

**HOLISTIC DESIGN APPROACH FOR A  
SMALL SCALE DOMESTIC SAPS  
ON THE  
CENTRAL WHEAT BELT OF WESTERN AUSTRALIA**

**Presented by**

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TOP: Proposed domestic SAPS site near Cunderdin Air Field  
(sourced from the site owners, 2009);

BOTTOM: Jura International, Impressa S9 One Touch Coffee Machine  
(Jura International, 2010)

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School of Engineering and Energy  
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# DECLARATION

Except where otherwise indicated the work presented  
in this dissertation is the outcome of my own research.

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Karl William Tunnicliffe

# ABSTRACT

The objective for this research project was to develop a commercially feasible holistic design approach for small scale stand alone power supply (SAPS) systems. Technical and economic performance expectations may conventionally be viewed as dominant design influences. A feasibility study for the options available to a proposed small scale domestic SAPS on the Central Wheat Belt of Western Australia fulfilled the role of a case study in exploring the holistic design approach.

Overall the research project comprised developing together with implementing the holistic design approach through the SAPS case study and analysing the outcome. The principal tools involved in the design approach were AS4509 part 2, HOMER and a holistic design tool that was developed for the purposes of holistically screening and ranking the prospective energy system solutions.

An important feature of the holistic design tool was considered that it assisted in transparently capturing together with communicating the reasoning behind the recommended holistically optimal solutions. Opportunity costs were included in the HOMER simulations to account for the time commitments of the clients that were projected to be involved in the solution options.

A commercially feasible structure was considered to have been established for the holistic design approach as an outcome of the research. The structure provided the foundations for progressive enhancements to the consistency, repeatability, productivity and meaningfulness of the approach. In the short run the structure was viewed to have achieved a practical solution for the case study in the form of a prospectively holistically optimised system for recommended implementation.

# TABLE OF CONTENTS

<b>ABSTRACT</b> .....	<b>III</b>
<b>LIST OF FIGURES</b> .....	<b>VI</b>
<b>LIST OF TABLES</b> .....	<b>VII</b>
<b>LIST OF ABBREVIATIONS</b> .....	<b>VIII</b>
<b>ACKNOWLEDGEMENTS</b> .....	<b>IX</b>
<b>1.0 INTRODUCTION</b> .....	<b>1</b>
1.1 BACKGROUND .....	1
1.1.1 <i>A Definition for “A Holistic Design Approach”</i> .....	2
1.2 OBJECTIVE .....	3
1.3 STRUCTURE OF THE DISSERTATION .....	4
<b>2.0 METHOD</b> .....	<b>5</b>
2.1 METHOD OUTLINE .....	5
2.2 AS4509.2.....	6
2.3 CLIENT CONSULTATION AND SITE VISIT .....	7
2.4 LOAD PROFILE CONSTRUCTION .....	7
2.5 ENERGY SOURCES EVALUATION.....	10
2.6 BASE CASE IDENTIFICATION .....	11
2.7 BACK OF THE ENVELOPE CALCULATIONS.....	12
2.8 HOMER .....	13
2.9 SYSTEM CONFIGURATION ESTABLISHMENT .....	15
2.10 TECHNICAL SPECIFICATIONS COMPILATION .....	15
2.11 COSTING APPROACH .....	16
2.12 HOLISTIC DESIGN TOOL DEVELOPMENT .....	19
2.12.1 <i>Lessons Used</i> .....	19
2.12.2 <i>Bullet Points Analysis (BPA)</i> .....	21
2.12.3 <i>Example Application of the Holistic Design Tool</i> .....	22
2.12.3.1 <i>Bullet Points Analysis by Example</i> .....	22
2.12.3.2 <i>Holistic Weights Scale by Example</i> .....	23
2.12.3.3 <i>Three Calculated Holistic Ranking Parameters by Example</i> .....	24
2.12.3.4 <i>Holistic Curve by Example</i> .....	25
2.12.4 <i>Holistic Ranking Process</i> .....	26
2.12.4.1 <i>Holistic Index Filter</i> .....	26
2.12.4.2 <i>Holistic Index Scale</i> .....	28
2.12.4.3 <i>Holistic Index Ranking Interpretation</i> .....	29
<b>3.0 RESULTS</b> .....	<b>31</b>
3.1 RESULTS OUTLINE .....	31
3.2 CLIENT AND SITE PROFILE .....	31
3.3 LOAD PROFILE .....	35
3.3.1 <i>Electrical Energy Service Expectations</i> .....	35
3.3.2 <i>Load List</i> .....	36
3.3.3 <i>Energy Usage</i> .....	38
3.3.4 <i>Peak and Surge Loads</i> .....	38
3.3.5 <i>Load Management</i> .....	42
3.3.6 <i>Average Daily Load Profile</i> .....	43
3.3.7 <i>Inverter Sizing</i> .....	45

3.4 SYSTEM ENERGY SOURCES .....	49
3.4.1 Diesel Genset.....	49
3.4.1.1 Back of the Envelope Calculations .....	49
3.4.1.2 Technical Specifications .....	50
3.4.1.3 Costing .....	51
3.4.2 Lead Acid Battery Bank .....	54
3.4.2.1 Back of the Envelope Calculations .....	54
3.4.2.2 Technical Specifications .....	56
3.4.2.3 Costing .....	57
3.4.3 Wind Turbine.....	59
3.4.3.1 Wind Source Assessment.....	59
3.4.3.2 Back of the Envelope Calculations .....	67
3.4.3.3 Technical Specifications .....	69
3.4.3.4 Costing .....	70
3.4.4 Photovoltaic Array.....	73
3.4.4.1 Solar Source Assessment .....	73
3.4.4.2 Back of the Envelope Calculations .....	76
3.4.4.3 Technical Specifications .....	78
3.4.4.4 Costing .....	80
3.5 SYSTEM CONFIGURATION.....	82
3.6 BASE CASES.....	83
3.6.1 Grid Connection.....	83
3.6.1.1 Worksheet Calculations .....	83
3.6.1.2 HOMER Break Even Connection Distance .....	84
3.6.2 Diesel-Battery-Inverter SAPS .....	86
3.7 HOLISTIC RANKING .....	87
3.7.1 Inductive Reasoning of the Holistic Weights .....	87
3.7.1.1 Bullet Points Analysis (BPA) .....	92
3.7.1.2 HOMER Simulations Holistic Weights Contribution .....	94
3.7.2 Holistic Ranking Outcome .....	99
<b>4.0 ANALYSIS OF RESULTS.....</b>	<b>101</b>
4.1 SIMPLE AND SUITABLY QUICK TO APPLY? .....	101
4.2 PRODUCTIVE USE OF TIME AND BASIC RESOURCES? .....	103
4.3 ENHANCED TRANSPARENCY IN THE SOLUTION PROCESS? .....	104
4.4 HOLISTICALLY MEANINGFUL AND USEFUL OUTCOMES? .....	105
<b>5.0 FUTURE RESEARCH.....</b>	<b>108</b>
<b>6.0 CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>109</b>
<b>7.0 REFERENCES .....</b>	<b>112</b>
<b>APPENDICES .....</b>	<b>122</b>
A1.0 EXTENDED SUMMER AND WINTER .....	122
A2.0 EQUATIONS FOR HBP, MHI AND HI.....	123
A3.0 AVERAGE DAILY ENERGY USAGE WORKSHEET .....	124
A4.0 DAILY PEAK LOAD MANAGEMENT MAP.....	127
A5.0 METEOROLOGICAL DATA ANALYSES.....	130
A6.0 GRID CONNECTION LIFE CYCLE COSTING EXCEL WORKSHEET .....	137
A7.0 HOLISTICITY CURVE - LEAD ACID BATTERY BANK .....	139
A8.0 BPA FOR PV – ECONOMIC HF AND ENVIRONMENTAL HF.....	140
A8.1 Economic BPA – Photovoltaics.....	140
A8.2 Environmental BPA – Photovoltaics.....	148
A9.0 HOMER SIMULATION RESULTS TABLES .....	152
A10.0 LIST OF COMPUTER FILES ON DISK.....	157
A11.0 DISK OF COMPUTER FILES .....	161

# LIST OF FIGURES

FIGURE 1.1.1 WEATHER OBSERVATION STATIONS MAP WITH THE CENTRAL WHEAT BELT SHOWN AS REGION 13 ALONG WITH CUNDERDIN AIR FIELD (CUNDERDIN AP) HIGHLIGHTED, WESTERN AUSTRALIA.....	2
FIGURE 2.12.1.1 DE BONO’S SIX THINKING HATS .....	20
FIGURE 2.12.3.4.1 HOLISTICITY CURVE FOR A THEORETICAL PROSPECTIVE PV ENERGY SYSTEM SOLUTION .....	25
FIGURE 2.12.4.1.1 HOLISTICITY INDEX FILTER; UNACCEPTABLE ENVIRONMENTAL HW IN THE HOLISTICITY CURVE TO LEFT, UNACCEPTABLE ECONOMIC AND TECHNICAL HWS IN THE HOLISTICITY CURVE TO THE RIGHT .....	27
FIGURE 2.12.4.2.1 HOLISTICITY INDEX RANKING SCALE; ILLUSTRATED ON HOLISTICITY CURVES .....	28
FIGURE 2.12.4.3.1 HOLISTICITY INDEX RANKING INTERPRETATION; ILLUSTRATED ON HOLISTICITY CURVES.....	29
FIGURE 3.2.1 PROPOSED SITE FOR THE SDPR SAPS ON THE CENTRAL WHEAT BELT OF WESTERN AUSTRALIA .....	32
FIGURE 3.2.2 SITE REVEGETATION WITH NATIVE TREES .....	32
FIGURE 3.2.3 PROSPECTIVE SITE LAYOUT FOR THE SAPS .....	34
FIGURE 3.2.4 CUNDERDIN AIR FIELD WEATHER STATION EXPOSURE: TOP – LOOKING NORTH; BOTTOM - LOOKING SOUTH .....	34
FIGURE 3.3.4.1 PEAK LOAD MAP MANAGEMENT CURVE – PRESENT SUMMER LOAD PROFILE .....	39
FIGURE 3.3.6.1 AVERAGE DAILY LOAD PROFILES CONSTRUCTED FOR USE IN HOMER: TOP - PRESENT SUMMER; MIDDLE – PRESENT WINTER; BOTTOM – FUTURE SUMMER .....	44
FIGURE 3.3.6.2 SAPS LOAD PROFILES CONFIGURED IN HOMER : TOP - PRESENT SUMMER DAILY LOADS WITH RANDOM VARIABILITY ADDED; BOTTOM – PRESENT ANNUAL PERIODIC LOAD DISTRIBUTION WITH 2 WEEKS ON AND 2 WEEKS OFF.....	44
FIGURE 3.4.3.1.1 CUNDERDIN AIR FIELD: MEAN WIND SPEED, WS – AVERAGE FOR ALL 12 YEARS BOM RAW DATA; NASA MONTHLY AVERAGE DAILY SOLAR DATA - AVERAGE DAILY SOLAR IRRADIATION ON A HORIZONTAL SURFACE, 31° (LATITUDE) COLLECTOR SLOPE AND 46° COLLECTOR SLOPE TOGETHER WITH CLEARNESS INDEX...	65
FIGURE 3.4.3.1.2 DIURNAL VARIATION IN THE AVERAGE HOURLY WIND SPEED AND AVERAGE HOURLY WIND POWER DENSITY – CUNDERDIN AIR FIELD VALIDATED DATA 2006 (YEAR 10): TOP – JANUARY; BOTTOM – JULY .....	66
FIGURE 3.4.4.1.1 EXAMPLE OF THE ANNUAL DAILY AVERAGE HOURLY SOLAR IRRADIATION PROFILE CONSTRUCTED BY HOMER FROM THE NASA ANNUAL AVERAGE MONTHLY DAILY IRRADIATION DATA FOR A HORIZONTAL SURFACE; SHOWN FOR THE DAYS FROM 1ST TO 7TH OF JANUARY .....	74
FIGURE 3.5.1 BLOCK DIAGRAM SHOWING THE GENERIC PARALLEL CONFIGURATION SAPS SYSTEM MODELLED FOR SIMULATION IN HOMER.....	82
FIGURE 3.6.1.2.1 HOMER GRID CONNECTION (“GRID EXTENSION”) OPTION CONFIGURATION DIALOGUE BOX .....	85
FIGURE 3.7.1.1 DIESEL-BATTERY-INVERTER HOLISTICITY CURVE.....	90
FIGURE 3.7.1.2 WIND-BATTERY-INVERTER HOLISTICITY CURVE .....	90
FIGURE 3.7.1.3 PV-BATTERY-INVERTER HOLISTICITY CURVE .....	90
FIGURE 3.7.1.4 GRID CONNECTION HOLISTICITY CURVE .....	90
FIGURE 3.7.1.5 PV-WIND-BATTERY-INVERTER HOLISTICITY CURVE.....	91
FIGURE 3.7.1.6 PV-DIESEL-BATTERY-INVERTER HOLISTICITY CURVE .....	91
FIGURE 3.7.1.7 WIND-DIESEL-BATTERY-INVERTER HOLISTICITY CURVE .....	91
FIGURE 3.7.1.8 PV-WIND-DIESEL-BATTERY-INVERTER HOLISTICITY CURVE .....	91
FIGURE 3.7.2.1 BLOCK DIAGRAM SHOWING THE PROSPECTIVE HOLISTICALLY OPTIMISED SAPS CONFIGURATION DESIGN SOLUTION FOR THE PRESENT PERIODIC CLIENT LOAD PROFILE; PV-BATTERY-INVERTER .....	100
FIGURE A5.1 MEAN WIND SPEED, WS – CUNDERDIN AIR FIELD 12 YEARS RAW DATA; 1997 (MEAN 1) TO 2008 (MEAN 12) .....	130
FIGURE A5.2 MEAN WIND POWER DENSITY, WPD – CUNDERDIN AIR FIELD 12 YEARS RAW DATA; 1997 (MEAN 1) TO 2008 (MEAN 12).....	131
FIGURE A5.3 MEAN AIR TEMPERATURE, AT – CUNDERDIN AIR FIELD 12 YEARS RAW DATA; 1997 (MEAN 1) TO 2008 (MEAN 12) .....	132
FIGURE A5.4 MEAN WIND SPEED, WS – CUNDERDIN AIR FIELD; ALL 12 YEARS RAW DATA, 2004 AND 2006 VALIDATED DATA, 9AM AND 3PM PREFEASIBILITY DATA, NASA DATA .....	133
FIGURE A5.5 WIND SPEED DISTRIBUTION HISTOGRAM – CUNDERDIN AIR FIELD VALIDATED DATA: TOP - 2004 (YEAR 8); BOTTOM – 2006 (YEAR 10).....	134
FIGURE A5.6 WIND DIRECTION AND ENERGY DENSITY ROSE – CUNDERDIN AIR FIELD VALIDATED DATA: TOP - 2004 (YEAR 8); BOTTOM – 2006 (YEAR 10) .....	135
FIGURE A5.7 CUNDERDIN AIR FIELD: MEAN WIND POWER DENSITY, WPD – AVERAGE FOR ALL 12 YEARS BOM RAW DATA; NASA MONTHLY AVERAGE DAILY SOLAR DATA - AVERAGE DAILY SOLAR IRRADIATION ON A HORIZONTAL SURFACE, 31° (LATITUDE) COLLECTOR SLOPE AND 46° COLLECTOR SLOPE .....	136
FIGURE A7.1 LEAD ACID BATTERY BANK HOLISTICITY CURVE .....	139

# LIST OF TABLES

TABLE 2.12.1.1 FMEA EXAMPLE RATING SCALE; SEVERITY RATING OF A POTENTIAL PROBLEM .....	20
TABLE 2.12.3.2.1 HOLISTIC RANKING SCALE - APPLICABLE TO HW, HBP AND HI .....	23
TABLE 3.3.1.1 SERVICE EXPECTATIONS IDENTIFIED AS BEST MET BY ENERGY SOURCES OTHER THAN THE SAPS .....	36
TABLE 3.3.7.1 PERCEIVED KEY DESIGN PARAMETERS FOR THE TWO INVERTERS SIMULATED IN HOMER, ALL RATINGS FOR OPERATING TEMPERATURE OF 40 °C .....	45
TABLE 3.4.3.1.1 CUNDERDIN AIR FIELD ANNUAL MEAN WIND SPEED AT THE 10 M REFERENCE ANEMOMETER HEIGHT TOGETHER WITH VARIOUS HEIGHTS INTERPOLATED USING A POWER LAW EXPONENT OF 0.14 FOR THE PREFEASIBILITY AND VALIDATED DATA .....	60
TABLE 3.6.1.1.1 GRID CONNECTION - LEVELISED NET PRESENT COST PER UNIT OF ELECTRICITY USAGE AS CALCULATED BY THE GRID CONNECTION LIFE CYCLE COSTING WORKSHEET FOR THE VARIOUS LOAD PROFILES CONSTRUCTED FOR THE CLIENTS .....	84
TABLE 3.7.1.1 HOLISTIC ANALYSIS PARAMETERS - SINGLE ENERGY SOURCES; RANKINGS INCLUDE COMPARISON WITH "HYBRID ENERGY SOURCES" TABLE .....	89
TABLE 3.7.1.2 HOLISTIC ANALYSIS PARAMETERS - HYBRID ENERGY SOURCES; RANKINGS INCLUDE COMPARISON WITH "SINGLE ENERGY SOURCES" TABLE .....	89
SOLUTIONS; FOR PRESENT AND FUTURE PERIODIC LOAD PROFILE .....	90
TABLE 3.7.1.2.1 ABBREVIATIONS USED IN THE HOMER SIMULATIONS RESULTS TABLES .....	96
TABLE 3.7.1.2.2 HOMER SIMULATION RESULTS FOR THE PRESENT PERIODIC LOAD PROFILE - FIRST HALF OF TABLE ..	97
TABLE 3.7.1.2.3 HOMER SIMULATION RESULTS FOR THE PRESENT PERIODIC LOAD PROFILE - SECOND HALF OF TABLE .....	98
TABLE 3.7.2.1 OVERALL HOLISTIC RANKING FOR PROSPECTIVE ENERGY SYSTEM SOLUTIONS; FOR PRESENT AND FUTURE PERIODIC LOAD PROFILE .....	99
TABLE A1.1 EXTENDED "SUMMER" AND "WINTER" SEASONS IN A NONE LEAP YEAR FOR AVERAGE DAILY ENERGY USAGE ESTIMATION .....	122
TABLE A3.1 AVERAGE DAILY ENERGY USAGE WORKSHEET .....	124
TABLE A4.1 DAILY PEAK LOAD MANAGEMENT MAP .....	127
TABLE A6.1 GRID CONNECTION LIFE CYCLE COSTING WORKSHEET – PERIODIC OCCUPANCY WITH PRESENT SUMMER AND WINTER LOAD PROFILE .....	137
TABLE A9.1 ABBREVIATIONS USED IN THE HOMER SIMULATIONS RESULTS TABLES .....	152
TABLE A9.2 HOMER SIMULATION RESULTS FOR THE FUTURE PERIODIC LOAD PROFILE - FIRST HALF OF TABLE .....	153
TABLE A9.3 HOMER SIMULATION RESULTS FOR THE FUTURE PERIODIC LOAD PROFILE - SECOND HALF OF TABLE ....	154
TABLE A9.4 HOMER SIMULATION RESULTS FOR THE PRESENT PERMANENT LOAD PROFILE - FIRST HALF OF TABLE ..	155
TABLE A9.5 HOMER SIMULATION RESULTS FOR THE PRESENT PERMANENT LOAD PROFILE - SECOND HALF OF TABLE .....	156

# LIST OF ABBREVIATIONS

ac	alternating current
BOM	Bureau of Meteorology
BOTECs	Back of the Envelope Calculations
BPA	Bullet Points Analysis
CFs	Capacity Factors
CWB	Central Wheat Belt
dc	direct current
DOD	Depth of Discharge
genset	generator set
HBP	Holistic Balance Point
HI	Holistic Index
HW	Holistic Weight
MHI	Mean Holistic Imbalance
MPPT	Maximum Power Point Tracker
NWIS	North West Interconnected System
O&M	Operating and Maintenance
PV	Photovoltaic
RAPS	Remote Area Power Supply
RE	Renewable Energy
REC	Renewable Energy Certificate
SAPS	Stand Alone Power Supply
SDPR	Small Domestic Periodic Residence
SSD	Small Scale Domestic
SWIS	South West Interconnected System



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