

Energy Savings Report – Large Supermarket

Voltage as a Service (VAAS)TM is an energy-saving service solution for regulating and optimising the voltage supplied to electrical equipment to the optimal level for efficient operation. The purpose of VAAS is to reduce energy consumption, lower electricity bills, and decrease carbon emissions by ensuring that electrical devices operate at their most efficient voltage level.

Executive Summary

Objective	Report on voltage provided to load using dynamic Voltage Optimisation
Site Location	Site #1032 Regional City, Western Australia, Australia
Facility Type	Large Supermarket
Time Period	A 2 week period, from 21 st August 2024 through to 4 th September 2024

Methodology

Data Collection	3 phase voltage meter
Communication	4G wireless. 1 minute interval messaging
Sample interval	1 minute interval data
Data storage	iStar Cloud Repository
Accuracy	Class 1 accuracy

EVO IPMVP using Period OFF : Period ON Analysis

The IPMVP outlines various approaches that can be applied to measure and verify energy savings. In this Application Note, we describe the key methods relevant to verifying Voltage Optimisation energy savings performance.

Baseline Period	VO was OFF for 7 days
Measurement Period	VO was ON for 7 days

Simple comparisons for the Period OFF : Period ON were made.

The conclusion following IPMVP analysis is that energy savings of 26.08% kWh are directly attributed to Voltage Optimisation at the Large Supermarket facility.

Summary Statistics

Period	Period Start	Period End	Energy Usage [kWh]	Ratio	Reduction
VO OFF	21/8/2024 07:00	28/8/2024 07:00	37,931.23		
VO ON	4/9/2024 07:00	12/9/2024 07:00	28,037.14	73.92%	26.08%

Voltage Profiles

Figure 1 Average Load Voltage – 1 minute average – 14 day study period

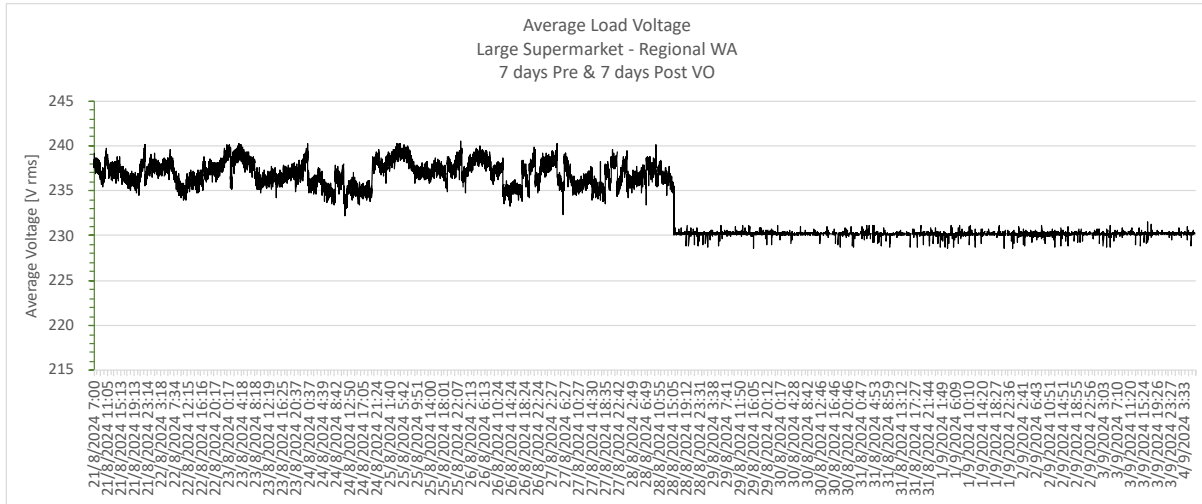


Figure 2 Average Time of Day Load Voltage – 1 minute average - Pre and Post VO activation

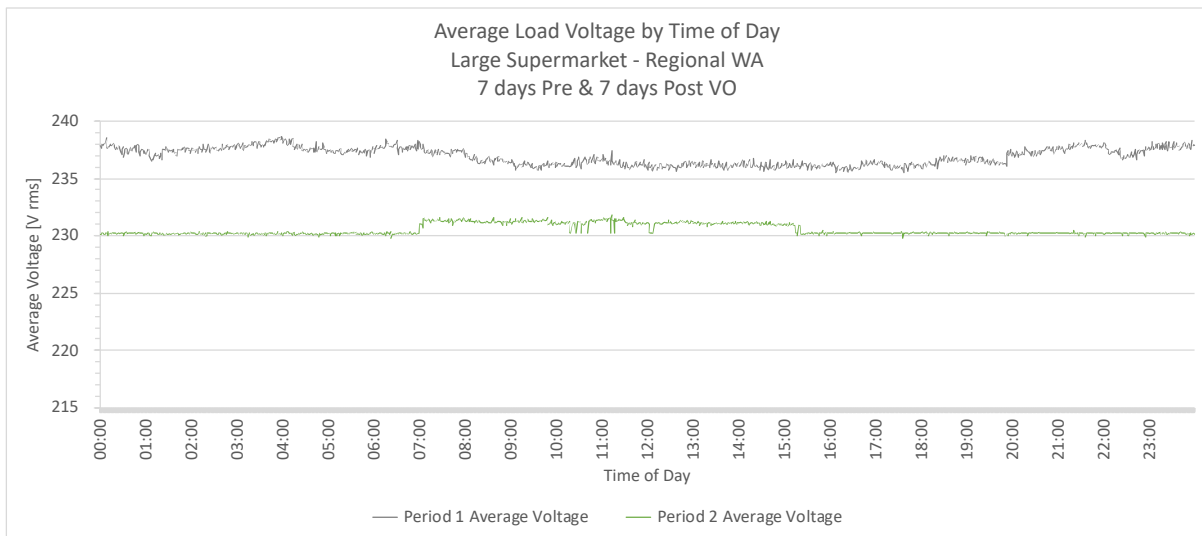


Table 1 Voltage summary statistics for the Baseline Period (VO OFF)

Baseline Period (VO OFF)					
N	10340				
Mean	236.9137	Mean Standard Error	0.0130		
Mean LCL 95%	236.8882	Mean UCL 95%	236.9392		
Trimmed Mean (5%)	236.9167	Geometric Mean	236.9100	Harmonic Mean	236.9063
Median	236.9667	Median Error	0.0002	Mode	236.8667
Standard Deviation	1.3220	Variance	1.7478	Coefficient of Variation	0.0056
Range	10.4667	Minimum	230.0667	Maximum	240.5333
IQR	2.0000	Percentile 25% (Q1)	235.9000	Percentile 75% (Q3)	237.9000
Mean Deviation	1.0904	Median Absolute Deviation	0.4667	Coefficient of Dispersion	0.0046

Table 2 Voltage summary statistics for the Measurement Period (VO ON)

Measurement Period (VO ON)					
N	9295				
Mean	230.2063	Mean Standard Error	0.0016		
Mean LCL 95%	230.2031	Mean UCL 95%	230.2095		
Trimmed Mean (5%)	230.2100	Geometric Mean	230.2062	Harmonic Mean	230.2062
Median	230.2000	Median Error	0.0000	Mode	230.2333
Standard Deviation	0.1585	Variance	0.0251	Coefficient of Variation	0.0007
Range	2.9667	Minimum	228.5333	Maximum	231.5000
IQR	0.1000	Percentile 25% (Q1)	230.1667	Percentile 75% (Q3)	230.2667
Mean Deviation	0.0776	Median Absolute Deviation	0.0667	Coefficient of Dispersion	0.0003

Tables 1 and 2 above demonstrate the effect of the Voltage Optimisation (VO). The average voltage has been reduced from 236.9 V to 230.2 V, and the variance has been reduced from 1.75 V to 0.03 V. The histograms presented below in Figures 3 and 4 summaries the mean reduction and the reduction in variance; this performance achieved using a fully dynamic voltage control with rapid response.

Figure 3 Baseline Period Voltage Histogram

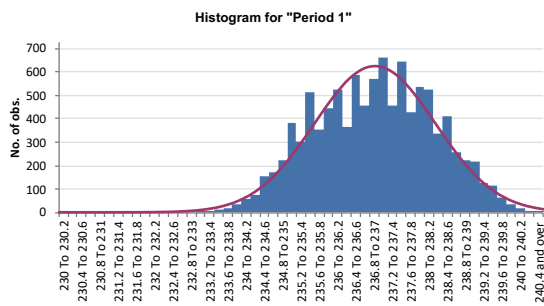
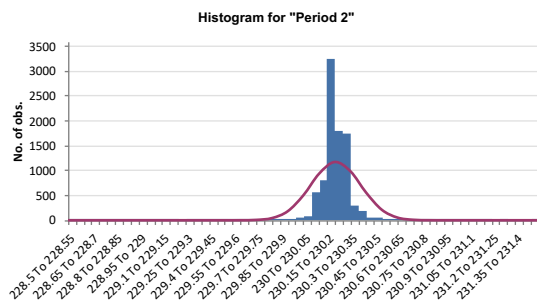
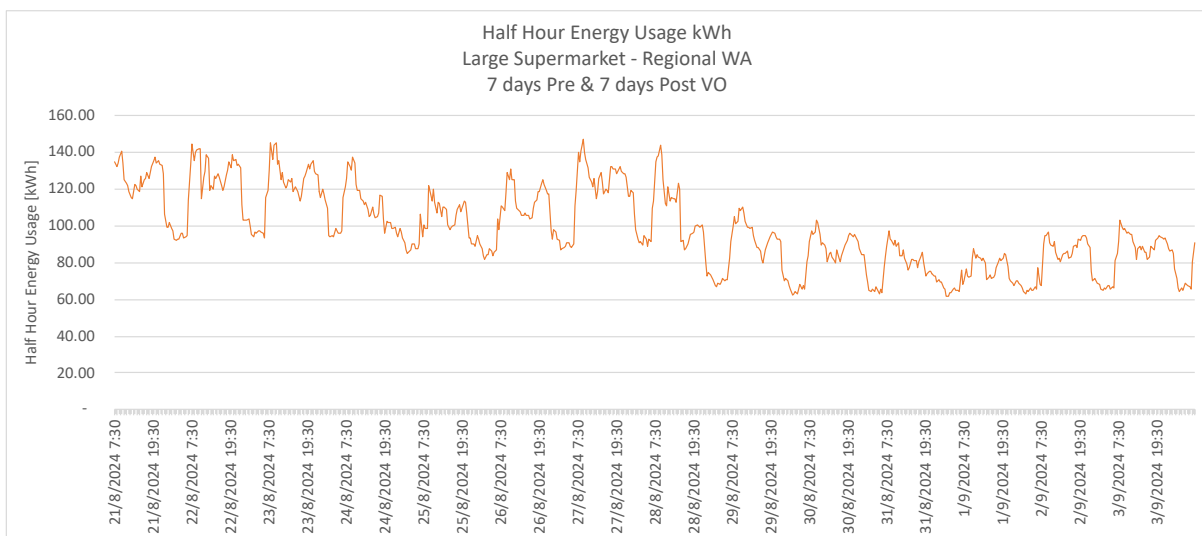


Figure 4 Measurement Period Voltage Histogram



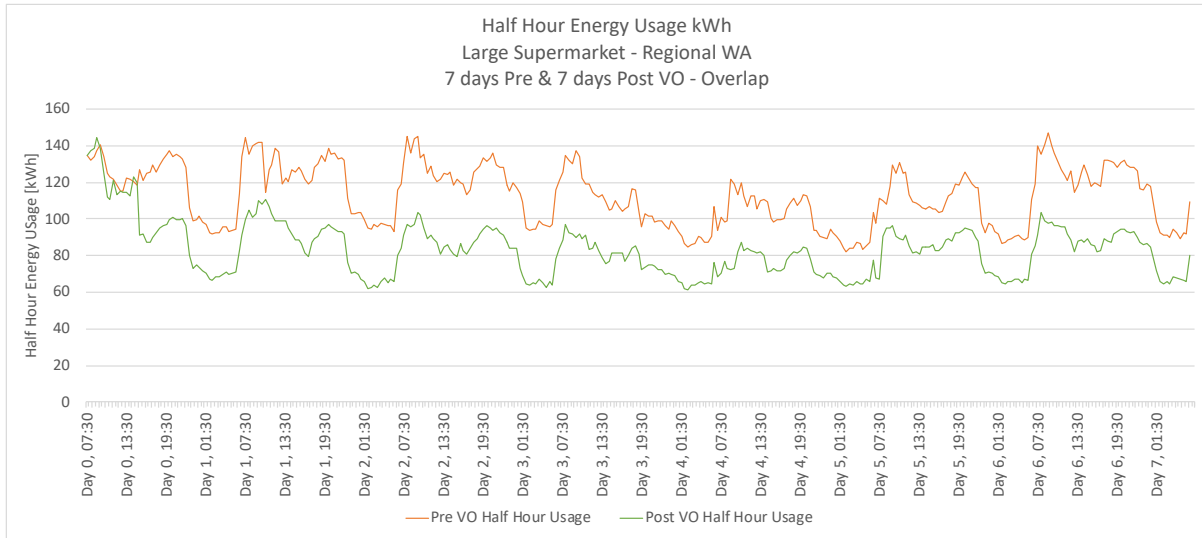
Energy Usage Profiles

Figure 5 Half Hour Energy Usage across the 14 day Study Period



In the following figure, the half hour energy usage for the Baseline Period (Pre VO) and the Measurement Period (Post VO) are plotted together, over the synchronised 7 days of each period. The difference in the two plots is the energy savings, and it is significant across the Post VO period.

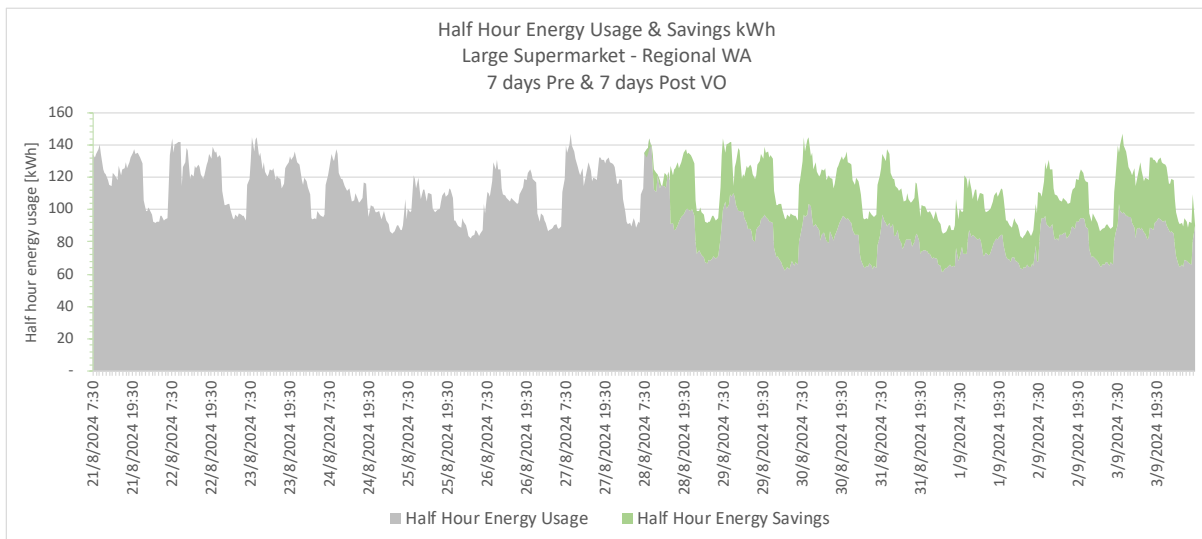
Figure 6 Half Hour Energy Usage for the 7 day periods Pre and Post VO activation



Energy Savings Profile

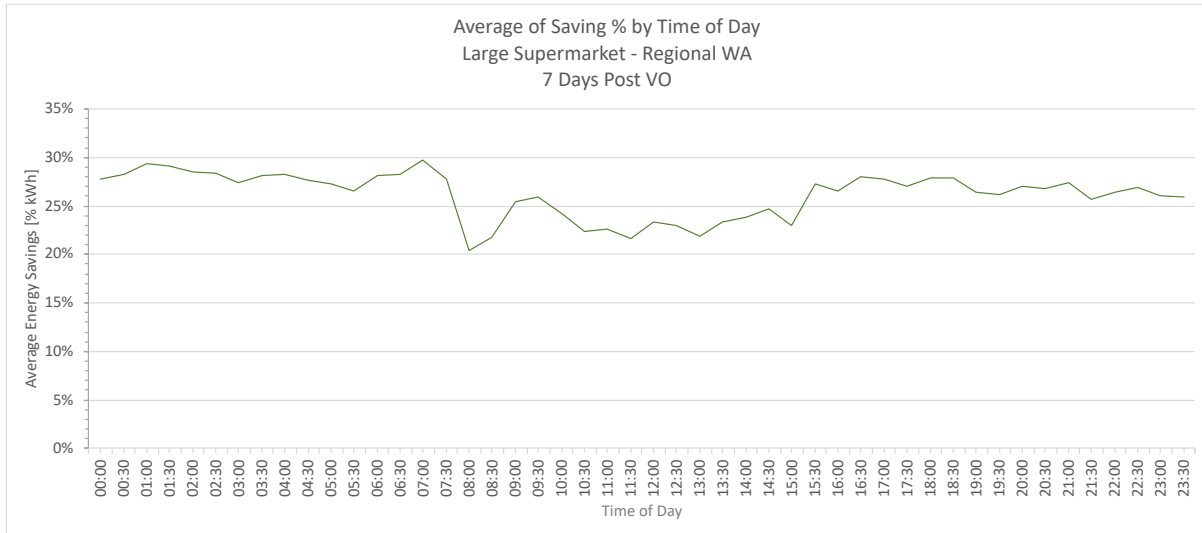
In the following figure the energy savings performance is shown when the Voltage Optimisation (VO) is activated. The reduction in energy usage is readily apparent during the 7 day Measurement Period. The energy savings shown in green are significant.

Figure 7 Average Half Hour Energy Savings across the 7 day Measurement Period



In the following figure the energy savings performance is plotted by time of day. The energy savings shown is the average half hour savings for that time of day across the 7 days of the Measurement Period. Of note is the fairly consistent savings across the day.

Figure 8 Average Half Hour Energy Savings across the 7 day Measurement Period



Conclusion

The conclusion following IPMVP analysis is that energy savings of 26.08% kWh are directly attributed to Voltage Optimisation at the Large Supermarket facility.

The analysis has been careful to ensure methodological rigour, and attention to detail, to explain variation in energy usage across the period.

The mean reduction in voltage and the reduction in its variance demonstrates the fine level of voltage control performance achieved using a fully dynamic voltage control with rapid response.

Voltage as a Service (VAAS) offers both immediate and long-term financial benefits while aligning with broader strategic goals related to sustainability, operational efficiency, and risk management. These benefits make VAAS an attractive proposition for businesses looking to reduce energy costs, enhance their environmental credentials, and improve their overall competitiveness.

Voltage as a Service (VAAS) can provide a very useful contribution to a company’s plans to meet its Carbon emission targets, as well as reporting requirements. Voltage as a Service (VAAS) provides the right voltage to electrical equipment, ensuring efficiency, cost savings, environmental benefits and performance reporting while maintaining equipment performance and longevity.

For further information, contact us at sales@vaasco.net

VAASCO GROUP

VAASCO Group Ltd ABN 80 653 685 164
corporate HQ – Suite 3, Level 10, 45 William Street, Melbourne VIC 3000 Australia
correspondence - PO Box 7, Flinders Lane Victoria 8009 Australia

phone +61 2 9475 0971

fax +61 2 9475 4055

email sales@vaasco.net

web www.vaasco.net