



Measuring and Verification (M&V) Savings Report

SOLAR ASSISTED Air conditioning,
Toyota Tsusho, Durban South Africa

ASSESSMENT PERIOD April 2017

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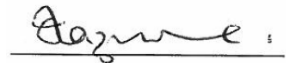
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List of Abbreviations

RTE	Real Time Energy
M&V	Measuring & Verification
ECM	Energy Conservation Measure
ESCo	Energy Service Company

1 Introduction

1.1 Toyota Tsusho Company Overview

Toyota Tsusho Africa (Pty) Ltd (TTAF), established in 1999, is a wholly owned subsidiary of Toyota Tsusho Corporation (TTC), founded as a trading and supply-chain specialist. TTAF is a multi-business enterprise, comprising of 'Mobility', 'Life & Community' and 'Earth & Resource' capabilities, strategically located to ensure optimal service and delivery output to our customers. TTAF manufactures the following at this facility based in Durban South (Wheel and Tyres assemblies, Airbags, Rubber Linings and Brakes).

In line with Toyota Tsusho strategy on energy conservation, Tsusho has undertaken to install a Solar Assisted air conditioning system to replace the aged air conditioning system.

Measurement and Verification (M&V) is the process of forecasting the savings and measuring the actual savings from energy management, energy conservation and/or energy efficiency projects.



Figure 1: Location of Toyota Tsusho

1.2 Scope of Measurement and Verification (M&V) Review

The agreed focus for the M&V review was the:

- i. Pre-installation M&V consisting of a baseline model using historical data taking into account any correlated independent variables
- ii. Develop an M&V plan detailing
 - the measurement boundary
 - how savings will be calculated
 - how long performance will be evaluated
- iii. Indication of the M&V protocol utilized in determining the baseline

1.3 Project Overview

The planned M&V activities for this M&V project will be classified according to SANS 50010 M&V framework document as well as the M&V Performance Contracting Guideline, thereby determining the M&V methodology and plan the activities accordingly; where necessary, develop the specification and installation procedures for the project-specific metering to collect the necessary data to develop, characterise and verify the baseline models. This section also specifies the metering activities necessary to obtain the required M&V data after project implementation.

The purpose of the Baseline M&V Report is to provide the baseline power demand and energy consumption of this project that will represent what it would have been if the Energy Conservation Measures (ECM) were not implemented. The post-implementation power and energy measurements will be compared to that of the baseline and the savings will be calculated.

This document provides:

- A description of the project, its activities and the stakeholders;
- The baseline methodology applicable to this project;
- The measurements that were taken to determine the baseline power demand and energy consumption; and
- The baseline values that represent the baseline power demand and energy consumption of this project.
- Calculation methodology for monthly savings

2 Savings

The summary of Energy and Demand savings for April 2017 is as follows:

Rand Value of kWh Savings (R0.7686kWh)	R	11 138.15	14492.4 kWh
Demand Savings (R81.70/kVA)	R	4 201.77	51.43 kVA
Total Savings	R	15 339.91	

2.1 Energy Savings Determination

Savings kWh = old energy use kWh – new energy use kWh

Date	Heat Load	ThermX [kWh]	Weekday/Weekend	Public Holiday	M&V Allocated Day	Baseline [kWh]	Savings [kWh]
2017-04-01	5.3	258.8	Saturday	No	Saturday	373.3	114.5
2017-04-02	5.1	116.1	Sunday	No	Sunday	487.6	371.5
2017-04-03	4.3	322.1	Weekday	No	Weekday	918.3	596.2
2017-04-04	4.4	406.7	Weekday	No	Weekday	924.0	517.3
2017-04-05	4.7	324.1	Weekday	No	Weekday	941.4	617.3
2017-04-06	1.8	152.5	Weekday	No	Weekday	773.8	621.4
2017-04-07	2.1	147.6	Weekday	No	Weekday	791.2	643.6
2017-04-08	3.9	69.9	Saturday	No	Saturday	357.3	287.3
2017-04-09	4.5	44.7	Sunday	No	Sunday	460.3	415.6
2017-04-10	4.5	321.3	Weekday	No	Weekday	929.8	608.5
2017-04-11	3.9	338.2	Weekday	No	Weekday	895.2	557.0
2017-04-12	3.8	216.1	Weekday	No	Weekday	889.4	673.3
2017-04-13	4.6	266.7	Weekday	No	Weekday	935.6	668.9
2017-04-14	0.2	50.8	Weekday	Good Friday	Sunday	264.5	213.8
2017-04-15	0.3	26.7	Saturday	No	Saturday	316.0	289.3
2017-04-16	1.3	26.4	Sunday	No	Sunday	314.6	288.2
2017-04-17	1.7	42.3	Weekday	Family Day	Sunday	332.8	290.5
2017-04-18	1.7	95.7	Weekday	No	Weekday	768.1	672.4
2017-04-19	2.2	91.7	Weekday	No	Weekday	797.0	705.3
2017-04-20	1.9	134.3	Weekday	No	Weekday	779.6	645.3
2017-04-21	1.8	118.5	Weekday	No	Weekday	773.8	655.3
2017-04-22	1.8	43.3	Saturday	No	Saturday	333.2	289.9
2017-04-23	1.5	74.1	Sunday	No	Sunday	323.7	249.6
2017-04-24	0	64.4	Weekday	No	Weekday	669.9	605.5
2017-04-25	0.5	77.3	Weekday	No	Weekday	698.7	621.4
2017-04-26	1.8	84.7	Weekday	No	Weekday	773.8	689.1
2017-04-27	2	56.2	Weekday	Freedom Day	Sunday	346.5	290.2
2017-04-28	2.3	113.3	Weekday	No	Weekday	802.7	689.4
2017-04-29	2.1	48.5	Saturday	No	Saturday	336.6	288.2
2017-04-30	2	29.7	Sunday	No	Sunday	346.5	316.8
						14492.5 kWh	
							77.7%
		Rand Value of kWh Savings (R0.7686kWh)		R	11 138.15		
		Demand Savings (R81.70/kVA)		R	4 026.69	49.29 kVA	
		Total Savings		R	15 164.84		

2.2 Demand Savings Determination

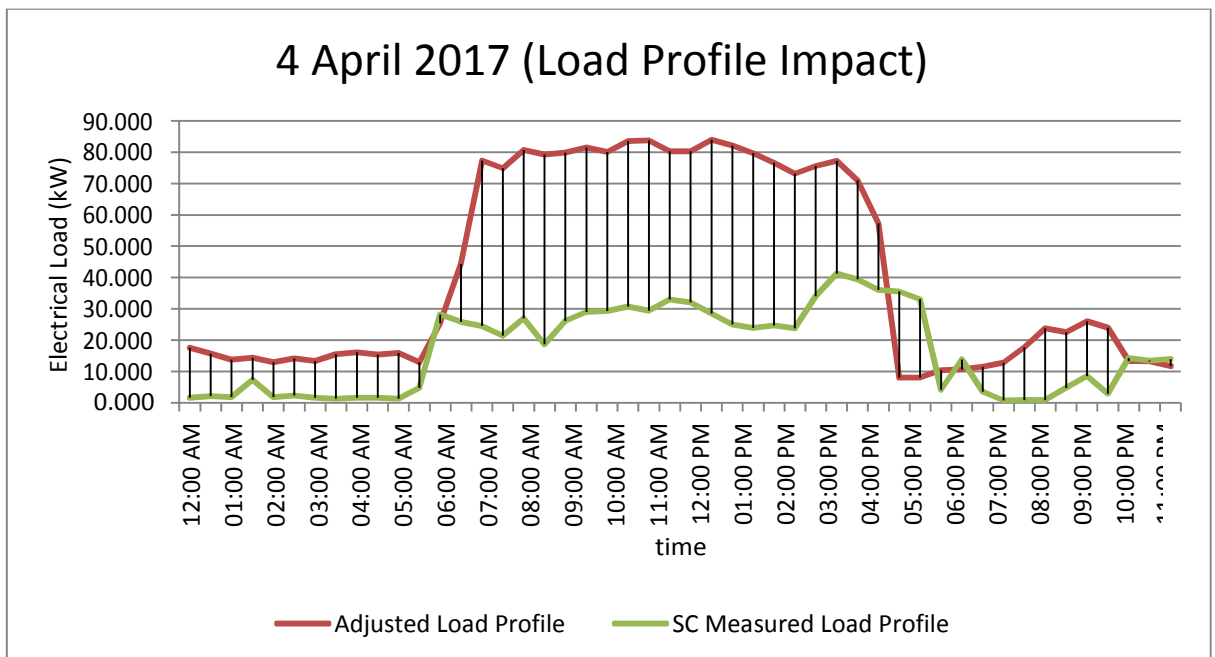
The data obtained at the baseline phase was used to develop the project baseline. The baseline profile consists of the average half hourly kW values for the Baseline phase divided into Weekdays, Saturdays and Sundays.

The demand baseline profile provided will thus be used to describe the Pre-implementation conditions for the installation of the ThermX HVAC plant energy conservation project. This baseline “profile” will remain unchanged throughout the savings determination unless baseline adjustments become necessary (metering data availability and other non-routine factors). Monthly baseline adjustments are made to allow for seasonal environmental changes.

Demand savings is determined at the time when the plant load reaches its maximum kVA usage over a half hour period. This point is identified at the end of each month and then the change of load profile is determined for ThermX energy conservation measure.

Table 1: Information Table for Maximum Demand Savings

	Source of Data		
Date of Assessment		15-May-17	
Month of Assessment		April 2017	
Max of Heat Load at Plant MD (weekdays)	Import from Heat Load Table	4.4	
Determined MD	From MD Regression Calculation in Baseline	83.94	kW
Baseline MD	From Baseline Data	65.653	
Baseline Adjustment Factor		1.279	
Time of SC MD		12:30 PM	
Date of Plant MD	From Main Meter	04-Apr-17	
Time of Plant MD	From Main Meter	11:30 AM	
SC Demand at Plant MD (kW)		80.28	kW
MD Savings		47.31	kW
Maximum Demand Savings		51.43	kVA
		41%	



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Table 2: Demand Baseline values for Weekday, Saturday and Sunday Operational Profile

time	Baseline (weekday)	Adjusted Load Profile	SC Measured Load Profile	Savings
12:00 AM	13.735	17.561	1.663	15.899
12:30 AM	12.337	15.774	2.121	13.653
01:00 AM	10.790	13.795	1.825	11.970
01:30 AM	11.311	14.461	7.357	7.104
02:00 AM	10.195	13.035	1.879	11.156
02:30 AM	11.127	14.226	2.391	11.836
03:00 AM	10.468	13.383	1.652	11.731
03:30 AM	12.156	15.541	1.394	14.148
04:00 AM	12.630	16.148	1.703	14.444
04:30 AM	12.110	15.482	1.680	13.802
05:00 AM	12.513	15.998	1.398	14.599
05:30 AM	10.124	12.943	4.770	8.174
06:00 AM	19.876	25.412	28.172	-2.760
06:30 AM	34.680	44.339	25.806	18.533
07:00 AM	60.426	77.255	24.531	52.724
07:30 AM	58.514	74.811	21.412	53.399
08:00 AM	63.128	80.710	26.980	53.730
08:30 AM	61.971	79.231	18.722	60.509
09:00 AM	62.457	79.853	26.141	53.712
09:30 AM	63.739	81.491	29.062	52.429
10:00 AM	62.597	80.031	29.334	50.697
10:30 AM	65.295	83.482	30.724	52.757
11:00 AM	65.520	83.768	29.467	54.302
11:30 AM	62.788	80.275	32.960	47.315
12:00 PM	62.784	80.271	32.066	48.205
12:30 PM	65.653	83.939	28.544	55.395
01:00 PM	64.209	82.092	25.075	57.017
01:30 PM	62.313	79.669	23.884	55.785
02:00 PM	59.896	76.579	24.714	51.865
02:30 PM	57.166	73.087	23.846	49.241
03:00 PM	59.098	75.558	34.063	41.495
03:30 PM	60.376	77.191	41.266	35.925
04:00 PM	55.508	70.968	39.422	31.547
04:30 PM	44.795	57.271	36.082	21.189
05:00 PM	6.303	8.058	35.518	-27.460
05:30 PM	6.342	8.109	33.083	-24.975
06:00 PM	8.142	10.409	4.192	6.217
06:30 PM	8.415	10.759	13.950	-3.191
07:00 PM	9.026	11.540	3.616	7.924
07:30 PM	10.084	12.893	0.838	12.055
08:00 PM	13.943	17.826	0.909	16.918
08:30 PM	18.607	23.790	0.900	22.890
09:00 PM	17.653	22.570	4.860	17.710
09:30 PM	20.349	26.017	8.592	17.425
10:00 PM	18.798	24.033	2.979	21.054
10:30 PM	10.464	13.379	14.313	-0.934
11:00 PM	10.389	13.283	13.540	-0.257
11:30 PM	9.197	11.758	14.049	-2.291

2.3 Length of the performance period

This is the second of 12 savings reports.

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