0
HA3 3 Units	260.4	264.7	266.0	174.3	182.4	175.8	91.0	91.0	89.0	260.2	264.3	264.6	188.5	197.2	191.6	83.0	83.0	81.0
HA4 2 Units	261.2	265.2	265.2	141.1	149.4	143.4	95.0	96.0	94.0	260.2	264.1	264.2	183.1	195.2	190.7	87.0	88.0	85.0

Raw data table recording phase 1, 2, and 3 results for voltage, current, and power factor meter readings in NJ and NY.

Hamid Pishdadian then used the following equations to reach each average required to survey the results of the SP1000 units:

Voltage for each panel unit was found by taking the first, second, and third phase averages from the *Collected Data Table* (Ex. 2) and multiplied by the square root of the 3 (1.73).

Current/Amperage for each panel unit was found by taking the first, second, and third phase averages from the *Collected Data Table* (Ex. 2) and multiplied by the square root of 3 (1.73)

Average Power Factor for each panel unit was found by averaging the recordings of the first, second, and third phase Power Factors recorded in the *Collected Data Table* (Ex. 2).

KVA for each panel unit was found by multiplying voltage and current from the final numbers recorded in the *Electrical Calculation Table* (Ex. 3) and then divided by 1,000.

KW for each panel unit was found by multiplying the final KVA number recorded in the *Electrical Calculation Table* (Ex. 3) by the final Average Power Factor number (Ex. 3).

Cable Loss for each panel was found by taking the metered voltage (Ex.2), subtracting it from the transformer supply voltage (480v) number, and multiplying the result by the current/amperage number (Ex.3). These numbers were recorded and used from when the SP1000 units were ON and OFF.

Once the SP1000 units were deactivated, each equation was repeated to log data in the OFF table.

See categorical results in **Exhibit 3** below:

Ex. 3

	ELECTRICAL CALCULATION											
	SP1000 ON						SP1000 OFF					
Panel name	Voltage(V)	3 Phase Amps(A)	Average PF(%)	Panel KVA	Panel KW	Cable Loss(KW)	Voltage(V)	3 Phase Amps(A)	Average PF(%)	Panel KVA	Panel KW	Cable Loss(KW)
	NEW JERSEY											
DHPVAC	465.1	140.2	87.3	65.2	56.9	2.1	464.1	158.8	81.3	73.7	60.0	2.5
DP1B	466.5	176.9	89.7	82.5	74.0	2.4	465.1	197.3	79.7	91.8	73.1	2.9
DP2B	467.4	175.2	88.3	81.9	72.3	2.2	466.6	197.1	80.3	92.0	73.9	2.6
DPHVAC3	463.6	123.6	87.0	57.3	49.8	2.0	462.9	134.1	81.3	62.1	50.5	2.3
Avrages	465.7	154.0	88.1				464.7	171.8	80.7			
Total				286.9	253.1	8.7				319.6	257.5	10.4
	NEW YORK											
8th FLR 3 Units	457.4	283.9	90.7	129.8	117.7	6.4	456.8	317.4	81.7	145.0	118.4	7.4
HA2 3 Units	457.1	308.7	92.3	141.1	130.3	7.1	455.9	335.3	83.0	152.9	126.9	8.1
HA3 3 Units	456.2	307.8	90.3	140.4	126.8	7.3	455.0	332.9	82.3	151.5	124.7	8.3
HA4 2 Units	456.5	250.8	95.0	114.5	108.8	5.9	454.7	328.1	86.7	149.2	129.3	8.3
Avrages	456.8	287.8	92.1				455.6	328.4	83.4			
Total				525.9	483.6	26.7				598.5	499.3	32.1

Conclusive data table recording phase 1, 2, and 3 results for voltage, current, and power factor meter readings in NJ and NY.

Once the Electrical Calculations were comprised, Hamid Pishdadian then recorded Estimated Panel Savings Calculations for the facilities in New Jersey and New York.

See **Exhibit 4A** and **4B** below:

Ex. 4A

Panel Savings Calculations New Jersey	
Monthly Demand(KW) based on 95% rate	303.6
Monthly KWh Consumption	185365.8
KWh Charge Rate ($/KWh)	0.18
Demand Charge Rate ($)	15.0
Estimated Cost to run panels (30% peak consumption) ($)	49295.3
KVA Reduction(KVA)	32.6
KW Reduction(KW)	4.3
KWh savings/Month(KWh) due to panel efficiency	3101.1
Demand Reduction(%)	10.2
Panel Efficiency Increase(%)	1.7
Voltage Rise(%)	0.2
Monthly Cable Savings(Refrig.Cables, 80% efficieny)(KWh)	2724.3
Monthly Voltage Rise Savings(KWh)	385.3
Panel Total KWh Savings/Month (KWh)	6210.6
Total Demand KW Savings/ Month (30% rise) (KW)	40.3
KWh savings at 95% power factor Calculation	3365.8
Estimated Savings ($)	$2,327.95

Estimated Panel Savings for New Jersey

Ex. 4B

Panel Savings Calculations New York	
Monthly Demand(KW) based on 95% rate	568.6
Monthly KWh Consumption	359513
KWh Charge Rate ($/KWh)	0.18
Demand Charge Rate ($)	15.0
Estimated Cost to run panels (30% peak consumption) ($)	95214.3
KVA Reduction(KVA)	72.7
KW Reduction(KW)	15.7
KWh savings/Month(KWh) due to panel efficiency	11298.2
Demand Reduction(%)	12.1
Panel Efficiency Increase(%)	3.1
Voltage Rise(%)	0.3
Monthly Cable Savings(Refrig.Cables, 80% efficieny)(KWh)	8652.7
Monthly Voltage Rise Savings(KWh)	932.8
Panel Total KWh Savings/Month (KWh)	20883.8
Total Demand KW Savings/ Month (30% rise) (KW)	89.8
KWh savings at 95% power factor Calculation	6061.6708
Estimated Savings ($)	$6,196.61

Estimated Panel Savings for New York

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Efficiency and Analysis

After all 3 phase calculations were comprised and totaled for both NYI facilities, KW demand (kilo-watt- or unit of real power) and KWh (kilowatt-hour) were the main focal points of the study as that is what determines the actual cost of a utility bill.

KWH (kilowatt-hour) is essentially the average KW (kilowatt) used on an hourly basis. KWH consumption in a facility varies throughout the day.

There were 4 reasonable, scientific assumptions that were made in this case study because they are not easily measurable. Due to the fact that New York Internet runs 24 hours a day, a 100% operational duty cycle is used in the cost calculations. Based on the method of data gathering, we can safely state that this analysis is an accurate representative of an entire month of the electrical consumption that NYI is using. The 4 assumptions are:

1. The transformer that supplies power to each building is a standard 480 volt unit.
2. There's roughly 10% electricity cost that has nothing to do with consumption such as taxes, service charges, etc. PMI's reading was based on 18 cents per KWH, and a $15 demand changed per KW between both NYI facilities.
3. Because NYI cables are air conditioned, PMI assumes that the equipment cooling the facility in the NYI have 80% efficiency. For every 1kw of heat generated by indoor power lines, it will take 1.25 KW of energy to cool it down because the machine that cools it down would possess an efficiency of 80%. So, the actual waste that NYI would have in its cables of 1KW, would actually cost NYI 2.25 KW.
4. It is assumed that the peak consumption during a month is 30% more than when the measurement was made.

These scientific assumptions are reasonable and an industry standard when analyzing energy management systems.

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Conclusion

Based on the Fluke Meter Readings (Ex. 1A, 1B), and Electrical Calculations (Ex.3) used by Chief Technology Officer, Hamid Pishdadian, New York Internet experiences on average a **Total Monthly Savings of $8,525.29** as a result of the 16 of the 17 installed SP1000 products**.**

POWER METRICS INTERNATIONAL
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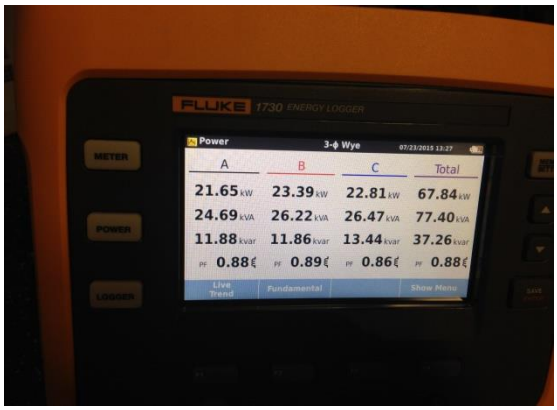
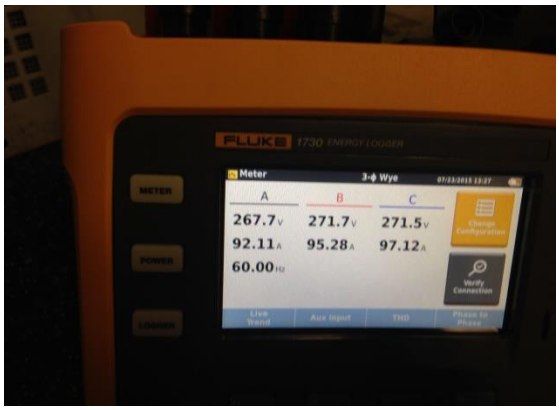
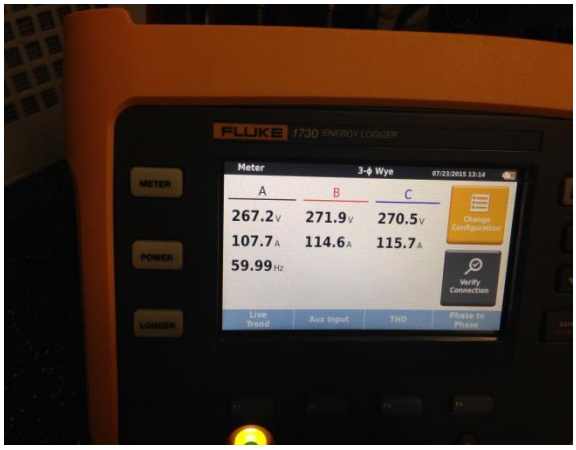
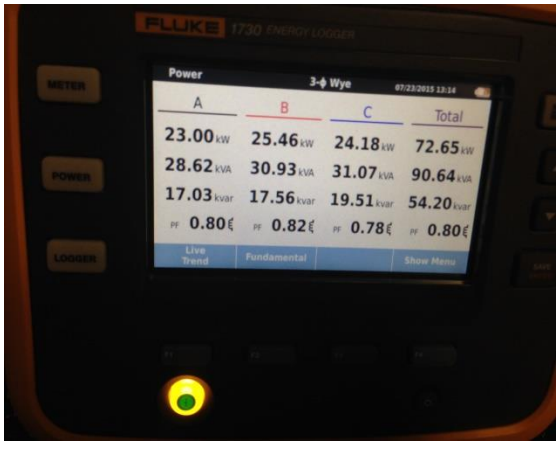
Appendix Photographs









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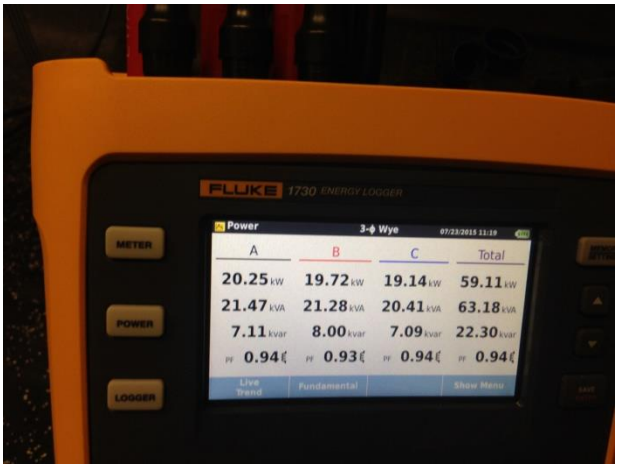

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