

LANGEBERG MUNICIPALITY



ELECTRICITY MASTERPLAN

Montagu Area of Supply

P302015-ELE-MPL-003-B

SEPTEMBER 2022

COMPILED FOR:

Langeberg Municipality
Private Bag X2, Ashton, 6705
South Africa
Telephone: +27 (0)23 614 8000
Facsimile: +27 (0)23 614 1841

COMPILED BY:

iX engineers (Pty) Ltd
Contact person: W Snyman
PO Box 7530, Bellville, 7535
South Africa
Telephone: +27(0)21 912 3000
Facsimile: +27(0)21 912 3222

email: wiets.s@ixengineers.co.za

LANGEBERG MUNICIPALITY

Disclaimer

This report has been prepared on behalf of and for the exclusive use of Langeberg Municipality, and is subject to and issued in accordance with the agreement between Langeberg Municipality and iXengineers (Pty) Ltd. Langeberg Municipality and iXengineers (Pty) Ltd accepts no liability or responsibility whatsoever for it in respect of any use of or reliance upon this report by any third party.

Copying this report without the permission of Langeberg and iXengineers (Pty) Ltd is not permitted.

1. EXECUTIVE SUMMARY

An electricity master plan report is a long-term planning document that investigates the current infrastructure and status of the electrical network, which forms the basis for future planning and network upgrade recommendations. Information on the changes to existing 11 kV networks were obtained from Langeberg Municipality.

This report deals with the electrical infrastructure in the Montagu supply area of Langeberg Municipality. The current notified maximum demand is 9MVA with recent maximum demand peaking at 8.2MVA. Application has been made to increase NMD to 10MVA. The load growth is forecasted at 2.29% per year based on historical average with some minor developments planned indicating that the NMD might be exceeded by 2025.

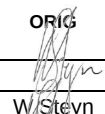
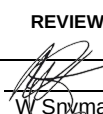
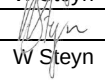
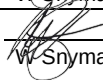
The impact of the load growth and new developments on the existing infrastructure was determined and recommendations were made on how to make sure that the electricity supply for the whole area remains reliable and of an acceptable quality.

No major capital projects are currently proposed, several smaller upgrades are recommended.

Service delivery, demand side management initiatives, assessment of asset condition and economic development and alternative sources of energy are also discussed.

The projects completed to date have been updated as applicable.

P302015-ELE-MPL-003-B

REV	DESCRIPTION	ORIG	REVIEW	iXengineers APPROVAL	DATE	CLIENT APPROVAL	DATE
A	Issued for approval	 W Steyn	 W Snyman	N/A	2022-06-27		
B	Issued for approval	 W Steyn	 W Snyman	N/A	2022-09-09		

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

CONTENTS

1.	EXECUTIVE SUMMARY	1
2.	INTRODUCTION.....	2
3.	EXISTING INFRASTRUCTURE	2
3.1	BULK SUPPLY.....	3
3.2	11KV INFRASTRUCTURE	4
3.3	NETWORK ASSESSMENT	5
3.3.1	66KV NETWORK	5
3.4	ASSET CONDITION ASSESSMENT	5
3.4.1	SWITCHGEAR.....	6
3.4.2	MINIATURE SUBSTATIONS.....	6
3.4.3	TRANSFORMERS	6
3.4.4	CONSUMER METERS	6
3.4.5	ASSESMENT OF EFFICIENCY LEVELS AND SERVICE DELIVERY	7
3.5	OPERATIONS.....	7
3.6	LEVELS OF SERVICE.....	8
3.7	DEMAND SIDE MANAGEMENT	9
4.	ENERGY LOSSES.....	9
4.1	BACKGROUND OBJECTIVE METHODOLOGY	9
4.2	MONTAGU TECHNICAL LOSSES.....	10
5.	PREVIOUS COMPLETED PROJECTS.....	10
6.	ASSESSMENT OF ECONOMIC DEVELOPMENT	11
7.	ALTERNATIVE SOURCES OF ENERGY	12
7.1	CURRENT SSEG INSTALLATIONS	12
7.2	SSEG IMPACT ON MUNICIPAL REVENUE	13
7.3	ALTERNATIVE ENERGY SUPPLY FOR MUNICIPAL BUILDINGS	14
7.4	ALTERNATIVE ENERGY SUPPLY OPTIONS FOR MUNICIPAL FEED IN POINTS.....	15

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

8.	FUTURE DEVELOPMENTS / LOAD GROWTH FORECAST	17
8.1	HISTORIC LOAD GROWTH TREND	17
8.2	PROPOSED DEVELOPMENTS	19
9.	LOAD FLOW ANALYSIS	21
9.1	METHODOLOGY	21
9.2	RESULTS OF LOAD FLOW ANALYSIS.....	21
9.2.1	CURRENT MAXIMUM DEMAND LOAD FLOW	22
9.2.2	5-YEAR MAXIMUM DEMAND LOAD FLOW	23
9.2.3	10-YEAR MAXIMUM DEMAND LOAD FLOW	25
9.2.4	VARIOUS CONTINGENCIES	26
10.	RECOMMENDED CAPITAL UPGRADES	28
11.	CONCLUSIONS	28
12.	RECOMMENDATIONS	29
	APPENDIX 1 – MONTAGU 11KV ELECTRICAL DISTRIBUTION NETWORK LAYOUT	30
	APPENDIX 2 – MONTAGU 11KV SINGLE LINE DIAGRAM	31
	APPENDIX 3 – SIMPLIFIED 11KV SINGLE LINE DIAGRAM	32
	APPENDIX 4 – ASSET CONDITION ASSESSMENT	33
	APPENDIX 5 – NETWORK TECHNICAL LOSSES CALCULATION	34
	APPENDIX 6 – SSEG IMPACT ON MUNICIPAL REVENUE	35
	APPENDIX 7 – ALTERNATIVE ENERGY SUPPLY OPTION FOR MUNICIPAL FEED IN POINTS	36
	APPENDIX 8 – PROPOSED DEVELOPMENTS	37
	APPENDIX 9 – LOAD GROWTH FORECAST	38
	APPENDIX 10 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS	39
	APPENDIX 11 – PROSPECTIVE FAULT LEVEL STUDY	40
	APPENDIX 12 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY	
	41	
	APPENDIX 13 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY	42

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 14 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS	43
APPENDIX 15 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY ...	44
APPENDIX 16 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY	45
APPENDIX 17 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS	46
APPENDIX 18 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY .	47
APPENDIX 19 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY	48
APPENDIX 20 – RECOMMENDED CAPITAL UPGRADES.....	49

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

LIST OF ABBREVIATIONS

ACSR	Aluminium Conductor Steel Reinforced
ADMD	After Diversity Maximum Demand
IDP	Integrated Development Plan
LED	Local Economic Development
LV	Low Voltage
kVA	kilovolt Ampere: Apparent Power
kW	kilowatt: Real Power
kWh	kilowatt hour
MFMA	Municipal finance management act
MV	Medium Voltage
MVA	Megavolt Ampere: Apparent Power
MW	Megawatt
NDP	National Development Plan
NMD	Notified Maximum Demand
NRS	National Rationalised Specifications
N/C	Normally Closed
N/O	Normally Open
PILC	Paper Insulated Lead Covered
PV	Photovoltaic
SALGA	South African Local Government Association
SANS	South African National Standards
SDBIP	Service Delivery Budget Implementation Plan
SDF	Spatial Development Framework
SS	Substation
SSEG	Small Scale Embedded Generation
SWH	Solar Water Heater
XLPE	Cross-linked Polyethylene

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

2. INTRODUCTION

ix Engineers (Pty) Ltd was appointed to compile a new master plan which includes updates to the previous master plan on the electricity infrastructure in the Langeberg Municipal area.

The contents of this report will cover the Montagu area of supply. The other supply areas will be covered in separate reports.

This master plan report must be read in conjunction with the drawings and other information available in the Appendices.

3. EXISTING INFRASTRUCTURE

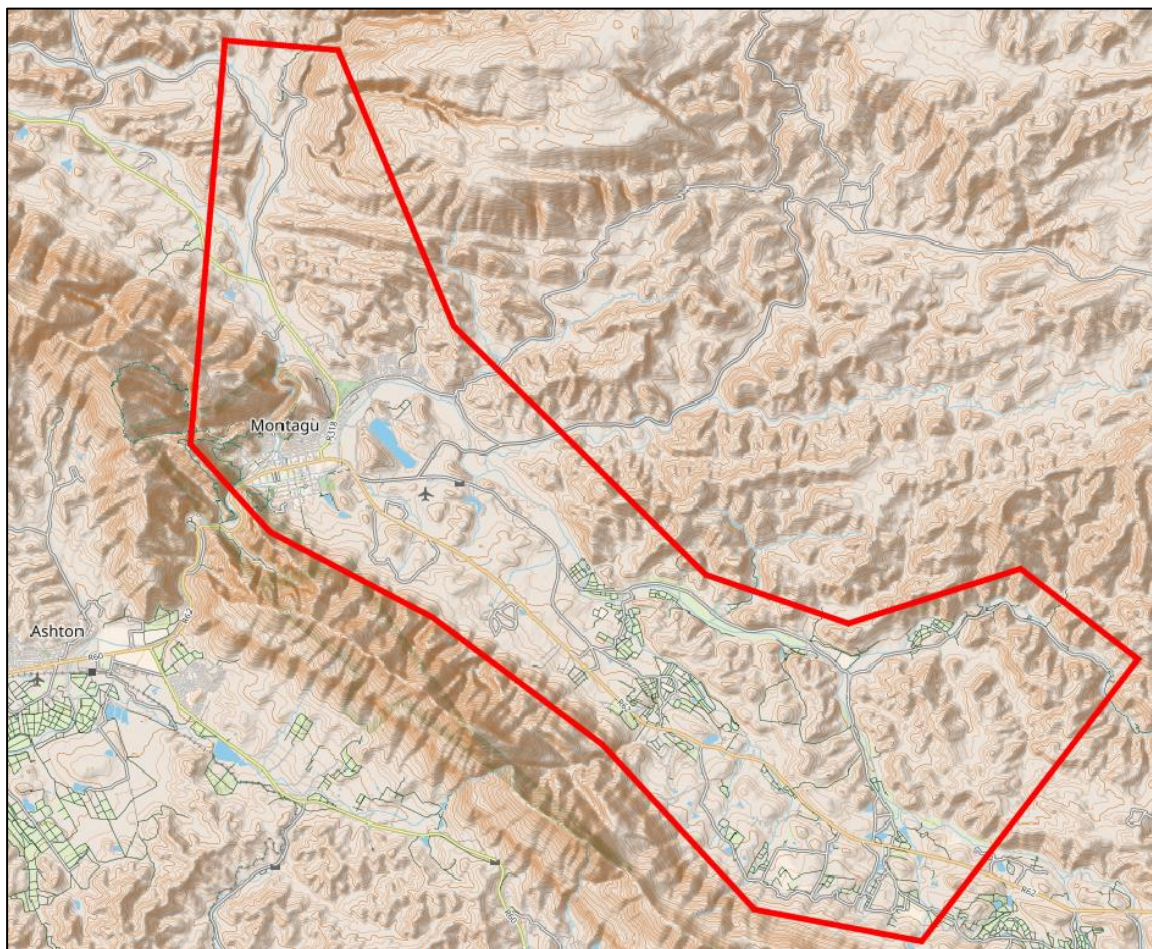


Figure 1: Montagu Distribution Area

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

3.1 BULK SUPPLY

Montagu is currently supplied in bulk from the Eskom 66/22/11 kV Montagu substation. Supply is taken at 11kV. A 66 kV ACSR Oak line feeds from the Ashton Substation to the Montagu Substation. There is currently only one 20 MVA 66/11kV transformer installed with a standby 5 MVA 66/11kV.

Montagu area is on the Megaflex tariff.

Supply Conductor	Supply Conductor Capacity (MVA)*		Supply Voltage (kV)	Maximum Demand (MVA)	Notified Maximum Demand (MVA)
	Chicadee	2 x 185mm ²			
ACSR Chicadee; 2 x 185mm ² Cable	10.1	12.95	11	8.2**	9

*Supply indicated is per feeder (Two parallel feeders run from the Eskom substation to the Montagu substation), hence 20.2MVA supply conductor capacity available.

**Maximum demand figure from March 2022.

Historical maximum demand and notified maximum figures for Montagu are shown in the chart below:

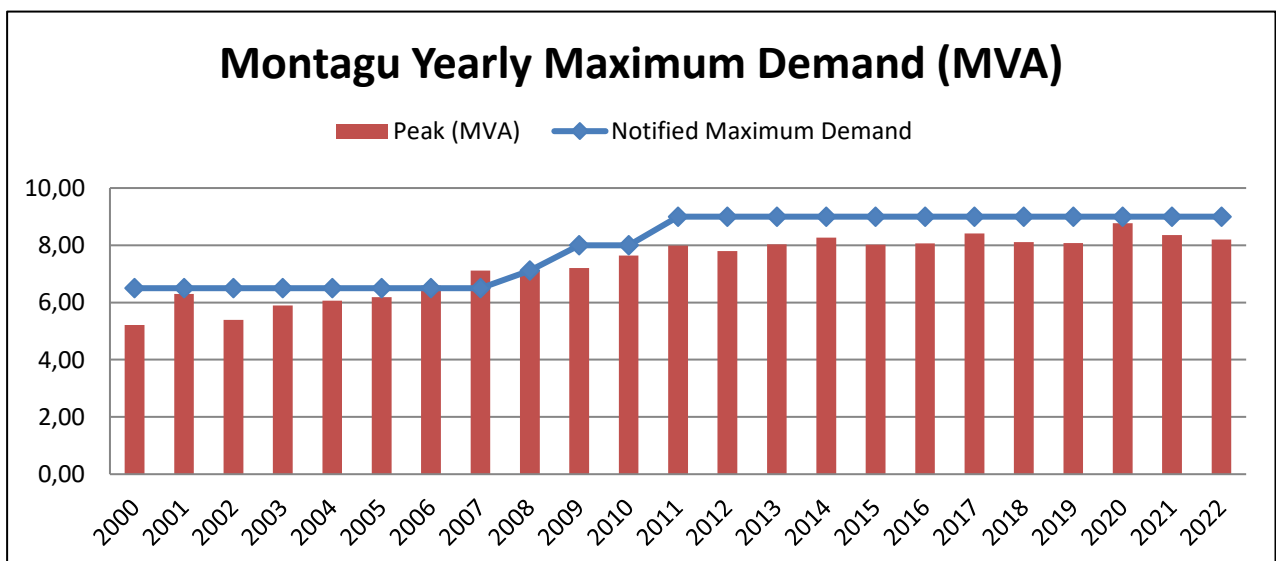


Figure 2: Montagu Yearly Maximum Demand Figures

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

Montagu has shown steady growth up until 2011, where after the demand levelled out and no significant increase has been seen since.

The current notified maximum demand (NMD) is 9 MVA. Application has been made to Eskom to increase NMD to 10 MVA.

The monthly maximum demand figures are included below indicating that Montagu area of supply reaches its peak during the month of February / March each year.

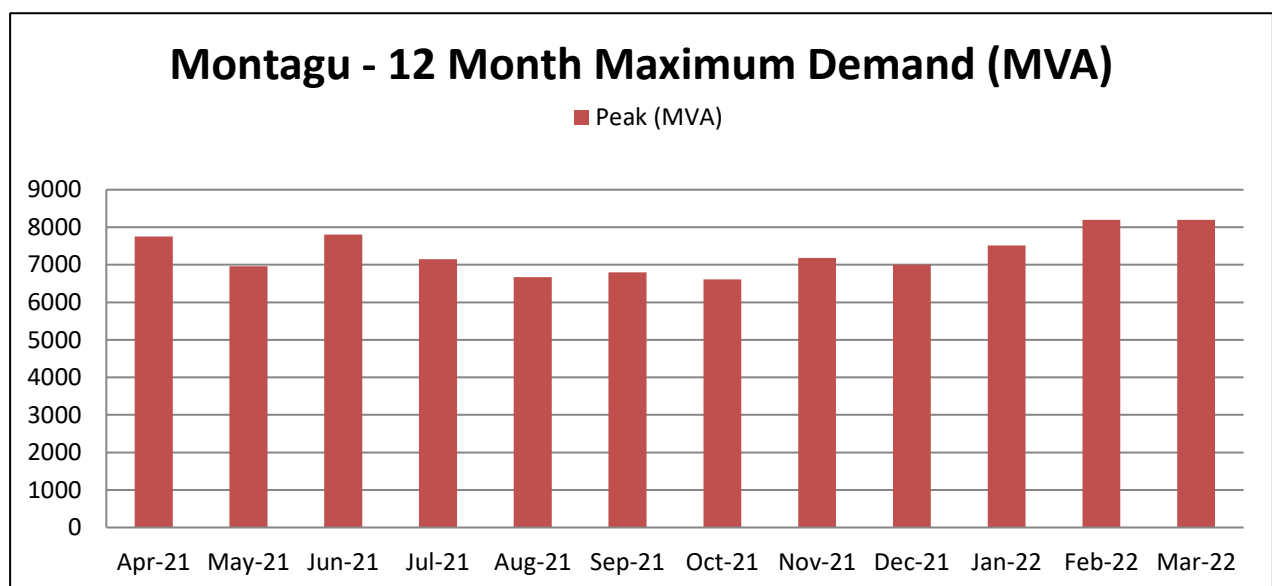


Figure 3: Montagu Monthly Maximum Demand Figures

3.2 11KV INFRASTRUCTURE

The supply is taken at 11kV from the Montagu Eskom Substation. There are two incomers that feed the Montagu 11kV main switching station. The incoming feeders are of the ACSR Chicadee type whereafter they are terminated to 2 x 185mm² three core copper underground cables per feeder and taken into the switching station building.

The bus section in the switching station is operated normally closed.

There are four feeders from the Montagu main switching station that feed the town area as well as outlying rural areas. The ring feeders from Montagu main switching station are well established and create several switching scenarios to supply power to users should faults on certain parts of the network occur. There are some spur feeders in the town area but these have been identified to be upgraded to ring networks.

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

There are also several outlying areas that are supplied on spur feeders which are not feasible to be included on the ring networks.

The 11kV cable feeders used in Montagu area consist of the PILC type. The overhead lines consist of ACSR, and bare copper conductors.

The 11kV electrical distribution network layout for Montagu is included in Appendix 1 and the single line diagram is included in Appendix 2.

The town area majorly consists of underground cable networks with sections of overhead lines that can be replaced in future to further strengthen the network.

The simplified 11kV single line diagram for the Montagu area is included in Appendix 3.

3.3 NETWORK ASSESSMENT

3.3.1 66kV NETWORK

The Montagu substation is fed from the Ashton – Montagu line. There is no alternative supply to the Montagu substation.

3.4 ASSET CONDITION ASSESSMENT

The information of existing assets was obtained from the municipal asset register.

The asset condition assessments for the various equipment are included in Appendix 4.

The expected useful life for the different asset types are indicated below as published in the Municipal Finance Management Act Guidelines.

Asset Type	Expected Useful Life (Years)
MV Transformer	45
MV Cables and Lines	45
MV Substation and Switchgear	45
LV Network	50
Consumer Meters	15

Table 1: MFMA – Local Government Capital Asset Management Guideline

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

3.4.1 SWITCHGEAR

The 11kV switchgear for the Montagu switching station were installed in 1993 and are still within the expected useful life.

3.4.2 MINIATURE SUBSTATIONS

The miniature substations are all still within their expected useful life with the oldest miniature substation due for replacement in 2041.

3.4.3 TRANSFORMERS

The assessment indicates that 63 transformers are over their expected useful life as and will need to be replaced urgently. When replacing these transformers, allowance should be made for installation of surge arrestors as some pole mounted transformers do not have surge arresters installed and are thus vulnerable to damage due to lightning strikes on the overhead line.

3.4.4 CONSUMER METERS

Langeberg Municipality is on a continued meter replacement programme. In the financial year 2020/21, 385 meters were replaced with prepaid meters for the entire Langeberg municipal area.

All STS prepayment meters will be affected by the Token Identifier (TID) rollover happening on 24 November 2024. Any tokens generated after this date will be rejected by the meter as being old tokens. The current TID base date that is used to generate tokens is 1993.

To overcome this issue, all STS prepayment meters will require a key change token to be entered into the meter and be accepted by the meter. After the key change has been accepted, the new tokens will be calculated from a 2014 base date and will have a lifespan up to 2045.

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

3.4.5 ASSESMENT OF EFFICIENCY LEVELS AND SERVICE DELIVERY

3.5 OPERATIONS

The effectiveness of operations was assessed in accordance with the requirements of the Integrated Development Plan (IDP). Basic service delivery objectives were set at restoring 95% of municipal interruptions within 4 hours and 98% within 24 hours after complaints have been received according to NRS 047 Electricity Supply – Quality of Service and Reporting Guidelines. From the below chart it is evident that both objectives have been surpassed.

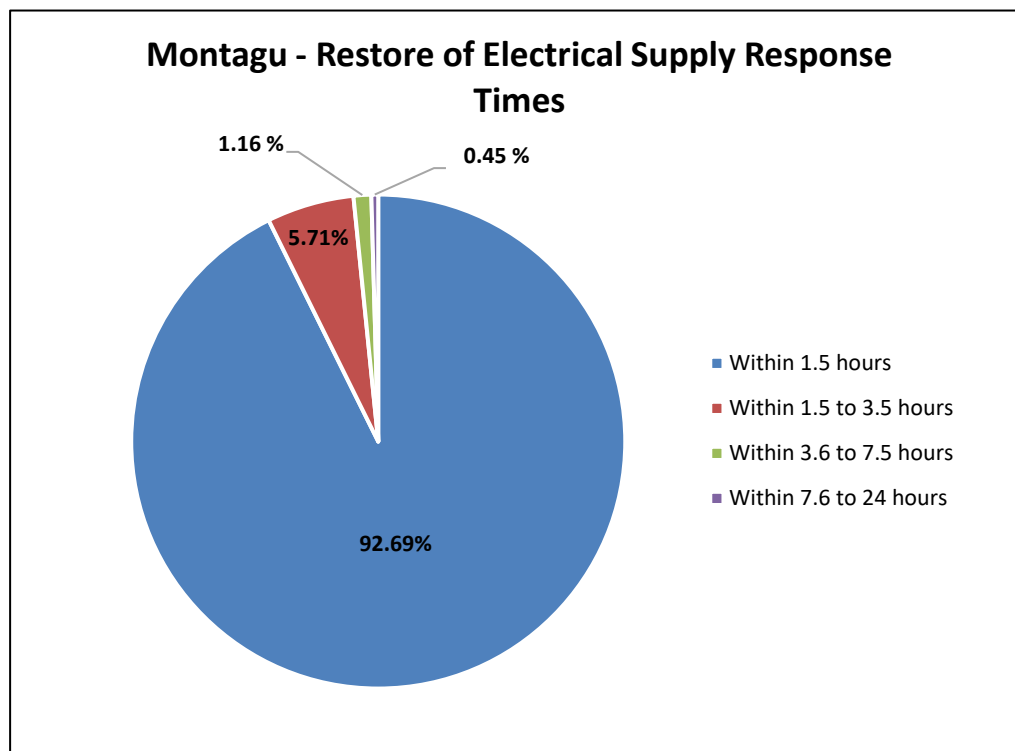


Figure 4: Electricity Supply Restore Response Times (Jan 20 – Sep 21)

The IDP also sets out an objective to provide quotations for new electricity connections (within 10 days) where existing network is being used, and within 30 days where extensions must be done.

The chart below indicates the response time success percentages per category. Deviations are indicated as 4% which is within the recommended target percentage success rate (at least 90% as stated in NRS 047) for providing quotations timeously.

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

The figures are for the whole of the Langeberg Municipal area.

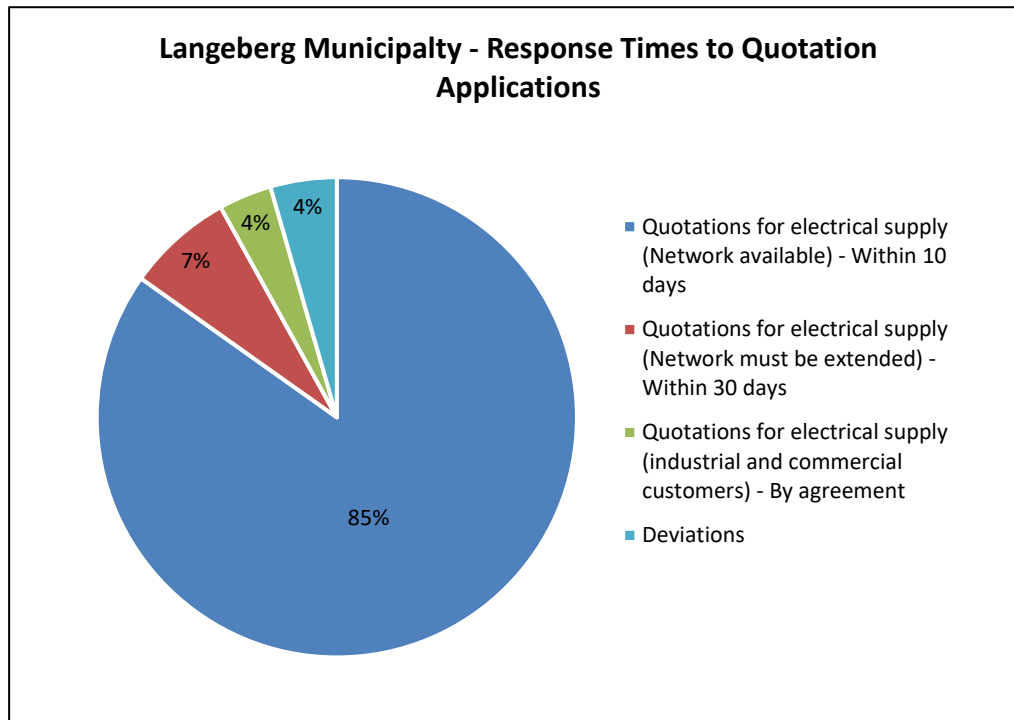


Figure 5: Quotation Application Response Times (Jun 20 – Jul 21)

3.6 LEVELS OF SERVICE

The possibility to restrict residential consumers by lowering the 60A rating of circuit breakers was also considered in this report.

According to the SDBIP figures, there are 17,804 (30 June 2021) formal residential properties connected to the municipal network which are billed.

To replace these circuit breakers will require substantial resources from the municipality to implement. If implemented, the lowered rating could cause nuisance tripping due to established consumer load profiles.

An option that could be considered is to implement the setting of meters, where applicable, to a certain amperage to trip and reset after a certain period and evaluate the response from consumers.

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

3.7 DEMAND SIDE MANAGEMENT

The following are forms of demand side management initiatives that can be implemented / expanded on to further reduce the demand of the municipality:

- Set limits on meters,
- Installation of high efficiency motors,
- Installation of variable speed drives, where feasible to reduce,
- Installation of power factor correction equipment where low power factor measurements are experienced to reduce reactive energy supply from municipal network,
- Solar water heater installations / retrofit,
- SSEG installations with backup battery systems to reduce the reliance on the municipal network during peak periods,
- Replacement of street light lamps with LED.

4. ENERGY LOSSES

4.1 BACKGROUND OBJECTIVE METHODOLOGY

The transfer of electricity from generation to the end-users involves losses in energy volumes (electrical or technical losses) that reduce the amount of electricity volumes available for sale to end-customers. In addition, other energy losses may also occur due to non-metered usage related to electricity theft (non-technical).

Energy loss is an intrinsic risk in the electricity business and utilities globally have the challenge to address this issue.

Technical losses include resistive losses of the primary feeders, the distribution transformer losses (resistive losses in windings and the core losses), resistive losses in the secondary network, resistive losses in service cables and losses in and due to kWh meter accuracy. Losses are inherent to the distribution of electricity and cannot be eliminated.

The calculation of technical losses can be done using various approaches with different degrees of accuracy. Technical losses in distribution systems are directly related to consumers' load curves, which vary due to seasonality and / or changes in load over the year. For the management of technical losses, a balance between absolute calculation accuracy and the effort must prevail. Acceptable approaches to calculate

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

technical losses of an electricity distribution network can be divided into two groups. These are the full accuracy methods and methods of representative load profiles.

4.2 MONTAGU TECHNICAL LOSSES

An investigation was done to determine the level of technical losses in the Montagu networks. The total losses were calculated by using the representative load profiles as the sum of all loads and no load losses. The table below summarises the contribution of each element in the network to the total technical loss, refer to Appendix 5 for the technical losses calculation.:

Network Element	% loss contribution
Transformers No Load Losses	0.68
Transformers Partial Load Losses	1.56
MV Network Losses	1.28
LV Network Losses	2.22
Total losses	5.75

The estimated technical loss factor for Montagu is therefore 1.0575. The Montagu network can be classified as a mixed load between industrial, urban (residential and small holdings) and rural. Using this classification and comparing the above calculated load factor to the NRS 080 table 1(a) and 1(b) guideline indicates the calculated value is within the guideline values.

5. PREVIOUS COMPLETED PROJECTS

The following capital projects were executed since 2017:

Project Description		Year	Reference numbers	Budget spent (VAT excluded)
1.	Replacement of Prepaid Meters	Continuous		
2.	Install 11kV Switchgear Brink S/S, Montagu	2019/20	T63/2018	R 850,000.00
3.	Upgrade 11kV Line to Poortjieskloof	2019/20	T64/2018	R 1,502,850.00

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

4.	Replacement of Oil Insulated Switchgear	2019/20		R 591,340.00
Total				R 2,944,190.00

6. ASSESSMENT OF ECONOMIC DEVELOPMENT

The Local Economic Development Strategy must form an integral part of the assessment, latest version available is dated May 2018.

The LED strategy is aligned with the national and provincial planning framework.

The following are requirements set out in the National Development Plan (NDP) relating to electricity needs and supported by the LED strategy of Langeberg Municipality:

Objective (NDP)	Action proposed	Langeberg Municipality Status	Objective achieved / Action required
Economic Infrastructure	90% of people with access to the electricity grid by 2030	LED strategy confirmed that 94% of households used electricity as energy source for lighting. (2017)	Objective Achieved, continuously monitor new developments and provide electricity supply as required.
	Move to less carbon-intensive electricity production (renewable energy), including solar water heating	Refer to section on Alternative Sources of Energy in the masterplan for description. SSEG grid connection allowed.	Continuous development, Langeberg Municipality to be included in future SWH programmes.
	Establish a national, regional and municipal fibre-optic network to provide the base for broad band access and attract private investment	N/A	Fibre-optic ducts could be installed, at relatively low cost, with new or replacement of existing cables on strategic routes to reduce double excavations.
Environmental Sustainability and Resilience	Municipal regulations to stimulate renewable energy	Guidelines currently in place for SSEG connection to grid	Objective achieved
	All new buildings to meet the energy-efficiency	Energy efficiency conditions included in Langeberg	Land use Planning Bylaw dated 2015 includes

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

	criteria set out in South African National Standard 204	Municipality: Land Use Planning By Law Clause 66 (2) (h)	“energy efficiency” as a condition of approval. Reference to SANS 204 “Energy efficiency in buildings” to be included.
Inclusive Rural Economy	Improved infrastructure and service delivery to activate rural economies	Installation of networks as required.	Continuous implementation.
Social Protection	Design and implement mechanisms to assist the unemployed to access the labour market	Contract Participation Goals (CPG) and Extended Public Works Programme (EPWP) requirements to be included in tender conditions	Continuous implementation and reporting in projects.

7. ALTERNATIVE SOURCES OF ENERGY

7.1 CURRENT SSEG INSTALLATIONS

There are currently 49 SSEG installations exporting into the Langeberg Municipal network. Below is a trend indicating the growth of SSEG installations.

Montagu area of supply has twelve SSEG installations with a total of 238.6 kW installed capacity. The total installed capacity of SSEG's in Langeberg Municipal area is 1,863.28kW.

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

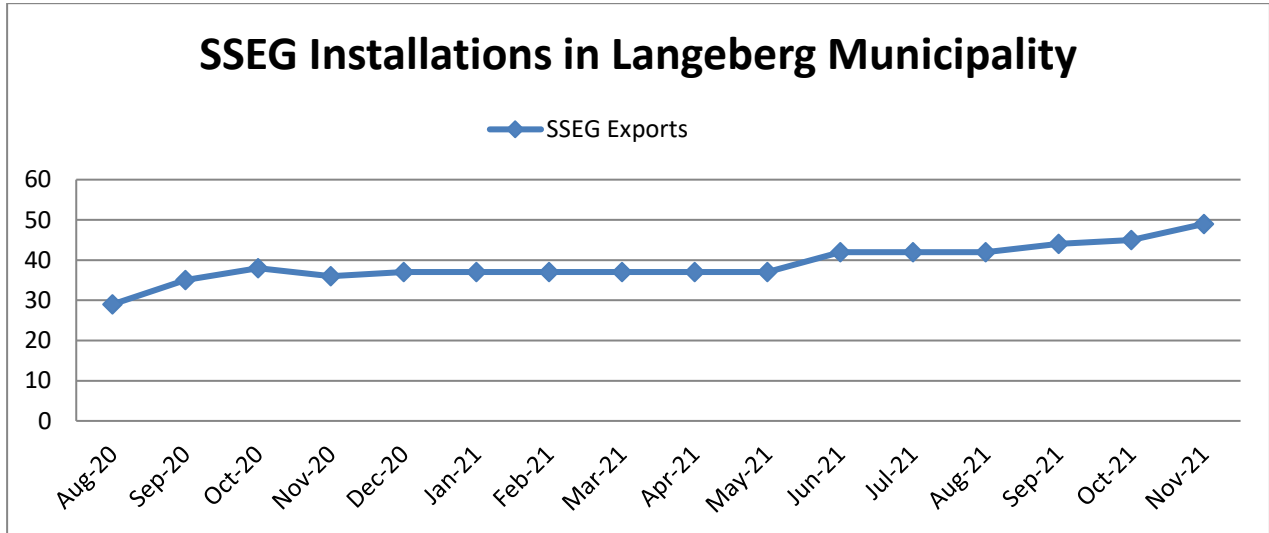


Figure 6: SSEG Installations

7.2 SSEG IMPACT ON MUNICIPAL REVENUE

A business case study on the impact of SSEG installations on municipal revenue was done and included in Appendix 6. Residential, Small Business, Medium Business and Large Business installations were considered.

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

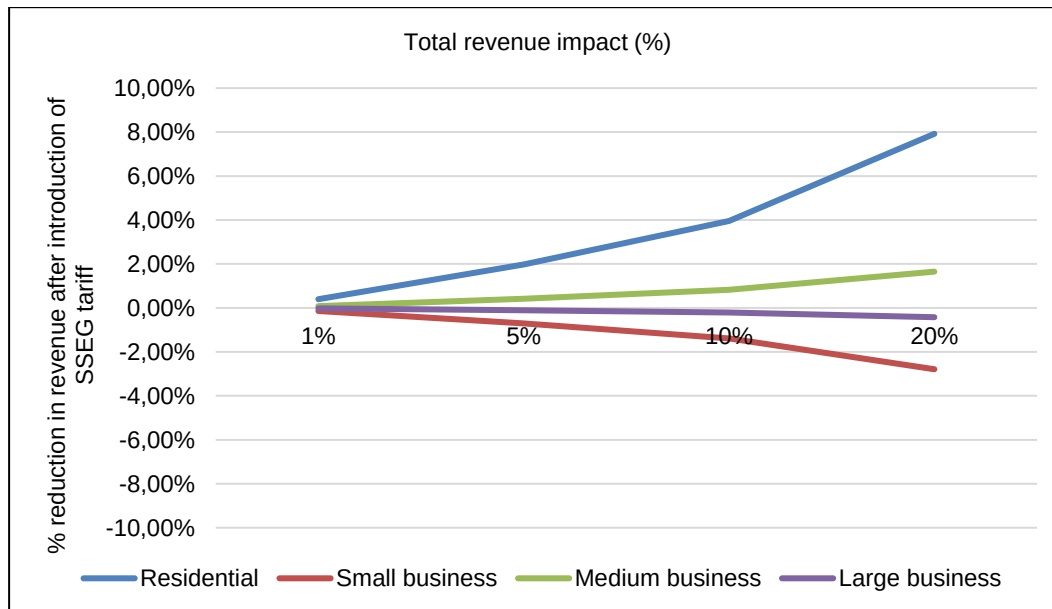


Figure 7: Revenue Impact of SSEG Installations

7.3 ALTERNATIVE ENERGY SUPPLY FOR MUNICIPAL BUILDINGS

An high level investigation into the possibility of supplying municipal buildings with alternative energy supply was undertaken. The Robertson municipal offices in Kerk Street was taken as an example study area for a solar PV system installation and report included in the Robertson area of supply masterplan report.

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

7.4 ALTERNATIVE ENERGY SUPPLY OPTIONS FOR MUNICIPAL FEED IN POINTS

A high-level investigation into the possibility of implementing a 2MWp (DC) solar PV plant at the Montagu Main substation has been undertaken. The area directly adjacent of the substation was used as a hypothetical area that could be utilised for the plant. An area of approximate 1.9 Ha would be required and the estimated annual production would be around 3.5GWh, refer to Appendix 7 for the simulation report.

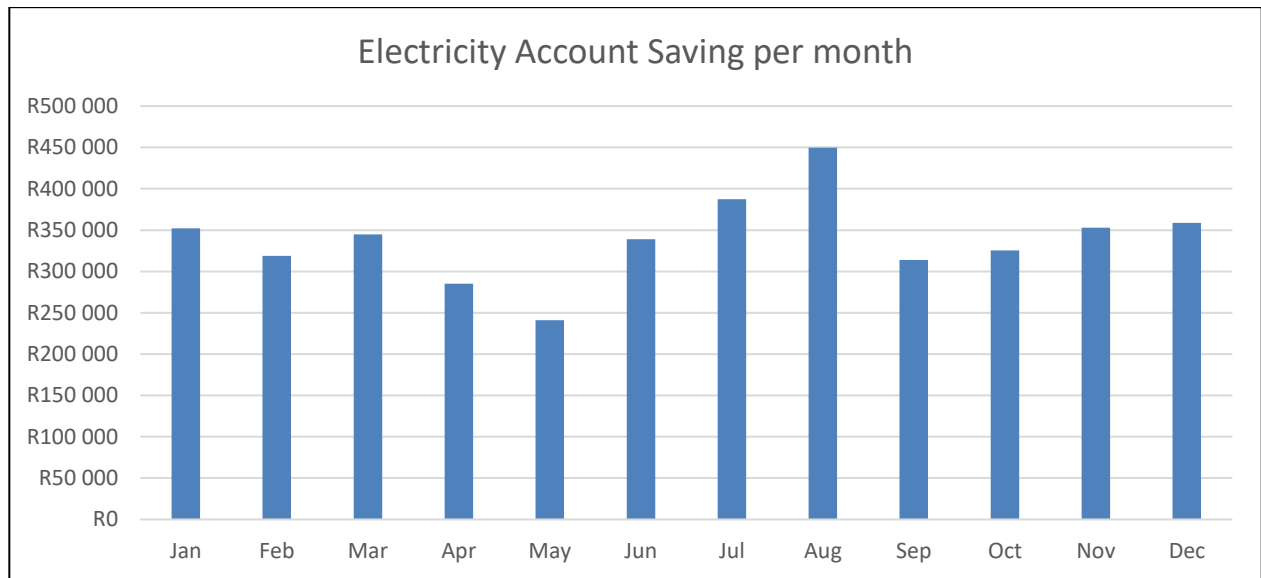
Below is a high-level cost estimate of both the capital and operation costs:

Capital Costs	
Solar PV Plant	Total
- Solar PV	24,000,000
-Perimeter Fence (electrified)	2,207,739
- CCTV	1,000,000
- Sundries	500,000
- Contingencies	2,770,774
Sub-total 1:	30,478,513
Grid Connection	
- Cable works	375,000
- Substation works	1,000,000
- Contingencies	137,500
Sub-total 2:	1,512,500
Professional Fees and Costs	
- Professional Fees	2,879,191
- Professional Costs	287,919
Sub-total 3:	3,167,110
Total (Sub-total 1+2+3)	35,158,123
Operational Costs per Annum	700,000

By applying the hourly production figures for a typical year to the applicable Eskom tariff (Megaflex 2022) and assuming no energy will be exported to the Eskom grid, the estimated monthly electricity account savings for the first year would be R4.07million. The chart below indicates the estimated saving per month:

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

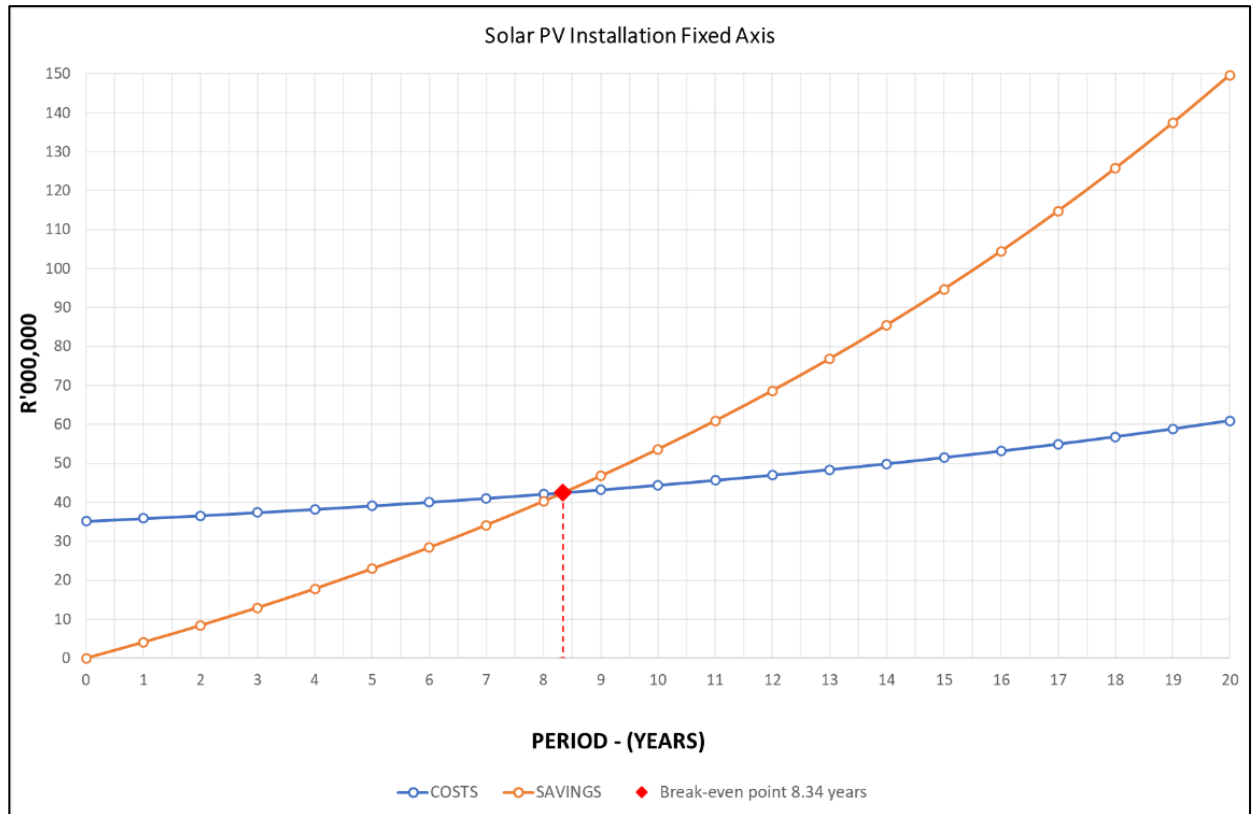


From the above a simple payback has been calculated without accounting for the costs of capital or the time cost of money. An annually compounded inflation rate of 6% has been assumed for both the O&M costs as well as tariff increases. The calculation indicates a break-even point of 8.338 years:

Solar PV - Fixed Axis					
PERIOD	Costs (R 'million)		Savings (R 'million)		NET Cashflow (R 'million)
	OPEX	Cum total	Annual	Cum total	
0		35.16		0	35.158
1	0.700	35.86	4.069	4.069	31.789
2	0.742	36.60	4.313	8.382	28.218
3	0.787	37.39	4.572	12.954	24.433
4	0.834	38.22	4.846	17.800	20.420
5	0.884	39.10	5.137	22.937	16.167
6	0.937	40.04	5.445	28.382	11.658
7	0.993	41.03	5.772	34.154	6.879
8	1.053	42.09	6.118	40.273	1.814
9	1.116	43.20	6.485	46.758	-3.556
10	1.183	44.38	6.874	53.632	-9.248
11	1.254	45.64	7.287	60.919	-15.281
12	1.329	46.97	7.724	68.643	-21.676
13	1.409	48.38	8.188	76.831	-28.455
14	1.493	49.87	8.679	85.510	-35.641
15	1.583	51.45	9.200	94.709	-43.258
16	1.678	53.13	9.752	104.461	-51.332
17	1.778	54.91	10.337	114.798	-59.890
18	1.885	56.79	10.957	125.754	-68.962
19	1.998	58.79	11.614	137.369	-78.579
20	2.118	60.91	12.311	149.680	-88.772

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY



8. FUTURE DEVELOPMENTS / LOAD GROWTH FORECAST

8.1 HISTORIC LOAD GROWTH TREND

Historic maximum demand figures for the Montagu network:

- Year 2000 : 5.21MVA
- Year 2005 : 6.19MVA
- Year 2010 : 7.65MVA
- Year 2015 : 8.02MVA
- Year 2020 : 8.77MVA

The historic maximum demand figures are based on the statistical metering data obtained from the Eskom Bulk Supply Point, as received from Langeberg Municipality.

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

Analysis of this data reveals a historical growth of 2.29% year on year average.

Using the historical figures, a graph was compiled to forecast future growth and included below:

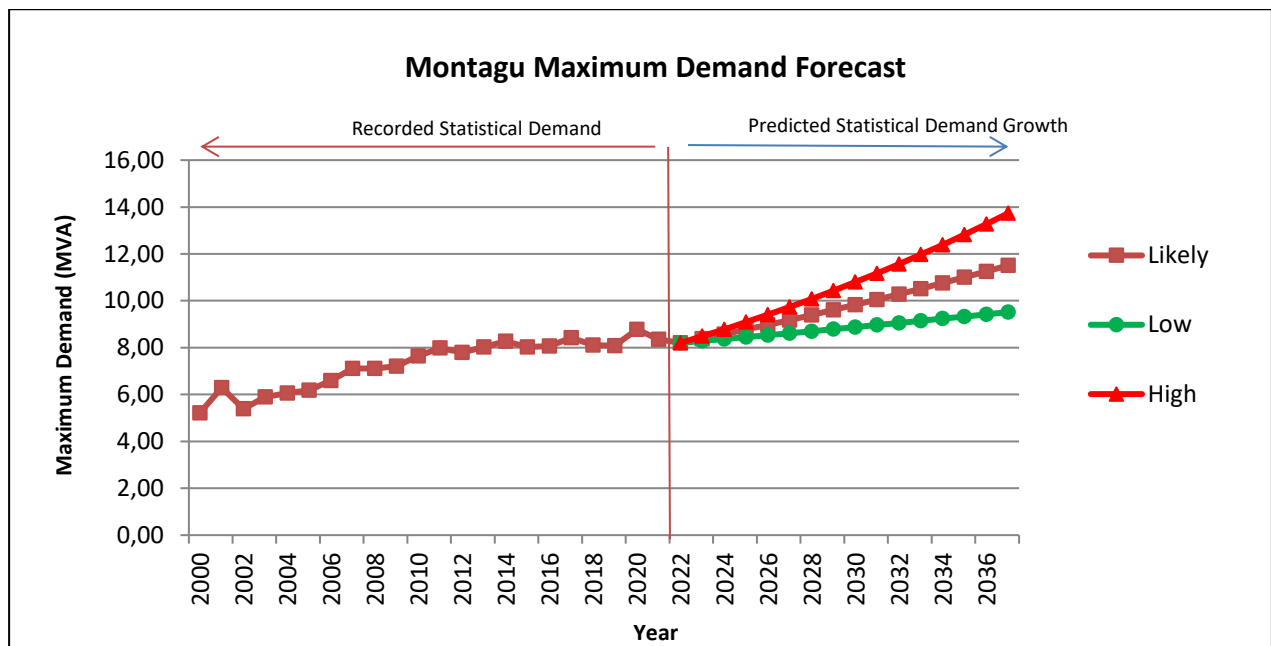


Figure 8: Montagu Maximum Demand Forecast based on historic growth

Predicted maximum demand figures for low, likely and high demand predictions are as follows:

These predictions exclude any future bulk loads.

Growth Prediction	Current	2027 (5-Year)	2032 (10-Year)
Low (1%)	8.19 MVA	8.62 MVA	9.06 MVA
Likely (2.29%)		9.18 MVA	10.28 MVA
High (3.5%)		9.74 MVA	11.56 MVA

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

8.2 PROPOSED DEVELOPMENTS

The proposed future developments as indicated on the layout in Appendix 8 and detailed forecast in Appendix 9 is a combination of information received from the Langeberg Municipality's Spatial Development Framework, current electricity supply applications submitted and correspondence with large power users.

A summary of the forecast is included on the next page.

The Montagu area is earmarked for several housing projects in particular the Mandela Square housing development.

Only loads of significant size are demonstrated separately, the remaining form part of the "Other Load Growth". The growth trend for the area will be simulated according to the likely trend of 2.29%.

Applying the above load growth forecasting, it is forecasted that the current NMD of 9 MVA will be reached by 2025.

ADMD loads for the above table were calculated as per NRS 034-1 guidelines for classification of domestic consumers. The bulk loads indicated are indications obtained from the developer.

The following classifications were used, as detailed in NRS 034-1:

- Township area – 2.37 kVA / erf
- Urban Residential 1 – 3.59 kVA / erf
- Urban Residential 2 – 4.72 kVA / erf

LANGEBERG MUNICIPALITY
ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

Summary of Load Growth Forecast:

Layout / Reference Number	Possible Developments	Area (Ha)	Number of erven	Total Load	Growth	Coinc. Factor	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Developments as per detailed Appendix																
	Other Current Loads			11,710	2.29%	0.7	11,710	11,978	12,252	12,533	12,820	13,114	13,414	13,721	14,035	14,357	14,685
	Total undiversified						11,710	12,139	12,675	13,882	14,973	15,946	17,024	17,868	18,432	18,804	19,417
	Total diversified (kVA)						8,197	8,498	8,872	9,718	10,481	11,162	11,917	12,508	12,903	13,163	13,592
	Total diversified (MVA)						8.20	8.50	8.87	9.72	10.48	11.16	11.92	12.51	12.90	13.16	13.59
	Notified Maximum Demand						9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00

LANGEBERG MUNICIPALITY**ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY**

9. LOAD FLOW ANALYSIS

9.1 METHODOLOGY

The simulation software used to perform the load flow analysis is ReticMaster® Electrical Network Software for Distribution Systems.

The existing information was obtained from single line diagrams as well as technical input from the Langeberg Municipality for the following areas:

- Montagu

The load flow simulations were performed on the network to provide insight into the Montagu MV Network as it currently appears, and how it will perform with the addition of the known 5 and 10 year loads as well as the 2.29% per annum increase for average load growth.

The following load flow simulations were performed:

- Simulation 1: Current Maximum Demand;
- Simulation 2: 5 Year Maximum Demand;
- Simulation 3: 10 Year Maximum Demand;
- Simulation 4: Various Contingencies.

9.2 RESULTS OF LOAD FLOW ANALYSIS

The Montagu network represents a diversified maximum demand of 8.197 MVA (measured in March 2022).

The Montagu Network has a total installed capacity of 28.266MVA. Therefore, the Montagu network appears relatively lightly loaded, with a demand factor of approximately 0.29 ($8.197 / 28.266$).

The total connected load per individual transformer was entered into the simulation software and a scaling factor was introduced to all loads to bring the maximum demand on the network in line with load growth

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

predictions to evaluate the effects on the network. This scenario was then simulated as the current status of the network and forms the basis for the future forecasting.

A coincidental factor of 0.7 was used as all the loads do not peak simultaneously.

The 5- and 10-year simulations were then prepared using scaling factors to coincide with the growth predictions and any known 5- and 10-year loads were added separately.

The following reports were then prepared for each scenario, where applicable and discussed:

- Prospective fault current study,
- Voltage level study (The NRS 034-1 stipulate that a voltage drop in the order of up to 3% to be acceptable in MV distributor cables),
- Conductor thermal capacity study.

9.2.1 CURRENT MAXIMUM DEMAND LOAD FLOW

Simulation 1 was based on the normal network configuration and operating conditions. The N/O and N/C points reflect the actual network status. There is one 20MVA 66/11kV transformer which supplies the Montagu MV network with a standby 5MVA 66/11kV transformer.

The simulation was performed applying a scaling factor of 0.42 to all the loads, which returned a maximum demand of 8.270 MVA compared to the actual maximum demand of 8.197 MVA. A difference of 73kVA, which is an acceptable difference.

Refer to Appendix 10 for the current maximum demand load flow analysis.

9.2.1.1 PROSPECTIVE FAULT CURRENT STUDY

The prospective short circuit fault current study was performed, and results included in Appendix 11. The study was only performed once as adding additional loads to the system will not affect the values. The equipment ratings exceed the prospective fault current values and no issues were identified.

9.2.1.2 VOLTAGE LEVEL STUDY

Refer to Appendix 12. All feeders are within guideline limits.

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

9.2.1.3 CONDUCTOR THERMAL CAPACITY STUDY

Refer to Appendix 13. All feeders are well within their thermal capacity limits, percentage loading indicated below:

Main Switching Station Feeders	Thermal Loading
MON SUID	38.5%
LANDELIK	19.3%
MONIS	59.2%
BRINK	26.9%

The Incomer 1 is currently loaded at 73.35%. It should be noted that the information on the type of conductor is not available and it was assumed to be Wolf.

The remainder of the feeders operate within their thermal limits.

9.2.2 5-YEAR MAXIMUM DEMAND LOAD FLOW

Simulation 2 was performed applying a scaling factor of 0.465 to all the loads, which returned a maximum demand of 9.29 MVA compared to the predicted maximum demand of 9.18 MVA. This was done prior to the adding of any known future loads

The following loads were added:

Description – 5 Year	kVA
Industrial 2	$600 \times 0.7 = 420\text{kVA}$
Mandela Square Housing	$1067 \times 0.7 = 747\text{kVA}$
Mandela Square Housing - TRA	$483 \times 0.7 = 338\text{kVA}$
Golf Course	$800 \times 0.7 = 560\text{kVA}$
Market Related Housing (4)	$100 \times 0.7 = 70\text{kVA}$
Total	$3,050 \times 0.7 = 2,135\text{kVA}$

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

Refer to Appendix 14 for the 5-year maximum demand load flow analysis.

9.2.2.1 VOLTAGE LEVEL STUDY

Refer to Appendix 15.

The Ashbury and Baden feeders from the MONIS RMU exceed the guideline limits, the highest percentage voltage drop is indicated below:

Feeder	Load	Percentage
Ashbury (From MONIS RMU)	OLYFBOOM	4.83%
Baden (From MONIS RMU)	SCHUSS	4.27%

9.2.2.2 CONDUCTOR THERMAL CAPACITY STUDY

Refer to Appendix 16. Percentage loading indicated below:

Main Switching Station Feeders	Thermal Loading
MON SUID	44.7%
LANDELIK	21.8%
MONIS	104.7%
BRINK	30.4%

The MONIS feeder from the main switching station (150mm² cable) exceeds its thermal capacity at 104.73%. The remainder of the feeder up to MONIS RMU, which is made up of Hare conductor operates around 80%.

The remainder of the feeders operate within their thermal limits.

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

9.2.3 10-YEAR MAXIMUM DEMAND LOAD FLOW

Simulation 3 was performed applying a scaling factor of 0.52 to all the loads, which returned a maximum demand of 10.41 MVA compared to the predicted maximum demand of 10.28 MVA. This was done prior to the adding of any known future loads

The following loads were added, where existing 5 year loads were already present, these were adjusted to total indicated below:

Description – 10 Year	kVA
Industrial 2	$1000 \times 0.7 = 700\text{kVA}$
Mandela Square Housing	$1308 \times 0.7 = 916\text{kVA}$
Golf Course	$1000 \times 0.7 = 700\text{kVA}$
Market Related Housing (4)	$335 \times 0.7 = 235\text{kVA}$
Montagu Winery	$250 \times 0.7 = 175\text{kVA}$
Total	$3893 \times 0.7 = 2,726\text{kVA}$

Refer to Appendix 17 for the 10-year maximum demand load flow analysis.

9.2.3.1 VOLTAGE LEVEL STUDY

Refer to Appendix 18.

The Ashbury and Baden feeders from the MONIS RMU have further exceeded the guideline limits.

The highest voltage drop on the feeders are as follows:

Feeder	Load	Percentage
Ashbury (From MONIS RMU)	OLYFBOOM	6.08%
Baden (From MONIS RMU)	SCHUSS	5.35%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

9.2.3.2 CONDUCTOR THERMAL CAPACITY STUDY

Refer to Appendix 19. All feeders are well within their thermal capacity limits, percentage loading indicated below:

Main Switching Station Feeders	Thermal Loading
MON SUID	50.1%
LANDELIK	24.5%
MONIS	127.6%
BRINK	34.1%

The MONIS feeder from the main switching station (150mm² cable) further exceeds its thermal capacity at 127.59%. The remainder of the feeder up to MONIS RMU, which is made up of Hare conductor also exceeds its thermal capacity.

The Ashbury feeder from MONIS RMU (70mm² cable) slightly exceeds its thermal capacity at 100.96%. The remainder of the feeder which is made up of Hare, Mink and Fox conductor operate within its thermal capacity.

The remainder of the feeders operate within their thermal limits.

9.2.4 VARIOUS CONTINGENCIES

The purpose of Simulation 4 is to determine the effect various contingencies (switching requirements) will have on the Montagu MV Network, with respect to existing N/O and N/C points, in order to assess network viability in the event of network faults occurring.

The results of the simulation are contained in the table below.

#	Critical Supply Scenarios	Action Required	Effect on Network
1	Fault on Feeder: Montagu South	1] Close N/O point Spar	A] Brink Feeder increases from 26.9% to 66.2% thermal capacity

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

#	Critical Supply Scenarios	Action Required	Effect on Network
			B] Moni's feeder remains at 59.1% thermal capacity
			C] Landelik Feeder remains at 19.3% thermal capacity
2	Fault on Feeder: Brink	1] Close N/O point: Spar	A] Montagu South Feeder increases from 38.54.5% to 65.97% thermal capacity
			B] Moni's Feeder remains at 59.1% thermal capacity
			C] Landelik Feeder remains at 19.3% thermal capacity
3	Fault on Feeder: Moni's	1] Close N/O point: N180	A] Montagu South Feeder remains at 38.5% thermal capacity
			B] Brink Feeder increases from 26.9% to 86.1% thermal capacity
			C] Landelik Feeder remains at 19.3% thermal capacity
4	Fault on Feeder: Landelik	1] Close N/O point: La Dom Pak	A] Montagu South Feeder remains at 38.5% thermal capacity
			B] Brink Feeder remains at 26.9% thermal capacity
			C] Moni's Feeder increases from 59.1% to 77.9% thermal capacity

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

The simulation poses questions, tabulated as “critical supply scenarios”. For each “critical supply scenario” there is an action required to be affected in the Montagu MV Network, and the consequences of the “critical supply scenario” and “action required” are included in the “effect on network”.

The Montagu Network has sufficient capacity to accommodate the critical supply scenarios as simulated above.

10. RECOMMENDED CAPITAL UPGRADES

Refer to Appendix 20 for list of recommended upgrades.

The capital projects are included as per the municipal plan for upgrading of the networks.

Masterplan recommendations were also included and indicated separately.

11. CONCLUSIONS

The following conclusions can be made for the Montagu area of supply:

- The current maximum demand of 8,2MVA is within the notified maximum demand of 9MVA to Eskom. Application has been made to increase NMD to 10MVA.
- The Montagu network is relatively lightly loaded, with a demand factor of 0.29. Total installed capacity of 28.266MVA,
- The current network operates within voltage and conductor thermal limits,
- The switchgear and miniature substation equipment are still within their expected useful life but several transformers have exceeded their expected useful life,
- The network has sufficient capacity to accommodate the critical supply scenarios,
- The volt-drop across the network exceeds limits recommended by NRS 034-1 guidelines for the 5- and 10-year forecast.
- Several feeders exceed their thermal capacity limit for the 5- and 10-year forecast and require upgrading to accommodate planned developments and general load growth,

LANGEBERG MUNICIPALITY**ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY**

12. RECOMMENDATIONS

The following recommendations are made:

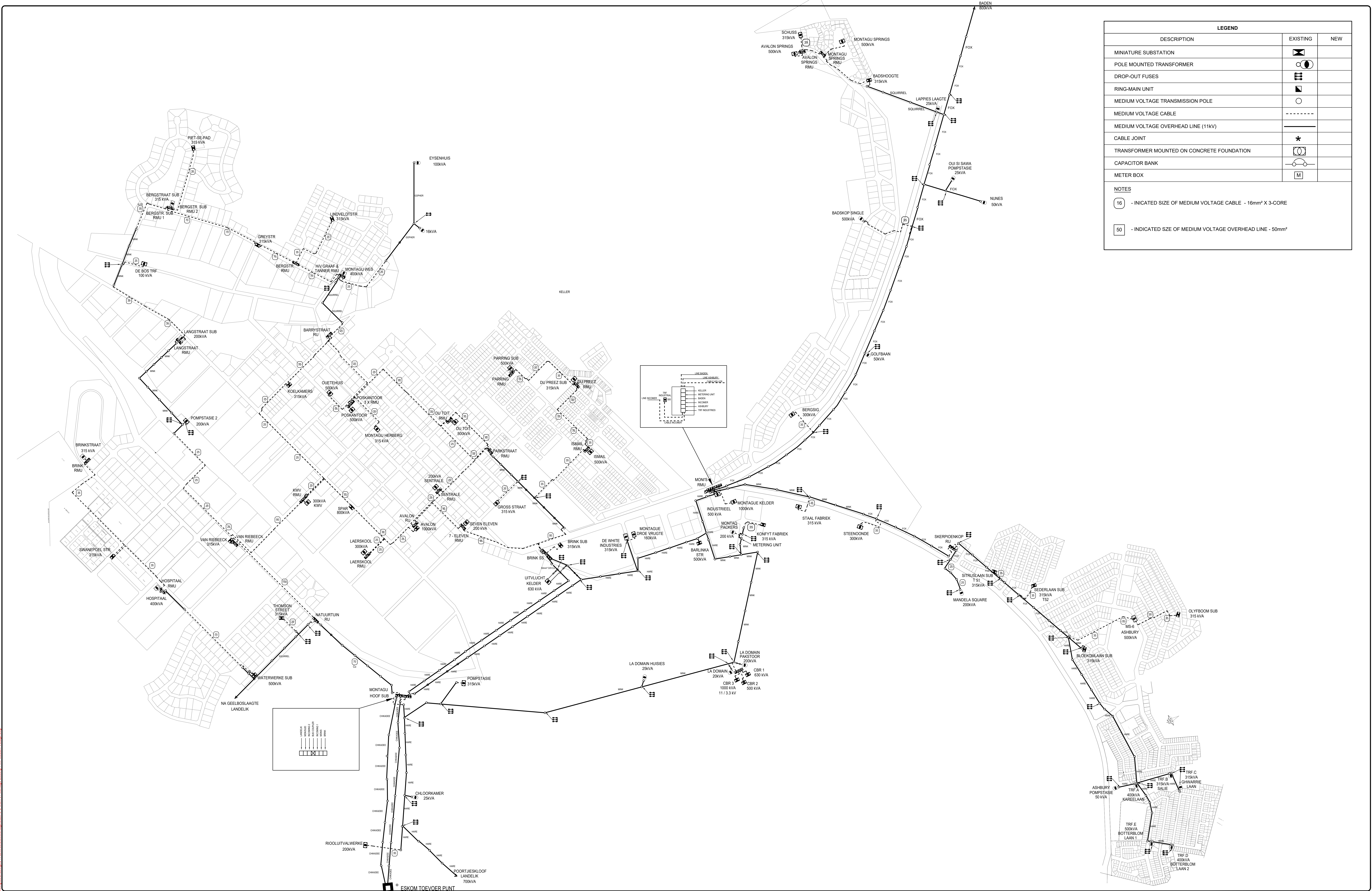
- Upgrading and replacement of network infrastructure as per the recommended capital project upgrades and masterplan recommendations,
- Regular updating of asset register,
- Information shortcomings were identified on existing layouts and schematics. Field studies to be conducted and all drawings to be updated,
- All infrastructure to be recorded on a GIS (geographic information system) and be updated regularly as projects are completed to keep an up to date database,
- An in-depth field study to determine the installation date of the different equipment types in the network to provide an accurate database of expected useful life remaining and phased replacement plan,
- Replacement of equipment that have exceeded their expected useful life as per asset condition assessment,
- Meter logging of municipal buildings electricity supply for implementation into study report for alternative energy supply e.g solar PV system,
- Installation of maximum demand meters on feeders in main switching station.

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 1 – MONTAGU 11KV ELECTRICAL DISTRIBUTION NETWORK LAYOUT

P:\1\X Engineers\202015 - Langeberg Munisipaliteit\202015-E-MON-01\Montagu\202015-E-MON-01_Montagu_Voltage.dwg



LEGEND		
DESCRIPTION	EXISTING	NEW
MINIATURE SUBSTATION		
POLE MOUNTED TRANSFORMER		
DROP-OUT FUSES		
RING-MAIN UNIT		
MEDIUM VOLTAGE TRANSMISSION POLE		
MEDIUM VOLTAGE CABLE		
MEDIUM VOLTAGE OVERHEAD LINE (11kV)		
CABLE JOINT		
TRANSFORMER MOUNTED ON CONCRETE FOUNDATION		
CAPACITOR BANK		
METER BOX		
NOTES		
16 - INDICATED SIZE OF MEDIUM VOLTAGE CABLE - 16mm² X 3-CORE		
50 - INDICATED SZE OF MEDIUM VOLTAGE OVERHEAD LINE - 50mm²		

NOTES

ix engineers retains the copyright in all intellectual property, including designs and/or documents prepared in terms of this appointment for the project covered by the appointment. The client may use the design and/or documents for the sole purpose of their intended use in this project only subject to payment for the design if it has been received. Use for any other purpose, whether or not the design and/or documents have been paid for constitutes an infringement of copyright, and all rights are reserved.

All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer.

Copyright reserved

REVISION SCHEDULE			
NO	DATE	DESCRIPTION	DRW CHK
0			

CONSULTING ENGINEER

20050166

JUNE 2022

DATE

CLIENT

DESIGNED

WS

DRAWN

WS

CHECKED

WMS

CLIENT CONSULTANT

31 Allen Drive | Loevenstein | Cape Town | 7530

Tel: +27 (0) 21 912 3000 | Fax: +27 (0) 21 912 322

www.ixengineers.co.za

CLIENT

MUNICIPALITEIT MASIPALA

PO BOX 52 - ROBERTSON - 6705

TEL: (023) 626 - 2426 - FAX: (023) 626 - 8206

PROJECT

MONTAGU ELECTRICAL DISTRIBUTION NETWORK

DRAWING DESCRIPTION

EXISTING 11kV MEDIUM VOLTAGE LAYOUT

SCALE FOR REDUCED PLAN

DATE: JUNE 2022

SCALE: NTS

ORIGINAL SIZE: A0

DRAWING NUMBER: P302015-E-MON-01

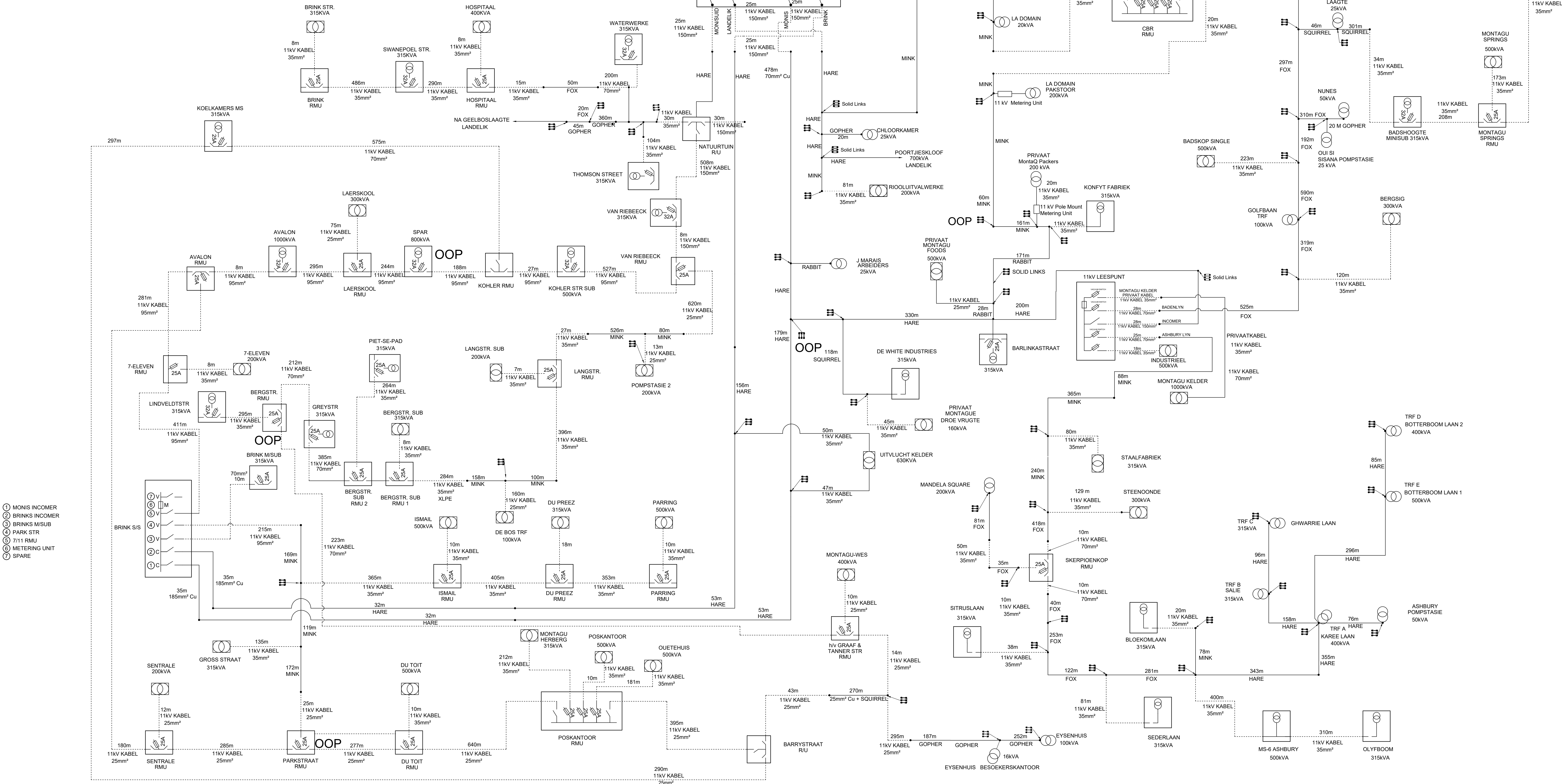
REV: 0

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 2 – MONTAGU 11KV SINGLE LINE DIAGRAM

VERKLARING	
BESKRYWING	SIMBOOL
MINIATUURSUBSTASIE MET RING-SKEISKAKELAAR	
OORHOOFSE HS LYN	
ONDERGRONDSE HS KABEL	
PAALGEMONTSEERDE TRANSFORMATOR	
UITVALSEKERINGS	
RINGSKEISKAKELAAR	
STROOMBREKER	
MINIATUURSUBSTASIE SONDER RING-SKEISKAKELAAR	
GRONDSTAANDE TRANSFORMATOR	
SEKERINGSKAKELAAR	



NOTES

ix engineers retains the copyright in all intellectual property, including designs and/or documents prepared in terms of this agreement for the project covered by the agreement. The client may use the designs and/or documents for the sole purpose of their intended use on this project only subject to payment for the design thereof being received. Use for any other purpose, whether or not the design and/or documents have been paid for constitutes an infringement of copyright, and all rights are reserved.

All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer.

Copyright reserved

REVISION SCHEDULE				
NO	DATE	DESCRIPTION	DRW	CHK
0				

CONSULTING ENGINEER		JUNE 2022	
SIGNATURE	20050166	PR No	DATE
CLIENT			
SIGNATURE		DATE	
DESIGNED	DRAWN	CHECKED	
WS	WS	WMS	

CONSULTANT

ixengineers
Infrastructure Excellence

31 Allen Drive | Loevenstein | Cape Town | 7530
Tel: +27 (0) 21 912 3000 | Fax: +27 (0) 21 912 322
www.ixengineers.co.za

CLIENT

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

PO BOX 52 - ROBERTSON - 6705
TEL: (023) 626 - 2426 - FAX: (023) 626 - 8300

PROJECT

**MONTAGU
ELECTRICAL DISTRIBUTION
NETWORK**

DRAWING DESCRIPTION

**EXISTING 11KV
SINGLE LINE DIAGRAM**

SCALE FOR REDUCED PLAN

DATE: JUNE 2022 SCALE: NTS ORIGINAL SIZE: A0

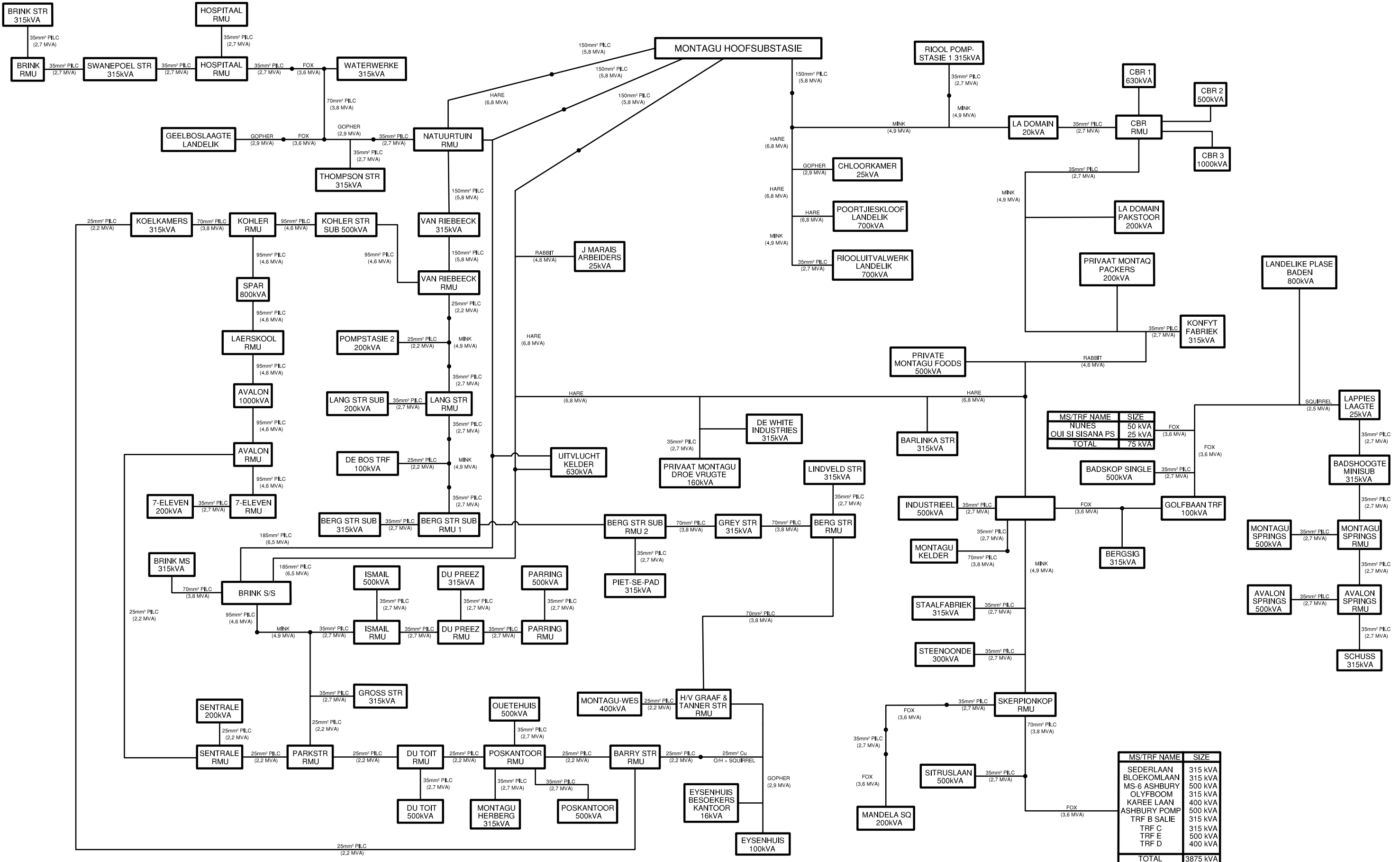
DRAWING NUMBER: P302015-E-MON-02 REV: 0

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 3 – SIMPLIFIED 11KV SINGLE LINE DIAGRAM

SIMPLIFIED 11kV NETWORK IN MONTAGU



LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 4 – ASSET CONDITION ASSESSMENT

Montagu 11kV Switchgear Asset Condition

Area (Suburb)	Asset Location	Name	Function	Installation Date	Replacement Date	Replacement Cost
Montagu	Montagu SS	FEERDER-1 BRINK MIDDEDORP	FEEDER	1993	2038	400,000.00
Montagu	Montagu SS	FEERDER-2 MONIS BADEN/ASHBURY	FEEDER	1993	2038	400,000.00
Montagu	Montagu SS	INCOMER 1	INCOMER	1993	2038	400,000.00
Montagu	Montagu SS	BUS SECTION	BUS SECTION	1993	2038	400,000.00
Montagu	Montagu SS	INCOMER 2	INCOMER	1993	2038	400,000.00
Montagu	Montagu SS	FEERDER-3MON SUID	FEEDER	1993	2038	400,000.00
Montagu	Montagu SS	FEERDER-4 LANDELIK	FEEDER	1999	2044	400,000.00
						2,800,000.00

Montagu Miniature Substation Asset Condition

Area (Suburb)	Name	Rating	Installation Date	Replacement Date	Replacement Cost
Montagu	MS SPAR	800	1996	2041	625,000.00
Montagu	MS CITRUS LAAN	315	1997	2042	525,000.00
Montagu	MS SEDER LAAN	315	1998	2043	525,000.00
Montagu	MS BLOEKOM LAAN	315	1998	2043	525,000.00
Montagu	MS OLYFBOOM	315	1998	2043	525,000.00
Montagu	MS SWANNEPOEL STR	315	2006	2051	525,000.00
Montagu	MS BERG STR	315	2006	2051	525,000.00
Montagu	MS LINTVELD	315	2006	2051	525,000.00
Montagu	MS BADS HOOGTE	315	2006	2051	525,000.00
Montagu	MS PIET SE PAD	315	2007	2052	525,000.00
Montagu	MS WATERWERKE	500	2008	2053	575,000.00
Montagu	MS AVALON PLACE	1000	2008	2053	65,000.00
Montagu	MS VAN RIEBEEK STR	315	2007	2052	525,000.00
Montagu	MS SPRINGS RESORT	500	2017	2062	575,000.00
Montagu	MS LANG STR	315			525,000.00
Montagu	MS KOELKAMER	315			525,000.00
Montagu	MS KOHLER	500	2013	2058	575,000.00
Montagu	MS DIENERLAAN	315	2012	2057	525,000.00
Montagu	MS BARLINKA WEG	500	2011	2056	575,000.00
Montagu	MS KONFYT FABRIEK	315	2000	2045	525,000.00
Montagu	Van Huysteen	315			525,000.00
					10,865,000.00

Montagu Transformer Asset Condition

Area (Suburb)	Name	Type of Transformer	Rating	Installation Date	Replacement Date	Replacement Cost
Montagu	PTRF CW JOUBERT & VOORMAN HUIS	POLE MOUNTED	20	1953	1998	20,000.00
Montagu	PTRF M BARNARD	POLE MOUNTED	30	1962	2007	55,000.00
Montagu	TRF LUCERNE	POLE MOUNTED	100	1962	2007	75,000.00
Montagu	PTRF DEON BRUWER HUIS	POLE MOUNTED	25	1963	2008	40,000.00
Montagu	PTRF H.W MEYER	POLE MOUNTED	50	1964	2009	55,000.00
Montagu	PTRF SARATOGA PUMP	POLE MOUNTED	200	1964	2009	130,000.00
Montagu	PTRF P.HUGO RIETVLEI TRUST 2	POLE MOUNTED	50	1965	2010	55,000.00
Montagu	PTRF QUI-SI-SANA HUIS	POLE MOUNTED	50	1965	2010	55,000.00
Montagu	PTRF KOSIE FOUCHE KLIPKUIL POMP(PAKKERS)	POLE MOUNTED	50	1966	2011	55,000.00
Montagu	PTRF P.J FOUCHE POORTJIES KLOOF 2(FLIP)	POLE MOUNTED	50	1966	2011	55,000.00
Montagu	PTRF M.W BUSSEL KNIPES HOPE	POLE MOUNTED	25	1966	2011	40,000.00
Montagu	TRF STEENONDE	FLOOR STANDING	315	2018	2063	20,000.00
Montagu	PTRF BADEN POMP	POLE MOUNTED	10	1966	2011	20,000.00
Montagu	PTRF PROSPECT DE WET FAMILY STORE 2	POLE MOUNTED	100	1966	2011	75,000.00
Montagu	PTRF VILJOENDRIF RIVER CRUISES	POLE MOUNTED	25	1966	2011	40,000.00
Montagu	PTRF KLIPDRIFT ROBERTSON WINERY STORE 2	POLE MOUNTED	25	1966	2011	40,000.00
Montagu	PTRF P..FOUCHE DAM(PAKKERS)	POLE MOUNTED	30	1967	2012	55,000.00
Montagu	PTRF KRIEL	POLE MOUNTED	25	1967	2012	40,000.00
Montagu	PTRF STEVEN	POLE MOUNTED	50	1967	2012	55,000.00
Montagu	PTRF HERFURTH	POLE MOUNTED	50	1968	2013	55,000.00
Montagu	Vee Pos/80A	POLE MOUNTED	25	1970	2015	40,000.00
Montagu	PTRF FT ZEEMAN	POLE MOUNTED	10	1970	2015	20,000.00
Montagu	PTRF ACCO SPAAR	POLE MOUNTED	10	1970	2015	20,000.00
Montagu	PTRF LAVENDER CREEK	POLE MOUNTED	10	1970	2015	20,000.00
Montagu	PTRF S.W BURGER LOCKARNO 3	POLE MOUNTED	10	1970	2015	20,000.00
Montagu	PTRF 1 JOHNNY BERGER	POLE MOUNTED	30	1970	2015	55,000.00
Montagu	PTRF KLIPDRIF HOUSEE	POLE MOUNTED	50	1970	2015	55,000.00
Montagu	PTRF STOCKWELL BEVISS CHALLENGER 1	POLE MOUNTED	10	1971	2016	20,000.00
Montagu	PTRF Jim KRIEL	POLE MOUNTED	100	1972	2017	75,000.00
Montagu	PTRF BON ACCORD KRUIS(SKOOLHUIS)	POLE MOUNTED	25	1972	2017	40,000.00
Montagu	PTRF 3 DANTJIE ZEEMAN	POLE MOUNTED	50	1972	2017	55,000.00
Montagu	PTRF SARATOGA PUMP 2	POLE MOUNTED	75	1972	2017	75,000.00
Montagu	PTRF GOUDMYN STEPH MALHERB	POLE MOUNTED	100	1972	2017	75,000.00
Montagu	PTRF ACCO 2	POLE MOUNTED	25	1973	2018	40,000.00
Montagu	PTRF ACCO POMP 2	POLE MOUNTED	50	1973	2018	55,000.00
Montagu	PTRF KUILVOER	POLE MOUNTED	25	1973	2018	40,000.00
Montagu	PTRF JAY SMITH	POLE MOUNTED	50	1973	2018	55,000.00
Montagu	PTRF HAASBROEK TALANA PAD	POLE MOUNTED	25	1973	2018	40,000.00
Montagu	PTRF PRINCE	POLE MOUNTED	25	1973	2018	40,000.00
Montagu	PTRF JACQUE KRIEL	POLE MOUNTED	15	1973	2018	20,000.00
Montagu	PTRF BOERE RUS 1	POLE MOUNTED	30	1973	2018	55,000.00
Montagu	PTRF D. NEL	POLE MOUNTED	50	1973	2018	55,000.00
Montagu	PTRF ASHTON LINE 30	POLE MOUNTED	10	1973	2018	20,000.00
Montagu	PTRF GOUDMYN PUMP	POLE MOUNTED	15	1973	2018	20,000.00
Montagu	PTRF ST KILDA GERRIT VAN DEVENTER STORES	POLE MOUNTED	25	1973	2018	40,000.00
Montagu	PTRF KLIPDRIFT HOUSE 3	POLE MOUNTED	25	1973	2018	40,000.00
Montagu	PTRF WOLMAGANG 2(Raws)	POLE MOUNTED	50	1974	2019	55,000.00
Montagu	PTRF EYSENHUIS	POLE MOUNTED	100	1974	2019	75,000.00
Montagu	PTRF GOUDMYN VILJOENDRIF	POLE MOUNTED	25	1974	2019	40,000.00
Montagu	PTRF VILJOENDRIFT PUMP 3	POLE MOUNTED	50	1974	2019	55,000.00
Montagu	PTRF PROSPECT PUMP	POLE MOUNTED	75	1974	2019	75,000.00
Montagu	PTRF STOCKWELL BEVISS CHALLENGER 2	POLE MOUNTED	25	1975	2020	40,000.00
Montagu	PTRF BOERE RUS 2	POLE MOUNTED	25	1975	2020	40,000.00
Montagu	PTRF J.P MARAIS HUIS	POLE MOUNTED	25	1975	2020	40,000.00
Montagu	PTRF EXCELSIOR WORKER HOUSES	POLE MOUNTED	100	1975	2020	75,000.00
Montagu	PTRF PROSPECT WORKER HORSES	POLE MOUNTED	100	1975	2020	75,000.00
Montagu	PTRF ARABELLA WORKER HOUSES 2	POLE MOUNTED	30	1975	2020	55,000.00
Montagu	PTRF J.J.C BELEGING	POLE MOUNTED	50	1976	2021	55,000.00
Montagu	PTRF QUI-SI-SANA RESTAURANT	POLE MOUNTED	50	1976	2021	55,000.00
Montagu	PTRF ASHTON LINE 31	FLOOR STANDING	50	1976	2021	55,000.00
Montagu	PTRF KLIPDRIFT WORKER HOUSES 2	POLE MOUNTED	25	1976	2021	40,000.00
Montagu	PTRF SONSKYN PUMP	POLE MOUNTED	50	1976	2021	55,000.00
Montagu	PTRF J.R STRYDOM DIE PLEIN	POLE MOUNTED	25	1977	2022	40,000.00
Montagu	PTRF SNYMAN HUIS	POLE MOUNTED		1978	2023	75,000.00
Montagu	PTRF KLIPDRIFT PUMP 5	POLE MOUNTED	50	1978	2023	55,000.00
Montagu	PTRF VILJOENDRIF STORE	POLE MOUNTED	75	1978	2023	75,000.00
Montagu	PTRF A.F KRIEL PRIMARY SCHOOL	POLE MOUNTED	10	1979	2024	20,000.00
Montagu	PTRF KLOORKAMER	POLE MOUNTED	25	1979	2024	40,000.00
Montagu	TRF MONTAGU SPRINGS RESORT	FLOOR STANDING	500	1979	2024	520,381.40
Montagu	PTRF BADEN SKOOL	POLE MOUNTED	10	1979	2024	20,000.00
Montagu	PTRF KLIPDRIFT MAIN HOUSE 1	POLE MOUNTED	16	1979	2024	20,000.00
Montagu	PTRF EXCELSIOR PUMP 1	POLE MOUNTED	25	1979	2024	40,000.00
Montagu	PTRF REDELING HUIS	POLE MOUNTED	16	1980	2025	20,000.00
Montagu	PTRF S.W LOCKARNO BURGER 4	POLE MOUNTED	25	1980	2025	40,000.00
Montagu	PTRF I.M JACOBSON 2	POLE MOUNTED	25	1980	2025	40,000.00
Montagu	PTRF A.J.H BURGER ARBEIDERS HUIS	POLE MOUNTED	100	1980	2025	75,000.00
Montagu	PTRF SABRINIALE PLASE	POLE MOUNTED	50	1980	2025	55,000.00
Montagu	PTRF J.A BRUWER WITSAND(NEW)	POLE MOUNTED	25	1980	2025	40,000.00
Montagu	PTRF KOSIE FOUCHE KLIPKUIL(PAKKERS)	POLE MOUNTED	50	1980	2025	55,000.00

Montagu	PTRF N.G.K TALANA SKOOL	POLE MOUNTED	50	1980	2025	55,000.00
Montagu	PTRF KOENIEKLOOF	POLE MOUNTED	15	1980	2025	20,000.00
Montagu	PTRF P. FOUCHE HUIS(PAKKERS)	POLE MOUNTED	50	1980	2025	55,000.00
Montagu	PTRF ARIKOOS KLOOF	POLE MOUNTED	30	1980	2025	55,000.00
Montagu	PTRF WAG-N-BIETJIE	POLE MOUNTED	25	1980	2025	40,000.00
Montagu	PTRF J.P MARIAS PAKSTOOR	FLOOR STANDING	200	1980	2025	464,288.00
Montagu	PTRF RIVERTON 1	POLE MOUNTED	100	1980	2025	75,000.00
Montagu	PTRF 1 GOUDMYN	POLE MOUNTED	10	1980	2025	20,000.00
Montagu	PTRF RIVERTON 2	POLE MOUNTED	50	1980	2025	55,000.00
Montagu	PTRF RIVERTON 3	POLE MOUNTED	50	1980	2025	55,000.00
Montagu	TRF CBR POMPSTASIE MARIAS HILL	FLOOR STANDING	500	1981	2026	520,381.40
Montagu	PTRF ACCO STOOR	POLE MOUNTED	50	1981	2026	55,000.00
Montagu	PTRF POMPSTASIE 6	POLE MOUNTED	100	1981	2026	75,000.00
Montagu	Cape Dry	POLE MOUNTED	160	1981	2026	130,000.00
Montagu	PTRF BORDEAUW(JORDAN)	POLE MOUNTED	50	1981	2026	55,000.00
Montagu	PTRF KLIPDRIFT ROBERTSON WINERY STORE 2	POLE MOUNTED	100	1981	2026	75,000.00
Montagu	PTRF 1 GERRIT VAN DEVENTER	POLE MOUNTED	50	1981	2026	55,000.00
Montagu	PTRF VILJOENDRIFT PUMP 2	POLE MOUNTED	75	1981	2026	75,000.00
Montagu	PTRF P. FOUCHE POORTJIES KLOOF 1(PAKKERS)	POLE MOUNTED	100	1982	2027	75,000.00
Montagu	TRF RIOOL WERKE 1	FLOOR STANDING	200	1982	2027	464,288.00
Montagu	TRF RIOOL POMPSTASIE 1	GROUND MOUNTED	315	1982	2027	464,288.00
Montagu	PTRF C.N.E.R KONIG	POLE MOUNTED	25	1982	2027	40,000.00
Montagu	PTRF A.J JOUBERT BADEN 2	POLE MOUNTED	25	1982	2027	40,000.00
Montagu	PTRF FT ZEEMAN STOOR	POLE MOUNTED	20	1983	2028	20,000.00
Montagu	PTRF GOLDEN VALLEY	POLE MOUNTED	100	1983	2028	75,000.00
Montagu	PTRF P BRUWER STOOR	POLE MOUNTED	10	1983	2028	20,000.00
Montagu	PTRF STOCKWILL PRIMARY SCHOOL	POLE MOUNTED	30	1983	2028	55,000.00
Montagu	PTRF KAAS FABRIEK HUIS	POLE MOUNTED	100	1983	2028	75,000.00
Montagu	PTRF S.W BURGER LOCKARNO 1	POLE MOUNTED	25	1983	2028	40,000.00
Montagu	TRF RIOOLPOMPSTASIE 2	GROUND MOUNTED	200	1983	2028	464,288.00
Montagu	PTRF KLAAS VOOGDS	POLE MOUNTED	100	1983	2028	75,000.00
Montagu	PTRF PROSPECT DE WET FAMILY STORE	POLE MOUNTED	100	1983	2028	75,000.00
Montagu	PTRF WELGELUK RED CANNA RESTUARANT	POLE MOUNTED	10	1983	2028	20,000.00
Montagu	TRF ACCO POMP 3	FLOOR STANDING	100	1984	2029	464,288.00
Montagu	PTRF ACCO 1	POLE MOUNTED	100	1984	2029	75,000.00
Montagu	PTRF SNYMAN MELKSTAL	POLE MOUNTED	50	1984	2029	55,000.00
Montagu	PTRF 2 ZANDVLIET	POLE MOUNTED	100	1984	2029	75,000.00
Montagu	PTRF ROUXVALE DJ ZEEMAN MAIN HOUSE	POLE MOUNTED	50	1984	2029	55,000.00
Montagu	PTRF PROSPECT DE WET FAMILY STORE 3	POLE MOUNTED	75	1984	2029	75,000.00
Montagu	PTRF WAKKERSTROM OOS TELKOM POINT	POLE MOUNTED	100	1985	2030	75,000.00
Montagu	PTRF KLIPDRIFT MAIN HOUSE 2	POLE MOUNTED	50	1985	2030	55,000.00
Montagu	PTRF PHILLIP FOUCHE	POLE MOUNTED	50	1986	2031	55,000.00
Montagu	PTRF W.M BUSSEL BADEN (SEUN HUIS)	POLE MOUNTED	25	1986	2031	40,000.00
Montagu	PTRF LUCERNE	POLE MOUNTED	10	1986	2031	20,000.00
Montagu	PTRF GOUDMYN PRIMARY SKOOL	POLE MOUNTED	16	1986	2031	20,000.00
Montagu	PTRF ACCO POMP 1	POLE MOUNTED	50	1987	2032	55,000.00
Montagu	PTRF BARDEN BERG POMP	POLE MOUNTED	25	1987	2032	40,000.00
Montagu	PTRF KLIPDRIFT ROBERTSON WINERY STORE 2	POLE MOUNTED	25	1987	2032	40,000.00
Montagu	PTRF M KLEINHANDS	POLE MOUNTED	16	1988	2033	20,000.00
Montagu	PTRF S.MALHERBE HUIS	POLE MOUNTED	25	1988	2033	40,000.00
Montagu	PTRF D.J JOUBERT	POLE MOUNTED	50	1988	2033	55,000.00
Montagu	PTRF KLIPDRIFT STORE 1	POLE MOUNTED	100	1988	2033	75,000.00
Montagu	PTRF RIVERTON INGANG	POLE MOUNTED	25	1988	2033	40,000.00
Montagu	PTRF CLOVERFIELD HOUSEE	POLE MOUNTED	50	1988	2033	55,000.00
Montagu	PTRF DRIE BERGE WYNKELDER	POLE MOUNTED	50	1989	2034	55,000.00
Montagu	PTRF KOGMANSKLOOF	POLE MOUNTED	25	1989	2034	40,000.00
Montagu	PTRF VAN LOVEREN FARM (Wolvendrift)	POLE MOUNTED	50	1989	2034	55,000.00
Montagu	PTRF FJ Du TOIT GOUDMYN PUMP 1	POLE MOUNTED	50	1989	2034	55,000.00
Montagu	PTRF KLIPDRIFT PUMP	POLE MOUNTED	50	1989	2034	55,000.00
Montagu	PTRF HELPMEEKAAR BOERDERY	POLE MOUNTED	50	1990	2035	55,000.00
Montagu	PTRF ST KILDA GERRIT VAN DEVENTER WORKER HOUSES	POLE MOUNTED	75	1990	2035	75,000.00
Montagu	PTRF ARBEIDERS (LA DOMAINE)	POLE MOUNTED	25	1991	2036	40,000.00
Montagu	PTRF 1 DE WETSHOF	POLE MOUNTED	100	1991	2036	75,000.00
Montagu	PTRF 2 JOHNNY BERGER	POLE MOUNTED	100	1991	2036	75,000.00
Montagu	PTRF RIETVLEI LAERSKOOL	POLE MOUNTED	25	1992	2037	40,000.00
Montagu	PTRF CANVAS	POLE MOUNTED	25	1992	2037	40,000.00
Montagu	PTRF CONRADI	POLE MOUNTED	50	1992	2037	55,000.00
Montagu	PTRF CONRADIE	POLE MOUNTED	100	1993	2038	75,000.00
Montagu	PTRF N. ENGEL AMANZI	POLE MOUNTED	50	1993	2038	55,000.00
Montagu	TRF SCHUSS	FLOOR STANDING	200	1993	2038	464,288.00
Montagu	PTRF DIE ERF	POLE MOUNTED	50	1993	2038	55,000.00
Montagu	TRF ASHTON LINE 19	FLOOR STANDING	100	1993	2038	464,288.00
Montagu	PTRF ASHTON LINE 67	POLE MOUNTED	100	1993	2038	75,000.00
Montagu	PTRF KLIPDRIF PUMP 3	POLE MOUNTED	100	1993	2038	75,000.00
Montagu	PTRF CLOVERFIELD PUMP 1	POLE MOUNTED	100	1993	2038	75,000.00
Montagu	PTRF ASHTON LINE 21	POLE MOUNTED	30	1993	2038	55,000.00
Montagu	PTRF ASHTON LINE 46	POLE MOUNTED	50	1993	2038	55,000.00
Montagu	PTRF DEWETSHOF	POLE MOUNTED	50	1993	2038	55,000.00
Montagu	PTRF ETIENNE ZEEMAN GOUDMYN	POLE MOUNTED	50	1993	2038	55,000.00
Montagu	PTRF P.HUGO RIETVLEI TRUST 1	POLE MOUNTED	25	1994	2039	40,000.00
Montagu	PTRF H.W ENGEL WELGEMOED KLIPKUIL	POLE MOUNTED	50	1994	2039	55,000.00
Montagu	TRF MONTAGU HERBERG	FLOOR STANDING	315	1994	2039	20,000.00
Montagu	PTRF KLIPDRIFT PUMP 2	POLE MOUNTED	100	1994	2039	75,000.00

Montagu	PTRF ASHTON LINE 2	POLE MOUNTED	100	1994	2039	75,000.00
Montagu	PTRF ASHTON LINE 13	POLE MOUNTED	50	1994	2039	55,000.00
Montagu	PTRF P.J HAASBROEK	POLE MOUNTED	50	1995	2040	55,000.00
Montagu	CW JOUBERT PAKSTOOR	FLOOR STANDING		1995	2040	464,288.00
Montagu	PTRF RICHARD KNIFE KAREVAANPARK	POLE MOUNTED	100	1995	2040	75,000.00
Montagu	PTRF CLOVERFIELD	POLE MOUNTED	10	1995	2040	20,000.00
Montagu	PTRF VILJOENDRIFT MAIN HOUSE	POLE MOUNTED	200	1995	2040	130,000.00
Montagu	PTRF 1 DANTJIE ZEEMAN	POLE MOUNTED	50	1995	2040	55,000.00
Montagu	PTRF RIVERTON 4	POLE MOUNTED	50	1995	2040	55,000.00
Montagu	PTRF A.J JOUBERT BADEN 1	POLE MOUNTED	50	1996	2041	55,000.00
Montagu	PTRF ASHTON LINE 28	POLE MOUNTED	25	1996	2041	40,000.00
Montagu	PTRF VILJOENDRIFT STORE 1	POLE MOUNTED	315	1996	2041	190,000.00
Montagu	PTRF NAPIER FOUNTAIN VALLEY	POLE MOUNTED	50	1997	2042	55,000.00
Montagu	PTRF A	POLE MOUNTED	400	1997	2042	350,000.00
Montagu	PTRF P.G HAASBROEK & EL SHADAI (NEW)	POLE MOUNTED	50	1997	2042	55,000.00
Montagu	TRF STAAL FABRIEK	FLOOR STANDING	315	1997	2042	20,000.00
Montagu	PTRF ASHTON LINE 51	POLE MOUNTED	100	1997	2042	75,000.00
Montagu	PTRF WILLEM VILJOEN MORESON	POLE MOUNTED	100	1997	2042	75,000.00
Montagu	PTRF KLIPDRIFT ROBERTSON WINERY STORE 2	POLE MOUNTED	25	1997	2042	40,000.00
Montagu	PTRF 1 ZANDVLIET	POLE MOUNTED	100	1997	2042	75,000.00
Montagu	PTRF ARABELLA STORE 1	POLE MOUNTED	50	1997	2042	55,000.00
Montagu	PTRF RIVERTON WORKER HOUSES	POLE MOUNTED	50	1997	2042	55,000.00
Montagu	PTRF SMIT	POLE MOUNTED	50	1998	2043	55,000.00
Montagu	PTRF LAMONTENARE POMP	POLE MOUNTED	100	1998	2043	75,000.00
Montagu	PTRF R.W STEENKAMP KLIPKUIL	POLE MOUNTED	50	1998	2043	55,000.00
Montagu	PTRF J.G VAN SCHALKWYK	POLE MOUNTED	160	1998	2043	130,000.00
Montagu	*****PTRF A.C WATTS,COOK*****	POLE MOUNTED	100	1998	2043	75,000.00
Montagu	PTRF J.J UYS (PA)	POLE MOUNTED	50	1998	2043	55,000.00
Montagu	TRF UITVLUCHT	GROUND MOUNTED	630	1998	2043	575,542.00
Montagu	PTRF ASHTON LINE 32	POLE MOUNTED	100	1998	2043	75,000.00
Montagu	PTRF A.J.H BURGER HUIS	POLE MOUNTED	50	1999	2044	55,000.00
Montagu	PTRF ASHBURY POMPSTASIE	POLE MOUNTED	75	1999	2044	75,000.00
Montagu	PTRF VODACOM TURING	POLE MOUNTED	25	1999	2044	40,000.00
Montagu	PTRF TELKOM TOWER	POLE MOUNTED	25	1999	2044	40,000.00
Montagu	PTRF MALERBE STOCKVILLE FARM	POLE MOUNTED	50	2000	2045	55,000.00
Montagu	PTRF KAAS FABRIEK	POLE MOUNTED	100	2000	2045	75,000.00
Montagu	PTRF RICHARD KNIFE BADEN	POLE MOUNTED	100	2000	2045	75,000.00
Montagu	TRF CLOVERFIELD PUMP 2	FLOOR STANDING	200	2000	2045	464,288.00
Montagu	PTRF 2 DE WETSHOF	POLE MOUNTED	50	2000	2045	55,000.00
Montagu	PTRF 1 VAN LOVERAN	POLE MOUNTED	50	2000	2045	55,000.00
Montagu	PTRF ROY BRUWER PAKSTOOR	POLE MOUNTED	100	2001	2046	75,000.00
Montagu	PTRF PIERRE JORDAAN BADEN	POLE MOUNTED	50	2001	2046	55,000.00
Montagu	PTRF BON ACCORD BOERDERY(RAUTENBACH)	POLE MOUNTED	100	2001	2046	75,000.00
Montagu	PTRF 3 GOUDMYN	POLE MOUNTED	50	2001	2046	55,000.00
Montagu	PTRF ROUXVALE DJ ZEEMAN WORKER HOUSES	POLE MOUNTED	50	2001	2046	55,000.00
Montagu	PTRF D	POLE MOUNTED	315	2002	2047	190,000.00
Montagu	PTRF ARF B	POLE MOUNTED	400	2002	2047	350,000.00
Montagu	PTRF E	POLE MOUNTED	500	2002	2047	350,000.00
Montagu	PTRF C	POLE MOUNTED	315	2002	2047	190,000.00
Montagu	PTRF THE ISLAND	POLE MOUNTED	50	2002	2047	55,000.00
Montagu	PTRF FABRIEK VUILWATER	POLE MOUNTED	100	2003	2048	75,000.00
Montagu	PTRF HERFUTH	FLOOR STANDING	25	2003	2048	40,000.00
Montagu	PTRF E.BRILLANT BOONTJIESRIVIER	POLE MOUNTED	100	2003	2048	75,000.00
Montagu	PTRF J.W UYS (SEUN)	POLE MOUNTED	100	2003	2048	75,000.00
Montagu	PTRF W.M BUSSEL BADEN(MA)	POLE MOUNTED	25	2003	2048	40,000.00
Montagu	PTRF T.J HARDKAMP	POLE MOUNTED	100	2004	2049	75,000.00
Montagu	PTRF ASHTON LINE 68	POLE MOUNTED	100	2004	2049	75,000.00
Montagu	PTRF ASHTON LINE 43	POLE MOUNTED	100	2004	2049	75,000.00
Montagu	PTRF WYNAND	POLE MOUNTED	100	2004	2049	75,000.00
Montagu	PTRF NEIL	POLE MOUNTED	100	2004	2049	75,000.00
Montagu	PTRF KLAASVOOGDS LINE 7	POLE MOUNTED	25	2004	2049	40,000.00
Montagu	PTRF J.R VAN EDEN GEELBOS LAAGTE	POLE MOUNTED	100	2005	2050	75,000.00
Montagu	TRF De White Ind	FLOOR STANDING	315	2005	2050	20,000.00
Montagu	PTRF LAPPIES LAAGTE	POLE MOUNTED	25	2005	2050	40,000.00
Montagu	PTRF ARABELLA PUMP 1	POLE MOUNTED	100	2005	2050	75,000.00
Montagu	PTRF ARABELLA WORKER HOUSES 1	POLE MOUNTED	50	2005	2051	55,000.00
Montagu	PTRF S.W BURGER LOCKARNO 2	POLE MOUNTED	300	2006	2051	190,000.00
Montagu	PTRF SRINGFIELD	POLE MOUNTED	5	2006	2051	20,000.00
Montagu	PTRF WOLMAGANG 3(Raws)	POLE MOUNTED	100	2007	2052	75,000.00
Montagu	PTRF ROY BRUWER HUIS	POLE MOUNTED	25	2007	2052	40,000.00
Montagu	PTRF GOUDMYN KOOS CINDY	POLE MOUNTED	100	2007	2052	75,000.00
Montagu	PTRF WELGELUK FARM	POLE MOUNTED	100	2007	2052	75,000.00
Montagu	PTRF EMLO TRUST	POLE MOUNTED	50	2008	2053	55,000.00
Montagu	PTRF 2 GERRIT VAN DEVENTER	POLE MOUNTED	25	2008	2053	40,000.00
Montagu	PTRF SARATOG 2	POLE MOUNTED	25	2008	2053	40,000.00
Montagu	PTRF PROSPECT PRIMARY SCHOOL	POLE MOUNTED	50	2008	2053	55,000.00
Montagu	PTRF THREE STAR STOOR	POLE MOUNTED	100	2009	2054	75,000.00
Montagu	TRF DE BOS	GROUND MOUNTED	100	2009	2054	464,288.00
Montagu	PTRF E.E MEYER(CYPRESS)	POLE MOUNTED	50	2009	2054	55,000.00
Montagu	TRF PROSPECT DE WET FAMILY	FLOOR STANDING	25	2009	2054	40,000.00
Montagu	PTRF KLIPDRIFT PUMP 4	POLE MOUNTED	100	2009	2054	75,000.00
Montagu	PTRF MANDELA SQUARE	POLE MOUNTED	200	2010	2055	130,000.00
Montagu	PTRF GOUDMYN LEEN & JANNY KLEER 1	POLE MOUNTED	100	2010	2055	75,000.00

Montagu	PTRF BON COURAGE PUMP	POLE MOUNTED	100	2010	2055	75,000.00
Montagu	PTRF RENNIE RETIEF	POLE MOUNTED	100	2010	2055	75,000.00
Montagu	Gholfbaan TRF	POLE MOUNTED	50	2009	2054	55,000.00
Montagu	PTRF G. VAN DEVENTER	POLE MOUNTED	100	2009	2054	75,000.00
Montagu	TRF BADSKOP SINGLE	FLOOR STANDING	500			520,381.40
Montagu	TRF BERG STR SS	FLOOR STANDING	315			20,000.00
Montagu	TRF BERGSIG	FLOOR STANDING	300			464,288.00
Montagu	TRF BRINK STR	FLOOR STANDING	315			20,000.00
Montagu	TRF DU PREEZ STR	FLOOR STANDING	315			20,000.00
Montagu	SUB DU TOIT STR	FLOOR STANDING	500			520,381.40
Montagu	TRF SPORTS VELD	FLOOR STANDING	315			20,000.00
Montagu	TRF ISMAEL STR	FLOOR STANDING	500	1983	2028	520,381.40
Montagu	TRANSFORMER	FLOOR STANDING	300	1972	2017	464,288.00
Montagu	TRF MONTAGU WES	FLOOR STANDING	400			520,381.40
Montagu	TRF ASHBURY	GROUND MOUNTED	500	1982	2027	520,381.40
Montagu	TRF PARRING STR	FLOOR STANDING	500			520,381.40
Montagu	TRANSFORMER	GROUND MOUNTED	500	2005	2050	520,381.40
Montagu	TRF LOCAL	FLOOR STANDING	500	1998	2043	520,381.40
Montagu	TRF HOSPITAL STR	FLOOR STANDING	400			520,381.40
Montagu	834	FLOOR STANDING	0			464,288.00
Montagu	1639	POLE MOUNTED	200			130,000.00
Montagu		FLOOR STANDING	100			464,288.00
Montagu		POLE MOUNTED	0			75,000.00
Montagu		POLE MOUNTED	200			130,000.00
Montagu	PTRF 1009	POLE MOUNTED	15			20,000.00
Montagu		POLE MOUNTED	16			20,000.00
Montagu		POLE MOUNTED	100			75,000.00
Montagu		POLE MOUNTED	25			40,000.00
Montagu	D.J Zeeman	POLE MOUNTED	50			55,000.00
Montagu		POLE MOUNTED	100			75,000.00
Montagu		POLE MOUNTED	16			20,000.00
Montagu		POLE MOUNTED	16			20,000.00
Montagu		POLE MOUNTED	15			20,000.00
Montagu		POLE MOUNTED	50			55,000.00
Montagu		POLE MOUNTED	100			75,000.00
Montagu	PTRF KLIPDRIF HOUSEE	POLE MOUNTED	50	1970	2015	55,000.00
Montagu	PTRF RIVERTON INGANG	POLE MOUNTED	25	1988	2033	40,000.00
Montagu	PTRF 1 VAN LOVERAN	POLE MOUNTED	50	2000	2045	55,000.00
Montagu		POLE MOUNTED	10			20,000.00
Montagu		POLE MOUNTED	16			20,000.00
Montagu		POLE MOUNTED	100			75,000.00
Montagu		POLE MOUNTED	100			75,000.00
Montagu		POLE MOUNTED	25			40,000.00
Montagu		POLE MOUNTED	25			40,000.00
Montagu		POLE MOUNTED	50			55,000.00
Montagu		POLE MOUNTED	0			75,000.00
Montagu	GOEDEMOED 1	POLE MOUNTED	50			55,000.00
Montagu	GOEDEMOED 2	POLE MOUNTED	100			75,000.00
Montagu	PTRF ST KILDA GERRIT VAN DEVENTER STORES 2	POLE MOUNTED	25	1973	2018	40,000.00
Montagu		POLE MOUNTED	160			130,000.00
Montagu	TRF MINI MARKET	FLOOR STANDING	200			464,288.00
Montagu		POLE MOUNTED	50			55,000.00
Montagu		POLE MOUNTED	25			40,000.00
Montagu		POLE MOUNTED	25			40,000.00
Montagu		POLE MOUNTED	100	2013	2058	75,000.00
Montagu		POLE MOUNTED	25			40,000.00
Montagu		POLE MOUNTED	25			40,000.00
Montagu	PTRF HAASBROEK POMP	POLE MOUNTED	50			55,000.00
Montagu	PTRF JAPIE KRIEL	POLE MOUNTED	25	1974	2019	40,000.00
Montagu		POLE MOUNTED	20			20,000.00
Montagu	PMT HT Kriel	POLE MOUNTED	50	1983	2028	55,000.00
Montagu		POLE MOUNTED	200			130,000.00
Montagu		POLE MOUNTED				75,000.00
Montagu		POLE MOUNTED	100			75,000.00
Montagu		FLOOR STANDING	200			464,288.00
Montagu		FLOOR STANDING	200			464,288.00
Montagu		POLE MOUNTED	100	1987	2032	75,000.00
Montagu		POLE MOUNTED	16			20,000.00
Montagu		POLE MOUNTED	25			40,000.00
Montagu		POLE MOUNTED	50	2002	2047	55,000.00
Montagu		FLOOR STANDING	100			464,288.00
Montagu		POLE MOUNTED	25			40,000.00
Montagu		POLE MOUNTED	50			55,000.00
Montagu		FLOOR STANDING	25			40,000.00
Montagu		POLE MOUNTED	15			20,000.00
Montagu		POLE MOUNTED	160			130,000.00
Montagu		POLE MOUNTED	100			75,000.00
Montagu		POLE MOUNTED	50	1984	2029	55,000.00
Montagu		POLE MOUNTED	50			55,000.00
Montagu		FLOOR STANDING	50			55,000.00
Montagu		FLOOR STANDING	200			464,288.00
Montagu		POLE MOUNTED				75,000.00
Montagu		POLE MOUNTED	16			20,000.00

Montagu		POLE MOUNTED	25			40,000.00
Montagu		FLOOR STANDING	400			520,381.40
Montagu		POLE MOUNTED	25			40,000.00
Montagu		FLOOR STANDING	25			40,000.00
Montagu	Cloverfield	POLE MOUNTED	50			55,000.00
Montagu		POLE MOUNTED	50			55,000.00
Montagu		POLE MOUNTED				75,000.00
Montagu	Huis Uitvlucht	FLOOR STANDING	500	1988	2033	520,381.40
						34,126,972.20

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 5 – NETWORK TECHNICAL LOSSES CALCULATION

 LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA	 iXengineers Infrastructure Excellence	Langeberg Municipality - Energy Losses	
ELECTRICAL ENERGY LOSSES CALCULATION - MONTAGU		Langeberg	PAGE 2
		iX P302015	REV. 0

Calculation of network losses in support of NRS 080 Reporting

CALCULATION SHEET NOTES

Langeberg Municipality - Energy Losses

NETWORK ANALYSIS AND ENERGY LOSSES

Energy losses calculation

Notes:

Energy losses comprises:

- 1 System losses due to I²R losses in distribution networks as calculated by loadflow analysis
- 2 No load losses of inductive element's magnetic circuits.
- 3 Load losses of transformers proportional to loading
- 4 Partial discharge losses - not considered due to destructive nature and maintenance requirements
- 5 Dielectric losses - Not considered
- 6 Similar network LV distribution losses used, no information available on LV Network

Calculation base:

- 1 Network I²R losses derived from network load-flow analysis
- 2 Network I²R losses adjusted for averaged load
- 3 Monthly maximum demand and energy statistics required

Definitions

- 1 Demand - Apparent power drawn from supply network
- 2 Load (Connected, etc) - The total connected load on the system.
- 3 Load Factor (LF) - The average power in the typical monthly period divided by the peak apparent power
- 4 Demand factor (DF) - The maximum demand divided by the connected load (indicative of reserve capacity)

PREPARED FOR:



Langeberg Municipality
Private Bag X2
ASHTON

Telephone: +27 (0) 23 615 8000

PREPARED BY:



31 Allen drive
Loevenstein
BELLVILLE , 7530
CAPE TOWN
South Africa
Telephone: +27(0)21 912 3000
Facsimile: +27(0)21 912 3222
e-mail: wynand.s@ixengineers.co.za

ELECTRICAL ENERGY LOSSES CALCULATION - MONTAGU

Langeberg

PAGE

3

iX

P302015

REV.

0

Date

6/17/2022

MV Network losses				Billing/log data				
Simu	Ratio	Network peak power:	P kW	Month	Demand kVA	Energy kWh	Load factor	Demand Factor
		Network losses from load flow:	P _{loss} kW	Apr	7752	3705342	0.65	0.68
		Network Average power	kVA	May	6960	3320870	0.65	0.61
		Total electrical losses	kW kWh/month % loss	Jun	7804	3109998	0.55	0.68
		Transformer No load Losses	33.2 24236 0.68%	Jul	7152	3440079	0.66	0.63
		Transformer Partial Load losses	76.3 55699 1.56%	Aug	6668	3308225	0.68	0.58
		HV & MV Network system losses pm	62.4 45564 1.28%	Sep	6796	3226030	0.65	0.60
		LV Network losses calculated pm	79025 2.22%	Oct	6607	3265081	0.68	0.58
		Total losses	204524 5.75%	Nov	7184	3349682	0.64	0.63
		Technical Loss Factor tlf :	1.057	Dec	7005	3814292	0.75	0.61
				Jan	7516	4193002	0.76	0.66
				Feb	8195	3878484	0.65	0.72
				Mar	8198	4105235	0.69	0.72
				Avg demand	7320	3559693	0.67	0.64
				Avg power	4876			

Notes:

1) Transformer quantities from single line diagram

2) Billing/Logs Eskom period Apr 2021 to Mar 2022.

Installed Transformer and reactor losses					
Qty	kVA	Losses/unit kW		Total loss kW	
		No load	Load	No load	FL loss
15	16	0.095	0.41	1.425	6.15
17	25	0.12	0.57	2.04	9.69
34	50	0.18	1	6.12	34
35	100	0.3	1.7	10.5	59.5
8	160	0.44	2.4	3.52	19.2
4	200	0.52	2.7	2.08	10.8
0	250	0.62	3.2	0	0
5	315	0.72	3.8	3.6	19
1	400	0.91	5.4	0.91	5.4
1	500	1.1	5.4	1.1	5.4
0	630	1.3	6.4	0	0
0	800	1.6	8	0	0
1	1000	1.9	9.5	1.9	9.5
0	1600	2.75	13.5	0	0
0	2000	3.25	16	0	0
121				33.195	178.64

Total installed capacity kVA 11420

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 6 – SSEG IMPACT ON MUNICIPAL REVENUE

This report was generated on	5/25/2022
For	Langeberg Municipality

Developed by

G:ENESIS
UNLOCKING VALUE

8 SALGA
SOUTH AFRICAN LOCAL
GOVERNMENT ASSOCIATION
Inspiring service delivery

**german
cooperation**
DEUTSCHE ZUSAMMENARBEIT

represented by
giz
German Development Cooperation GmbH

Table 1: SSEG tariffs chosen by the municipality

		Summer				Winter			
		Residential	Small business	Medium business	Large business	Residential	Small business	Medium business	Large business
Tariff type	TOU or flat tariff structure	Flat	Flat	TOU	TOU	Same as summer			
	Monthly or annual clearing of balances	Monthly clearing	Monthly clearing	Monthly clearing	Monthly clearing				
	Payment of credit balances to customers	No payments	No payments	No payments	No payments				
	Escalation of export tariff	Changes over time	Changes over time	Changes over time	Changes over time				
TOU tariffs	Import tariff								
	Fixed charge (R/m)			2,368	2,368			2,368	2,368
	Monthly demand charge (R/kVA)			276	254			276	254
	Peak (c/KWh)			94	93			94	93
	Standard (c/KWh)			94	93			94	93
	Off-peak (c/KWh)			94	93			94	93
	Export tariff								
	Peak (c/KWh)			68	68			68	68
	Standard (c/KWh)			68	68			68	68
Off-peak (c/KWh)			68	68			68	68	
Flat tariffs	Import tariff								
	Fixed charge (R/m)	1,538	1,538			1,538	1,538		
	Monthly demand charge (R/kVA)	-	-			-	-		
	Variable charge (c/KWh)	190	190			190	190		
	Export tariff								
	Variable charge (c/KWh)	68	68			68	68		

Table 2: Total revenue impact * (%)

% of customers on the relevant tariff that install rooftop PV	Residential	Small business	Medium business	Large business	Total
1%	0.40%	-0.14%	0.08%	-0.02%	0.25%
5%	1.98%	-0.70%	0.41%	-0.11%	1.23%
10%	3.96%	-1.40%	0.83%	-0.21%	2.46%
20%	7.92%	-2.79%	1.65%	-0.42%	4.91%

Notes: * Total revenue impact = (Reduction in municipal revenue + Value of Solar)/Municipal revenue prior to introduction of Solar PV SSEG tariffs

Chart 1: Total revenue impact (%)

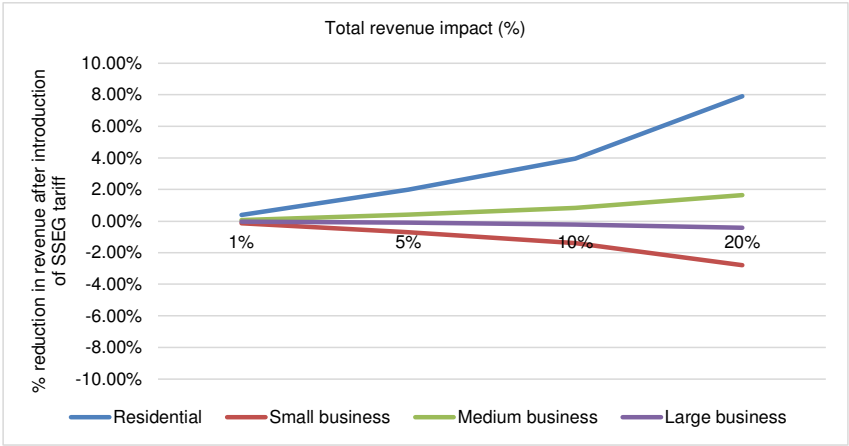


Table 3: Reduction in revenue, Value of Solar and Total effect (Rm)

	Residential	Small business	Medium business	Large business	Total
1% of customers install rooftop PV					
Reduction in revenue (Rm) (A)	1.1	-0.2	-0.2	-0.1	0.6
Value of Solar (Rm) (B)	0.6	0.1	0.3	0.1	1.0
Total effect (Rm) (A + B)	1.8	-0.1	0.0	0.0	1.7
5% of customers install rooftop PV					
Reduction in revenue (Rm) (A)	5.6	-1.2	-1.0	-0.3	3.1
Value of Solar (Rm) (B)	3.2	0.5	1.3	0.3	5.2
Total effect (Rm) (A + B)	8.8	-0.7	0.2	-0.1	8.3
10% of customers install rooftop PV					
Reduction in revenue (Rm) (A)	11.3	-2.3	-2.1	-0.7	6.2
Value of Solar (Rm) (B)	6.3	0.9	2.6	0.5	10.4
Total effect (Rm) (A + B)	17.6	-1.4	0.5	-0.1	16.5
20% of customers install rooftop PV					
Reduction in revenue (Rm) (A)	22.5	-4.6	-4.2	-1.4	12.3
Value of Solar (Rm) (B)	12.7	1.8	5.1	1.1	20.7
Total effect (Rm) (A + B)	35.2	-2.8	0.9	-0.3	33.0

Table 4: Business case for the Solar PV customer for the chosen SSEG tariffs

	Residential	Small business	Medium business	Large business	Key for PBP and IRR results:	Key for NPV results:
Net present value (Rands)	-263,700	648,328	409,308	4,101,820	Unfavourable	Negative
Pay-back period (PBP) (Years)	>26	3	11	6	Average	Positive
Internal rate of return	0%	36%	10%	19%	Very good	
LCOE (Rands)	0.94	1.04	0.97	0.89		
Monthly bill for one Solar PV customer (Rands)	R 2,608	R 11,891	R 8,485	R 259,127		

Table 5: Average electricity consumption per annum, average solar self-consumption rate per annum and peak demand per season

	Residential	Small business	Medium business	Large business
Avg elect cons/annum (KWh/a)	10,853	87,831	92,013	2,415,350
Avg solar self-cons rate/annum*	71%	100%	43%	100%
Summer peak demand (kW)	2.21	12.19	12.78	346.05
Winter peak demand (kW)	3.36	17.13	17.95	503.08

Notes: * Avg solar self-cons rate/annum = Rooftop PV electricity consumed on-site/Total rooftop PV electricity produced

Chart 2: Energy balances

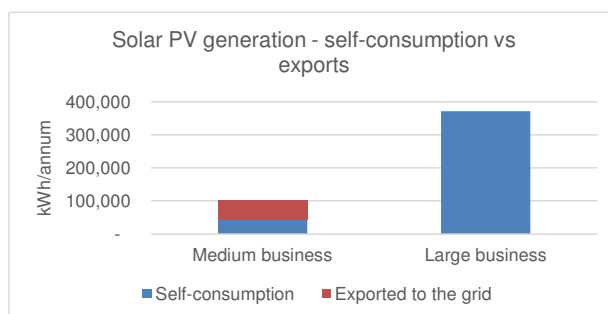
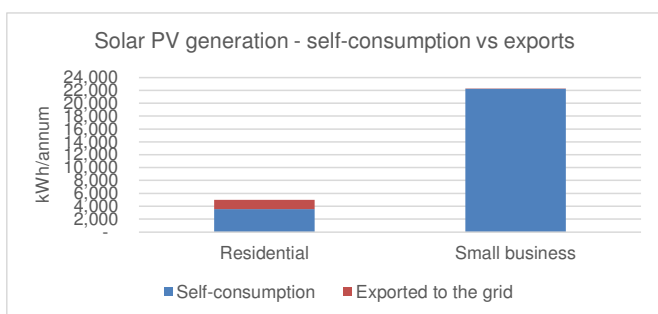


Table 6: Revenue Available for Network Costs and Average Bulk Energy Costs

		Residential	Small business	Medium business	Large business
Revenue per customer available for Network Costs (ZAR/month)	non-SSEG	R 1,280	R 9,688	R 7,482	R 132,456
	SSEG*	R 2,028	R 7,545	R 5,219	R 126,505
Average Bulk Purchase Costs (c/kWh)	non-SSEG	88.51	78.15	78.15	77.28
	SSEG	93.56	79.53	77.14	77.86

*Includes value of solar exports

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 7 – ALTERNATIVE ENERGY SUPPLY OPTION FOR MUNICIPAL FEED IN POINTS

Montagu 2MWp Langeberg Masterplan, Robertson, South Africa

Report

Project Name	Langeberg Masterplan
Project Address	Robertson, South Africa
Prepared By	Wiets Snyman info@ixengineers.co.za



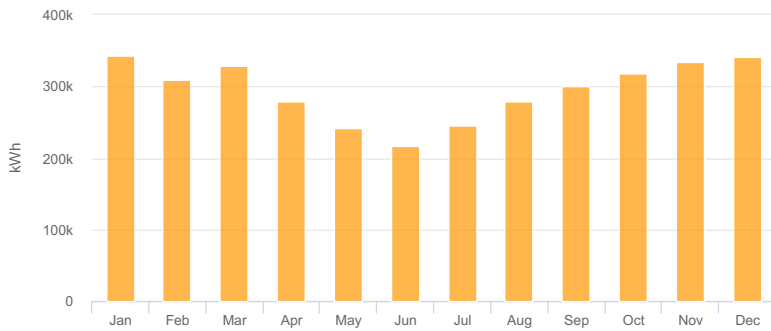
System Metrics

Design	Montagu 2MWp
Module DC Nameplate	2.00 MW
Inverter AC Nameplate	1.61 MW Load Ratio: 1.24
Annual Production	3,538 GWh
Performance Ratio	81.0%
kWh/kWp	1,766.6
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)
Simulator Version	4e8ad109b5-7184273f86-abd41a2ac5-1253cc88f6

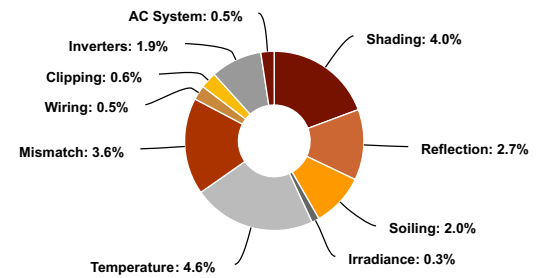
Project Location



Monthly Production



Sources of System Loss



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m ²)	Annual Global Horizontal Irradiance	1,902.8	
	POA Irradiance	2,181.1	14.6%
	Shaded Irradiance	2,093.4	-4.0%
	Irradiance after Reflection	2,037.8	-2.7%
	Irradiance after Soiling	1,997.0	-2.0%
	Total Collector Irradiance	1,996.9	0.0%
Energy (kWh)	Nameplate	4,002,351.3	
	Output at Irradiance Levels	3,991,057.5	-0.3%
	Output at Cell Temperature Derate	3,806,795.1	-4.6%
	Output After Mismatch	3,668,556.5	-3.6%
	Optimal DC Output	3,648,624.2	-0.5%
	Constrained DC Output	3,626,054.3	-0.6%
	Inverter Output	3,556,154.4	-1.9%
	Energy to Grid	3,538,373.6	-0.5%
Temperature Metrics			
	Avg. Operating Ambient Temp		20.3 °C
	Avg. Operating Cell Temp		30.3 °C
Simulation Metrics			
	Operating Hours	4607	
	Solved Hours	4607	

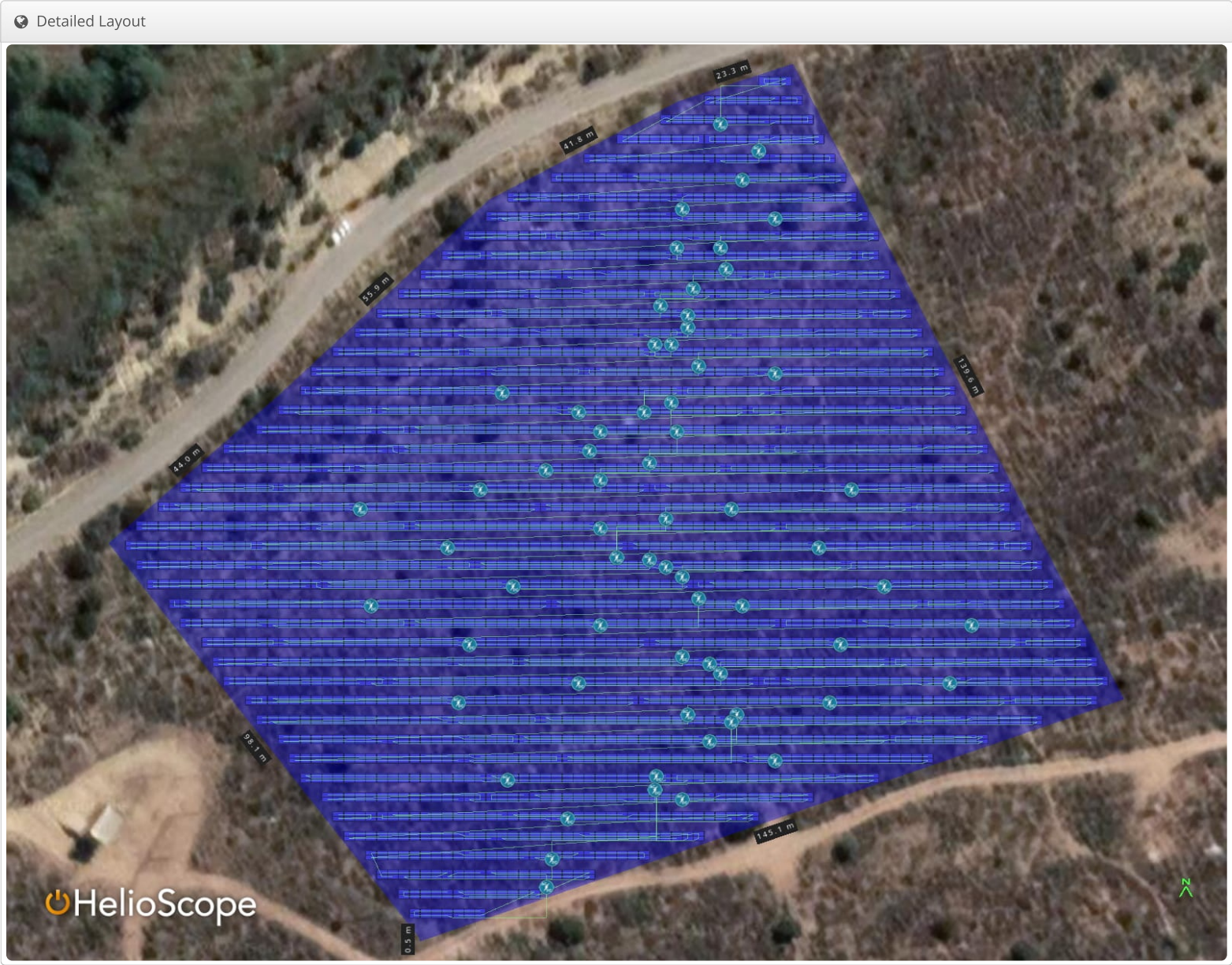
Condition Set

Description	Condition Set 1											
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)											
Solar Angle Location	Meteo Lat/Lng											
Transposition Model	Perez Model											
Temperature Model	Sandia Model											
Temperature Model Parameters	Rack Type	a	b	Temperature Delta								
	Fixed Tilt	-3.56	-0.075	3°C								
	Flush Mount	-2.81	-0.0455	0°C								
Soiling (%)	J	F	M	A	M	J	J	A	S	O	N	D
	2	2	2	2	2	2	2	2	2	2	2	2
Irradiation Variance	5%											
Cell Temperature Spread	4° C											
Module Binning Range	-2.5% to 2.5%											
AC System Derate	0.50%											
Module Characterizations	Module	Uploaded By						Characterization				
	CS3W-440MB-AG (Canadian Solar)	HelioScope						Spec Sheet Characterization, PAN				
Component Characterizations	Device	Uploaded By						Characterization				
	Sunny Tripower 24000TL-US (SMA)	HelioScope						Modified CEC				

Components		
Component	Name	Count
Inverters	Sunny Tripower 24000TL-US (SMA)	67 (1.61 MW)
Strings	10 AWG (Copper)	272 (16,092.9 m)
Module	Canadian Solar, CS3W-440MB-AG (440W)	4,552 (2.00 MW)

Wiring Zones			
Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	4-19	Along Racking

Field Segments									
Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Landscape (Horizontal)	32°	0°	2.0 m	2x1	2,276	4,552	2.00 MW



LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 8 – PROPOSED DEVELOPMENTS

Layout / Reference Number	Possible Developments	Area (Ha)
1	Middle income residential	3.31
2	GAP Housing	0.25
3	GAP Housing	1.43
4	Market related housing	8.16
5	Industrial	9.49
6a	Mandela Square Housing	11.36
6b	Mandela Square Housing	2.5
6c	Mandela Square Housing - TRA	1.8
6d	Housing	1.6

NOTES	

NOTES	

NOTES	

NOTES	

NOTES

If engineers retain the copyright in all intellectual property, including designs and/or documents prepared in terms of this agreement for the project covered by the agreement, the client may use the designs and/or documents for the safe operation of the structure only on the site and only subject to payment for the design having been received. Use for any other purpose, whether or not the designs and/or documents have been paid for, constitutes an infringement of copyright, and all rights are reserved.

All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer.

Copyright reserved

REVISION SCHEDULE				
No	DATE	DESCRIPTION		DRAWN BY
0				

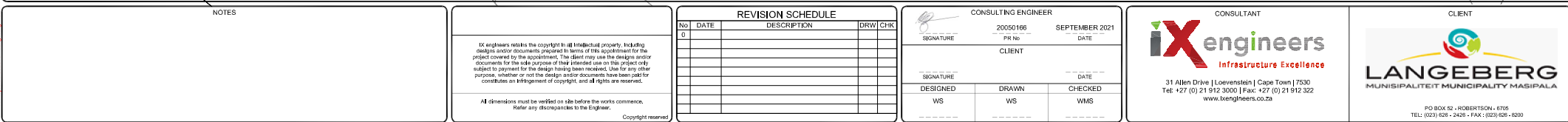
NOTES	If engineers retain the copyright in all intellectual property, including designs and/or documents prepared in terms of this agreement for the project covered by the agreement, the client may use the designs and/or documents for the safe operation of the structure only on the site and only subject to payment for the design having been received. Use for any other purpose, whether or not the designs and/or documents have been paid for, constitutes an infringement of copyright, and all rights are reserved. All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer. Copyright reserved	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th align="center" colspan="5">REVISION SCHEDULE</th> </tr> <tr> <th align="center">No</th> <th align="center">DATE</th> <th align="center" colspan="2">DESCRIPTION</th> <th align="center">DRAWN BY</th> </tr> <tr> <td align="center">0</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	REVISION SCHEDULE					No	DATE	DESCRIPTION		DRAWN BY	0				
REVISION SCHEDULE																	
No	DATE	DESCRIPTION		DRAWN BY													
0																	

NOTES	If engineers retain the copyright in all intellectual property, including designs and/or documents prepared in terms of this agreement for the project covered by the agreement, the client may use the designs and/or documents for the safe operation of the structure only on the site and only subject to payment for the design having been received. Use for any other purpose, whether or not the designs and/or documents have been paid for, constitutes an infringement of copyright, and all rights are reserved. All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer. Copyright reserved	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th align="center" colspan="5">REVISION SCHEDULE</th> </tr> <tr> <th align="center">No</th> <th align="center">DATE</th> <th align="center" colspan="2">DESCRIPTION</th> <th align="center">DRAWN BY</th> </tr> <tr> <td align="center">0</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	REVISION SCHEDULE					No	DATE	DESCRIPTION		DRAWN BY	0				
REVISION SCHEDULE																	
No	DATE	DESCRIPTION		DRAWN BY													
0																	

NOTES	If engineers retain the copyright in all intellectual property, including designs and/or documents prepared in terms of this agreement for the project covered by the agreement, the client may use the designs and/or documents for the safe operation of the structure only on the site and only subject to payment for the design having been received. Use for any other purpose, whether or not the designs and/or documents have been paid for, constitutes an infringement of copyright, and all rights are reserved. All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer. Copyright reserved	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th align="center" colspan="5">REVISION SCHEDULE</th> </tr> <tr> <th align="center">No</th> <th align="center">DATE</th> <th align="center" colspan="2">DESCRIPTION</th> <th align="center">DRAWN BY</th> </tr> <tr> <td align="center">0</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	REVISION SCHEDULE					No	DATE	DESCRIPTION		DRAWN BY	0				
REVISION SCHEDULE																	
No	DATE	DESCRIPTION		DRAWN BY													
0																	

NOTES 	REVISIONS SCHEDULE <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>No</th> <th>DATE</th> <th>DESCRIPTION</th> <th>DRW</th> <th>CHK</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> If engineers releases the copyright to all intellectual property, including designs and/or documents prepared in terms of this agreement for the project covered by the agreement. The client can use the designs and/or documents for the sole purpose of those intended and no other. This does not subject to payment for the design having been received, use for any other purpose, whether or not the design and/or documents have been paid for constitutes an infringement of copyright, and all rights are reserved. All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer. Copyright reserved	No	DATE	DESCRIPTION	DRW	CHK																																																								<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td align="center" colspan="2">CONSULTING ENGINEER</td> </tr> <tr> <td style="text-align: center;">20050166</td> <td style="text-align: center;">SEPTEMBER 2021</td> </tr> <tr> <td>SIGNATURE _____</td> <td>PR No. _____ DATE _____</td> </tr> <tr> <td align="center" colspan="2">CLIENT</td> </tr> <tr> <td>SIGNATURE _____</td> <td>_____ DATE _____</td> </tr> <tr> <td>DESIGNED _____</td> <td>DRAWN _____ CHECKED _____</td> </tr> <tr> <td>WS _____</td> <td>WS _____ WMS _____</td> </tr> </table>	CONSULTING ENGINEER		20050166	SEPTEMBER 2021	SIGNATURE _____	PR No. _____ DATE _____	CLIENT		SIGNATURE _____	_____ DATE _____	DESIGNED _____	DRAWN _____ CHECKED _____	WS _____	WS _____ WMS _____	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td align="center" colspan="2">CONSULTANT</td> </tr> <tr> <td align="center" colspan="2"> </td> </tr> <tr> <td align="center" colspan="2">Infrastructure Excellence</td> </tr> <tr> <td align="center" colspan="2"> 31 Allen Drive Looevenstein Cape Town 7830 Tel: +27 (0) 21 912 3000 Fax: +27 (0) 21 912 322 www.ixengineers.co.za </td> </tr> </table>	CONSULTANT				Infrastructure Excellence		31 Allen Drive Looevenstein Cape Town 7830 Tel: +27 (0) 21 912 3000 Fax: +27 (0) 21 912 322 www.ixengineers.co.za		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td align="center" colspan="2">CLIENT</td> </tr> <tr> <td align="center" colspan="2"> </td> </tr> <tr> <td align="center" colspan="2"> LANGE BERG MUNISIPALITEIT MUNICIPALITY MASIPALA </td> </tr> <tr> <td align="center" colspan="2"> PO BOX 52 • ROSEBUDTOWN • 6705 TEL: (023) 626 • 2426 • FAX : (023) 626 • 6260 </td> </tr> </table>	CLIENT				LANGE BERG MUNISIPALITEIT MUNICIPALITY MASIPALA		PO BOX 52 • ROSEBUDTOWN • 6705 TEL: (023) 626 • 2426 • FAX : (023) 626 • 6260	
No	DATE	DESCRIPTION	DRW	CHK																																																																																										
CONSULTING ENGINEER																																																																																														
20050166	SEPTEMBER 2021																																																																																													
SIGNATURE _____	PR No. _____ DATE _____																																																																																													
CLIENT																																																																																														
SIGNATURE _____	_____ DATE _____																																																																																													
DESIGNED _____	DRAWN _____ CHECKED _____																																																																																													
WS _____	WS _____ WMS _____																																																																																													
CONSULTANT																																																																																														
Infrastructure Excellence																																																																																														
31 Allen Drive Looevenstein Cape Town 7830 Tel: +27 (0) 21 912 3000 Fax: +27 (0) 21 912 322 www.ixengineers.co.za																																																																																														
CLIENT																																																																																														
LANGE BERG MUNISIPALITEIT MUNICIPALITY MASIPALA																																																																																														
PO BOX 52 • ROSEBUDTOWN • 6705 TEL: (023) 626 • 2426 • FAX : (023) 626 • 6260																																																																																														

NOTES 	REVISIONS SCHEDULE <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>No</th> <th>DATE</th> <th>DESCRIPTION</th> <th>DRW</th> <th>CHK</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> If engineers releases the copyright to all intellectual property, including designs and/or documents prepared in terms of this agreement for the project covered by the agreement. The client can use the designs and/or documents for the sole purpose of the intended use in the project subject to payment for the design having been received. Use for any other purpose, whether or not the design and/or documents have been paid for constitutes an infringement of copyright, and all rights are reserved. All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer. Copyright reserved	No	DATE	DESCRIPTION	DRW	CHK																																																			CONSULTING ENGINEER <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> SIGNATURE _____ PIR No.: 20050166 CLIENT _____ </td> <td style="width: 50%;"> DATE: SEPTEMBER 2021 </td> </tr> <tr> <td> SIGNATURE _____ DESIGNED: WS DRAWN: WS CHECKED: WMS </td> <td> DATE: _____ </td> </tr> </table>	SIGNATURE _____ PIR No.: 20050166 CLIENT _____	DATE: SEPTEMBER 2021	SIGNATURE _____ DESIGNED: WS DRAWN: WS CHECKED: WMS	DATE: _____	CONSULTANT Infrastructure Excellence 31 Allen Drive Looevenstein Cape Town 7830 Tel: +27 (0) 21 912 3000 Fax: +27 (0) 21 912 322 www.ixengineers.co.za	CLIENT LANGEBERG MUNICIPALITEIT MUNICIPALITY MASIPALA PO BOX 52 • ROSEBUDTOWN • 6705 TEL: (023) 626 • 2426 • FAX : (023) 626 • 6260
No	DATE	DESCRIPTION	DRW	CHK																																																											
SIGNATURE _____ PIR No.: 20050166 CLIENT _____	DATE: SEPTEMBER 2021																																																														
SIGNATURE _____ DESIGNED: WS DRAWN: WS CHECKED: WMS	DATE: _____																																																														



NOTES 	REVISIONS SCHEDULE <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>No</th> <th>DATE</th> <th>DESCRIPTION</th> <th>DRW</th> <th>CHK</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> If engineers releases the copyright to all intellectual property, including designs and/or documents prepared in terms of this agreement for the project covered by the agreement. The client can use the designs and/or documents for the sole purpose of the intended use in the project subject to payment for the design having been received, use for any other purpose, whether or not the design and/or documents have been used for constitutes an infringement of copyright, and all rights are reserved. All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer. Copyright reserved	No	DATE	DESCRIPTION	DRW	CHK																																																			CONSULTING ENGINEER <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> SIGNATURE _____ PIR No.: 20050166 CLIENT _____ </td> <td style="width: 50%;"> DATE: SEPTEMBER 2021 </td> </tr> <tr> <td> SIGNATURE _____ DESIGNED _____ WS _____ </td> <td> DATE: _____ DRAWN _____ WMS _____ </td> </tr> </table>	SIGNATURE _____ PIR No.: 20050166 CLIENT _____	DATE: SEPTEMBER 2021	SIGNATURE _____ DESIGNED _____ WS _____	DATE: _____ DRAWN _____ WMS _____	CONSULTANT Infrastructure Excellence 31 Allen Drive Looventstein Cape Town 7830 Tel: +27 (0) 21 912 3000 Fax: +27 (0) 21 912 322 www.ixengineers.co.za	CLIENT LANGEBERG MUNICIPALITEIT MUNICIPALITY MASIPALA PO BOX 52 • ROBERTSON • 6705 TEL: (023) 626 • 2426 • FAX : (023) 626 • 6260
No	DATE	DESCRIPTION	DRW	CHK																																																											
SIGNATURE _____ PIR No.: 20050166 CLIENT _____	DATE: SEPTEMBER 2021																																																														
SIGNATURE _____ DESIGNED _____ WS _____	DATE: _____ DRAWN _____ WMS _____																																																														

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 9 – LOAD GROWTH FORECAST

[illegible]

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 10 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS



LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 11 – PROSPECTIVE FAULT LEVEL STUDY

Montagu Prospective Fault Level Study

SUBSTATION/TRANSFORMER	3ø Fault (kA)	ø-G Fault (kA)
ESKOM	8.71	0.33
BUSBAR_1	8.61	0.33
BUSBAR_2	8.61	0.33
N201	8.61	0.33
N202	8.61	0.33
N226	8.61	0.33
N1	8.6	0.33
N2	8.6	0.33
N3	8.6	0.33
N4	8.6	0.33
N20	8.07	0.33
UITVLUCHT	7.99	0.33
BRINK_SS	7.34	0.32
BRINK_SUB	7.33	0.32
N19	7.31	0.32
NATUURTUIN	7.16	0.32
BUS_0136	7.11	0.32
N15	7.08	0.32
N6	7.01	0.32
VANRIEBEECK	6.92	0.32
vRIEBEECKRMU	6.92	0.32
N21	6.85	0.32
N204	6.85	0.32
THOMPSON	6.84	0.32
BUS_0131	6.61	0.32
N205	6.61	0.32
BUS_0130	6.54	0.32
BARLINKA_STR	6.52	0.32
MONTAGU_FOODS	6.5	0.32
N16	6.49	0.32
KOHLER_STR	6.31	0.31
N30	6.3	0.32
KOHLER_RMU	6.28	0.31
MONIS_RMU	6.16	0.32
INDUSTRIEEL	6.14	0.32
N181	6.14	0.32
N182	6.14	0.32
N17	6.12	0.32
MON_KELDER	6.09	0.32
_7_ELEVEN_RMU	5.98	0.32
N7_ELEVEN	5.97	0.32
N36	5.96	0.32
DE_WHITE	5.93	0.32

N24	5.91	0.32
GROSS_STR	5.9	0.32
MONTAGU_VRU	5.85	0.32
ISMAIL_RMU	5.83	0.32
N31	5.82	0.32
ISMAIL	5.82	0.32
MONTAQ_PACKERS	5.79	0.32
KONFYT	5.74	0.32
KOELKMRS	5.69	0.31
BUS_0141	5.65	0.32
PARKSTR_RMU	5.58	0.31
J_MARIAS_ARB	5.42	0.32
BUS_0020	5.33	0.32
AVALON_RMU	5.27	0.32
AVALON	5.26	0.32
BUS_0013	5.25	0.31
N11	5.15	0.32
DU_PREEZ_RMU	5.11	0.31
N8	5.09	0.31
N37	5.08	0.31
DU_PREEZ	5.08	0.31
WATERWERKE	5.07	0.31
HSPTL_RMU_1	5.06	0.31
HOSPITAAL	5.05	0.31
LAERSKOOL_RMU	5.04	0.31
SENTRALE_RMU	4.99	0.31
STAALFABRIEK	4.98	0.31
POMPSTASIE_2	4.97	0.31
SENTRALE	4.96	0.31
_POMPSTASIE_2	4.93	0.31
BARRY_STRRMU	4.92	0.31
LAERSKOOL	4.9	0.31
SPAR	4.86	0.31
N43	4.81	0.31
SWANEPOEL_	4.61	0.31
N38	4.61	0.31
PARRING_RMU	4.58	0.31
PARRING	4.56	0.31
N34	4.55	0.31
STEENONDE	4.46	0.31
BUS_132	4.41	0.31
BERGSIG	4.4	0.31
CHLOORKAMER	4.36	0.31
BUS_0133	4.3	0.31
N25	4.15	0.31
RIOOLUITVAL	4.08	0.31
POSKNTR_RMU	4.07	0.3

POSKANTOOR	4.05	0.3
N12	4	0.31
GEELBOSLAG_LANDELIK	3.99	0.31
N26	3.97	0.31
LANG_STR_RMU	3.96	0.31
LANG_STR_SUB	3.95	0.31
BRINK_RMU	3.93	0.31
BRINK	3.92	0.31
GOLFBAAN_TRF	3.86	0.3
OUETEHUIS	3.83	0.3
HERBERG	3.8	0.3
N42	3.76	0.3
SKERPIOEN_RMU	3.75	0.3
GRAAF_TANNER	3.73	0.3
MONTAGU_WES	3.72	0.3
BUS_0145	3.69	0.3
BUS_0146	3.64	0.3
BESOEKERS	3.59	0.3
N13	3.52	0.3
MANDELA_SQUARE	3.52	0.3
POORTJIESKLOOF	3.42	0.3
N196	3.41	0.3
N39	3.31	0.3
SITRUSLAAN	3.27	0.3
N197	3.25	0.3
DE_BOS	3.21	0.3
N40	3.15	0.3
DUTOIT_RMU	3.1	0.29
EYSENHUIS	3.09	0.29
SEDERLAAN	3.09	0.3
DU_TOIT	3.09	0.29
N33	2.98	0.29
N198	2.98	0.3
BERG_STR_RMU_1	2.98	0.3
BERG_STR	2.97	0.3
BERG_STR_RMU_2_	2.96	0.3
N27	2.94	0.3
BADSKOP	2.84	0.29
N44	2.82	0.29
GREYSTREET	2.81	0.3
PIETSEPAD	2.78	0.3
N114	2.77	0.29
N45	2.76	0.29
BLOEKOMLAAN	2.75	0.29
BERG_STR_RMU	2.73	0.3
TRFR_A_TO_E	2.66	0.29
ASHBURY	2.6	0.29

LA_DOMAIN	2.59	0.29
LINDVELDT	2.55	0.29
N186	2.49	0.29
N183	2.48	0.29
NUNES	2.47	0.29
OUI_SI	2.46	0.29
LANDELIKE_PLASE	2.46	0.29
OLYFBOOM	2.44	0.29
LAPPIES_LAAGTE	2.43	0.29
N28	2.32	0.29
N29	2.32	0.29
POMPSTASIE	2.31	0.29
CBR_RMU_	2.31	0.29
LA_DOM_PAK	2.31	0.29
CBR_1	2.31	0.29
CBR_2	2.31	0.29
CBR_3	2.31	0.29
N206	2.28	0.28
N189	2.09	0.28
BADSHOOGTE	2.08	0.28
MONTAGU_SPRINGS_RMU	2.01	0.28
AVALON_SPRINGS_RMU	1.97	0.28
AVALON_SPRINGS_	1.97	0.28
MONTAGU_SPRINGS	1.95	0.28
SCHUSS	1.93	0.28

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 12 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY

Montagu Current Voltage Level Study

Node Name	Min Voltage	Difference
ESKOM	99.31%	
N201	98.74%	0.57%
BUSBAR_1	98.73%	0.58%
N4	98.73%	0.58%
N226	98.73%	0.58%
N1	98.72%	0.59%
BUSBAR_2	98.70%	0.61%
N202	98.70%	0.61%
N2	98.69%	0.62%
N3	98.68%	0.63%
N20	98.63%	0.68%
UITVLUCHT	98.62%	0.69%
BRINK_SS	98.55%	0.76%
BRINK_SUB	98.55%	0.76%
N19	98.55%	0.76%
N15	98.53%	0.78%
N16	98.49%	0.82%
N17	98.49%	0.82%
BUS_0141	98.48%	0.83%
PARKSTR_RMU	98.48%	0.83%
GROSS_STR	98.48%	0.83%
Dummy_DUTOIT_RMU	98.48%	0.83%
SENTRALE_RMU	98.47%	0.84%
SENTRALE	98.47%	0.84%
NATUURTUIN	98.45%	0.86%
_7_ELEVEN_RMU	98.45%	0.86%
N7_ELEVEN	98.45%	0.86%
N6	98.43%	0.88%
THOMPSON	98.43%	0.88%
ISMAIL_RMU	98.42%	0.89%
ISMAIL	98.42%	0.89%
N24	98.39%	0.92%
DU_PREEZ_RMU	98.39%	0.92%
DU_PREEZ	98.39%	0.92%
AVALON_RMU	98.38%	0.93%
AVALON	98.38%	0.93%
PARRING_RMU	98.37%	0.94%
PARRING	98.37%	0.94%
LAERSKOOL_RMU	98.36%	0.95%
LAERSKOOL	98.36%	0.95%
SPAR	98.35%	0.96%
VANRIEBEECK	98.33%	0.98%
vRIEBEECKRMU	98.32%	0.99%

BUS__132	98.31%	1.00%
CHLOORKAMER	98.31%	1.00%
BUS_0133	98.30%	1.01%
N25	98.30%	1.01%
RIOOLUITVAL	98.30%	1.01%
BUS_0136	98.28%	1.03%
BUS_0020	98.27%	1.04%
J_MARIAS_ARB	98.27%	1.04%
BUS_0013	98.26%	1.05%
WATERWERKE	98.25%	1.06%
N8	98.25%	1.06%
GEELBOSLAG_LANDELIK	98.24%	1.07%
HSPTL_RMU_1	98.24%	1.07%
POORTJIESKLOOF	98.24%	1.07%
HOSPITAAL	98.24%	1.07%
SWANEPOEL_	98.22%	1.09%
KOHLER_STR	98.22%	1.09%
KOHLER_RMU	98.21%	1.10%
Dummy_SPAR	98.21%	1.10%
BRINK_RMU	98.19%	1.12%
N21	98.19%	1.12%
BRINK	98.19%	1.12%
N204	98.19%	1.12%
BUS_0131	98.11%	1.20%
N205	98.11%	1.20%
BUS_0130	98.10%	1.21%
MONTAGU_FOODS	98.10%	1.21%
BARLINKA_STR	98.10%	1.21%
DE_WHITE	98.09%	1.22%
MONTAGU_VRU	98.08%	1.23%
N30	98.08%	1.23%
N11	98.08%	1.23%
KOELKMRS	98.07%	1.24%
N31	98.07%	1.24%
MONTAQ_PACKERS	98.07%	1.24%
KONFYT	98.06%	1.25%
POMPSTASIE_2	98.06%	1.25%
_POMPSTASIE_2	98.06%	1.25%
N26	97.99%	1.32%
MONIS_RMU	97.97%	1.34%
INDUSTRIEEL	97.97%	1.34%
MON_KELDER	97.96%	1.35%
N181	97.96%	1.35%
N182	97.96%	1.35%
N12	97.95%	1.36%
LANG_STR_RMU	97.94%	1.37%
LANG_STR_SUB	97.94%	1.37%

N36	97.93%	1.38%
BARRY_STRRMU	97.89%	1.42%
N43	97.88%	1.43%
N13	97.85%	1.46%
N196	97.83%	1.48%
DE_BOS	97.83%	1.48%
N197	97.80%	1.51%
N42	97.79%	1.52%
GRAAF_TANNER	97.79%	1.52%
BESOEKERS	97.79%	1.52%
MONTAGU_WES	97.79%	1.52%
Dummy_BERG_STR_RMU	97.79%	1.52%
EYSENHUIS	97.78%	1.53%
POSKNTR_RMU	97.74%	1.57%
POSKANTOOR	97.74%	1.57%
BERG_STR	97.74%	1.57%
N198	97.74%	1.57%
BERG_STR_RMU_1	97.74%	1.57%
BERG_STR_RMU_2_	97.73%	1.58%
HERBERG	97.73%	1.58%
PIETSEPAD	97.72%	1.59%
OUETEHUIS	97.72%	1.59%
N37	97.72%	1.59%
STAALFABRIEK	97.72%	1.59%
GREYSTREET	97.71%	1.60%
BERG_STR_RMU	97.70%	1.61%
LINDVELDT	97.69%	1.62%
DUTOIT_RMU	97.67%	1.64%
DU_TOIT	97.67%	1.64%
N38	97.60%	1.71%
N27	97.59%	1.72%
STEENOONDE	97.59%	1.72%
N34	97.58%	1.73%
BERGSIG	97.58%	1.73%
N28	97.55%	1.76%
POMPSTASIE	97.54%	1.77%
LA_DOMAIN	97.41%	1.90%
GOLFBAAN_TRF	97.37%	1.94%
N29	97.25%	2.06%
SKERPIOEN_RMU	97.25%	2.06%
BUS_0145	97.25%	2.06%
BUS_0146	97.25%	2.06%
MANDELA_SQUARE	97.25%	2.06%
CBR_RMU_	97.24%	2.07%
LA_DOM_PAK	97.24%	2.07%
CBR_1	97.24%	2.07%
CBR_2	97.24%	2.07%

CBR_3	97.24%	2.07%
N206	97.24%	2.07%
Dummy_N30	97.24%	2.07%
N39	97.03%	2.28%
SITRUSLAAN	97.02%	2.29%
N33	97.00%	2.31%
BADSKOP	96.98%	2.33%
N40	96.94%	2.37%
SEDERLAAN	96.94%	2.37%
N114	96.90%	2.41%
N183	96.89%	2.42%
NUNES	96.89%	2.42%
OUI_SI	96.89%	2.42%
N44	96.76%	2.55%
N45	96.75%	2.56%
BLOEKOMLAAN	96.75%	2.56%
N186	96.74%	2.57%
LANDELIKE_PLASE	96.74%	2.57%
LAPPIES_LAAGTE	96.72%	2.59%
TRFR_A_TO_E	96.71%	2.60%
ASHBURY	96.71%	2.60%
OLYFBOOM	96.69%	2.62%
N189	96.54%	2.77%
BADSHOOGTE	96.53%	2.78%
MONTAGU_SPRINGS_RMU	96.48%	2.83%
MONTAGU_SPRINGS	96.47%	2.84%
AVALON_SPRINGS_RMU	96.47%	2.84%
AVALON_SPRINGS_	96.47%	2.84%
SCHUSS	96.46%	2.85%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 13 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY

Montagu Current Feeder Loading

Feeder to	Feeder % Loading
N3	59.16%
BUS_0136	50.12%
N21	50.02%
N204	50.02%
N205	50.02%
N202	49.56%
MONIS_RMU	41.46%
N1	38.54%
BARRY_STRRMU	36.72%
N181	35.88%
N201	33.08%
SKERPIOEN_RMU	32.71%
NATUURTUIN	32.65%
N39	31.05%
VANRIEBEECK	28.83%
N34	28.48%
N40	28.45%
N37	27.60%
VRIEBEECKRMU	27.24%
N182	27.06%
N2	26.97%
CBR_RMU_	26.07%
GOLFBAAN_TRF	26.01%
N44	25.84%
N38	25.71%
N33	25.19%
N11	24.83%
LAPPIES_LAAGTE	24.70%
POSKNTR_RMU	24.60%
N189	24.33%
KOHLER_STR	23.78%
KOELKMRS	23.49%
N20	22.85%
N114	21.05%
KOHLER_RMU	20.42%
N186	20.42%
N36	19.93%
N6	19.84%
N4	19.28%
BRINK_SS	18.72%
BADSHOOGTE	18.42%
LANG_STR_RMU	18.24%
N26	17.12%

N27	17.12%
BUS_0020	16.59%
N24	16.34%
N13	16.02%
LA_DOMAIN	15.24%
MONTAGU_SPRINGS_RMU	14.86%
ISMAIL_RMU	14.57%
N29	14.04%
BUS_0013	13.90%
AVALON	13.49%
N42	13.29%
_7_ELEVEN_RMU	13.13%
N15	12.34%
N198	12.31%
N43	12.25%
AVALON_RMU	11.94%
HSPTL_RMU_1	11.41%
CBR_3	11.19%
UITVLUCHT	11.05%
POMPSTASIE_2	10.98%
N16	10.92%
GRAAF_TANNER	10.70%
N12	9.82%
AVALON_SPRINGS_RMU	9.21%
ASHBURY	9.19%
TRFR_A_TO_E	8.68%
N196	8.63%
N8	8.41%
BERG_STR_RMU_2_	8.10%
N197	8.05%
MON_KELDER	7.79%
BUS_0130	7.78%
CBR_1	7.05%
SWANEPOEL_	6.98%
DE_WHITE	6.97%
DUTOIT_RMU	6.78%
DU_TOIT	6.78%
MONTAGU_FOODS	6.77%
LAERSKOOL_RMU	6.75%
LANDELIKE_PLASE	6.64%
GREYSTREET	5.65%
MONTAGU_SPRINGS	5.65%
AVALON_SPRINGS_	5.65%
BADSKOP	5.62%
CBR_2	5.59%
POSKANTOOR	5.57%
OUETEHUIS	5.57%

INDUSTRIEEL	5.56%
ISMAIL	5.54%
PARRING_RMU	5.54%
PARRING	5.54%
MONTAGU_WES	5.42%
SPAR	5.40%
N30	4.59%
HOSPITAAL	4.43%
SITRUSLAAN	4.31%
BARLINKA_STR	4.26%
N31	4.24%
BUS__132	3.97%
BUS_0133	3.87%
SCHUSS	3.56%
BLOEKOMLAAN	3.55%
OLYFBOOM	3.55%
SEDERLAAN	3.54%
PIETSEPAD	3.51%
HERBERG	3.51%
STAALFABRIEK	3.51%
DU_PREEZ_RMU	3.51%
BERG_STR	3.51%
KONFYT	3.50%
BRINK_RMU	3.49%
DU_PREEZ	3.49%
GROSS_STR	3.49%
BRINK	3.49%
THOMPSON	3.48%
BUS_0131	3.45%
STEENOONDE	3.35%
BERGSIG	3.35%
BERG_STR_RMU	3.19%
N17	3.07%
POORTJIESKLOOF	3.01%
PARKSTR_RMU	2.70%
SENTRALE_RMU	2.70%
_POMPSTASIE_2	2.70%
SENTRALE	2.70%
LAERSKOOL	2.70%
GEELBOSLAG_LANDELIK	2.69%
LINDVELDT	2.46%
WATERWERKE	2.44%
BRINK_SUB	2.44%
LA_DOM_PAK	2.24%
BUS_0146	2.24%
LANG_STR_SUB	2.22%
MONTAQ_PACKERS	2.22%

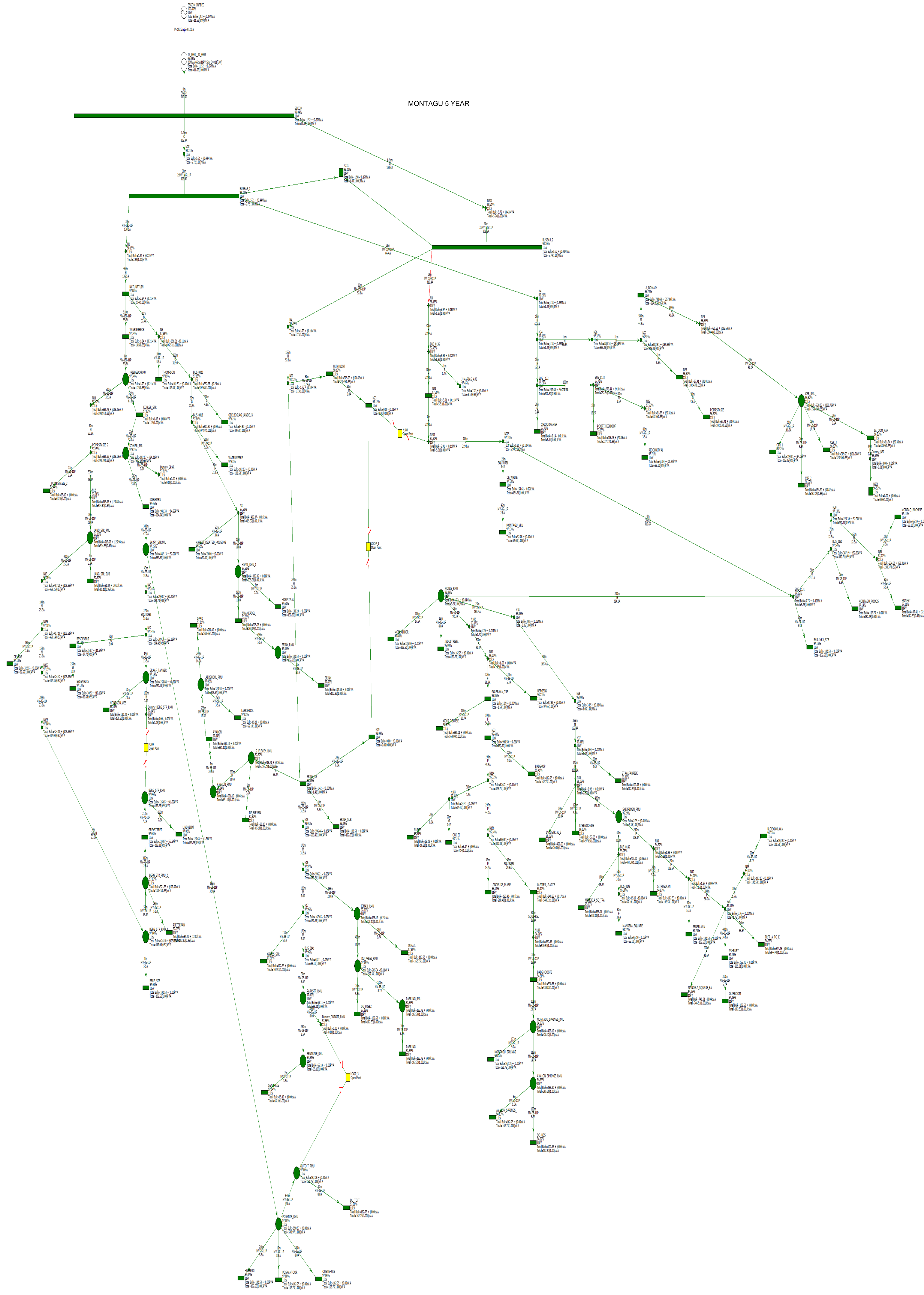
N7_ELEVEN	2.22%
RIOOLUITVAL	2.21%
N45	1.91%
N28	1.89%
POMPSTASIE	1.89%
MONTAGU_VRU	1.78%
BUS_0145	1.65%
MANDELA_SQUARE	1.65%
DE_BOS	1.35%
BESOEKERS	1.20%
BUS_0141	1.19%
N25	1.19%
EYSENHUIS	1.04%
N183	0.62%
BERG_STR_RMU_1	0.42%
NUNES	0.41%
CHLOORKAMER	0.26%
OUI_SI	0.26%
J_MARIAS_ARB	0.16%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 14 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS

MONTAGU 5 YEAR



LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 15 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY

Montagu 5 Year Voltage Level Study

Node Name	Min Voltage	Difference
ESKOM	99.04%	
N201	98.26%	0.78%
BUSBAR_1	98.25%	0.79%
N4	98.25%	0.79%
N231	98.25%	0.79%
N1	98.24%	0.80%
N202	98.16%	0.88%
BUSBAR_2	98.15%	0.89%
N2	98.15%	0.89%
N3	98.13%	0.91%
N20	98.08%	0.96%
UITVLUCHT	98.07%	0.97%
N23	98.07%	0.97%
BRINK_SS	97.99%	1.05%
BRINK_SUB	97.99%	1.05%
N19	97.99%	1.05%
N15	97.96%	1.08%
NATUURTUIN	97.93%	1.11%
N16	97.92%	1.12%
N17	97.91%	1.13%
BUS_0141	97.91%	1.13%
PARKSTR_RMU	97.91%	1.13%
N6	97.91%	1.13%
GROSS_STR	97.91%	1.13%
Dummy_DUTOIT_RMU	97.91%	1.13%
THOMPSON	97.90%	1.14%
SENTRALE_RMU	97.89%	1.15%
SENTRALE	97.89%	1.15%
N24	97.87%	1.17%
_7_ELEVEN_RMU	97.87%	1.17%
N7_ELEVEN	97.87%	1.17%
ISMAIL_RMU	97.84%	1.20%
ISMAIL	97.84%	1.20%
DU_PREEZ_RMU	97.81%	1.23%
DU_PREEZ	97.81%	1.23%
VANRIEBEECK	97.79%	1.25%
VRIEBEECKRMU	97.79%	1.25%
AVALON_RMU	97.79%	1.25%
AVALON	97.79%	1.25%
BUS__132	97.78%	1.26%
CHLOORKAMER	97.78%	1.26%
PARRING_RMU	97.78%	1.26%
PARRING	97.78%	1.26%

BUS_0133	97.77%	1.27%
N25	97.77%	1.27%
LAERSKOOL_RMU	97.77%	1.27%
LAERSKOOL	97.77%	1.27%
RIOOLUITVAL	97.76%	1.28%
SPAR	97.76%	1.28%
POORTJIESKLOOF	97.70%	1.34%
BUS_0020	97.69%	1.35%
BUS_0013	97.68%	1.36%
WATERWERKE	97.68%	1.36%
N8	97.67%	1.37%
HSPTL_RMU_1	97.67%	1.37%
KOHLER_STR	97.67%	1.37%
HOSPITAAL	97.67%	1.37%
MARKET_RELATED_HOUSING	97.67%	1.37%
KOHLER_RMU	97.66%	1.38%
GEELBOSLAG_LANDELIK	97.66%	1.38%
Dummy_SPAR	97.66%	1.38%
SWANEPOEL_	97.64%	1.40%
BRINK_RMU	97.61%	1.43%
BRINK	97.61%	1.43%
N11	97.52%	1.52%
KOELKMRS	97.50%	1.54%
POMPSTASIE_2	97.49%	1.55%
_POMPSTASIE_2	97.49%	1.55%
N26	97.42%	1.62%
BUS_0136	97.40%	1.64%
J_MARIAS_ARB	97.40%	1.64%
N12	97.36%	1.68%
LANG_STR_RMU	97.35%	1.69%
LANG_STR_SUB	97.35%	1.69%
BARRY_STRRMU	97.30%	1.74%
N43	97.29%	1.75%
N21	97.25%	1.79%
N13	97.25%	1.79%
N204	97.25%	1.79%
N196	97.23%	1.81%
DE_BOS	97.23%	1.81%
N197	97.20%	1.84%
N42	97.19%	1.85%
GRAAF_TANNER	97.19%	1.85%
BESOEKERS	97.19%	1.85%
MONTAGU_WES	97.19%	1.85%
Dummy_BERG_STR_RMU	97.19%	1.85%
EYSENHUIS	97.18%	1.86%
POSKNTR_RMU	97.13%	1.91%
POSKANTOOR	97.13%	1.91%

BERG_STR	97.13%	1.91%
N198	97.13%	1.91%
BERG_STR_RMU_1	97.13%	1.91%
BERG_STR_RMU_2_	97.12%	1.92%
HERBERG	97.12%	1.92%
PIETSEPAD	97.11%	1.93%
OUETEHUIS	97.11%	1.93%
GREYSTREET	97.10%	1.94%
BUS_0131	97.10%	1.94%
BARLINKA_STR	97.10%	1.94%
N205	97.10%	1.94%
BERG_STR_RMU	97.09%	1.95%
BUS_0130	97.09%	1.95%
MONTAGU_FOODS	97.09%	1.95%
DE_WHITE	97.08%	1.96%
MONTAGU_VRU	97.08%	1.96%
N30	97.08%	1.96%
LINDVELDT	97.07%	1.97%
N31	97.06%	1.98%
KONFYT	97.06%	1.98%
MONTAQ_PACKERS	97.06%	1.98%
DUTOIT_RMU	97.05%	1.99%
DU_TOIT	97.05%	1.99%
N27	96.97%	2.07%
N28	96.92%	2.12%
POMPSTASIE	96.92%	2.12%
MONIS_RMU	96.84%	2.20%
INDUSTRIEEL	96.83%	2.21%
MON_KELDER	96.83%	2.21%
N182	96.82%	2.22%
N181	96.81%	2.23%
LA_DOMAIN	96.77%	2.27%
N36	96.75%	2.29%
N29	96.58%	2.46%
CBR_RMU_	96.57%	2.47%
LA_DOM_PAK	96.57%	2.47%
CBR_1	96.57%	2.47%
CBR_2	96.57%	2.47%
CBR_3	96.57%	2.47%
N206	96.57%	2.47%
Dummy_N30	96.57%	2.47%
N37	96.28%	2.76%
STAALFABRIEK	96.27%	2.77%
N34	96.18%	2.86%
BERGSIG	96.18%	2.86%
N38	95.98%	3.06%
STEENOONDE	95.97%	3.07%

INDUSTRIAL_2	95.97%	3.07%
GOLFBAAN_TRF	95.81%	3.23%
GOLF_COURSE	95.78%	3.26%
N33	95.38%	3.66%
BADSKOP	95.36%	3.68%
N114	95.27%	3.77%
N183	95.26%	3.78%
NUNES	95.26%	3.78%
OUI_SI	95.26%	3.78%
SKERPIOEN_RMU	95.24%	3.80%
BUS_0145	95.23%	3.81%
BUS_0146	95.23%	3.81%
MANDELA_SQUARE	95.22%	3.82%
MANDELA_SQ_TRA	95.20%	3.84%
N186	95.09%	3.95%
LANDELIKE_PLASE	95.08%	3.96%
LAPPIES_LAAGTE	95.06%	3.98%
N189	94.86%	4.18%
BADSHOOGTE	94.85%	4.19%
N39	94.82%	4.22%
SITRUSLAAN	94.81%	4.23%
MONTAGU_SPRINGS_RMU	94.80%	4.24%
MONTAGU_SPRINGS	94.78%	4.26%
AVALON_SPRINGS_RMU	94.78%	4.26%
AVALON_SPRINGS_	94.78%	4.26%
SCHUSS	94.77%	4.27%
N40	94.65%	4.39%
SEDERLAAN	94.65%	4.39%
N44	94.29%	4.75%
N45	94.28%	4.76%
BLOEKOMLAAN	94.28%	4.76%
TRFR_A_TO_E	94.23%	4.81%
ASHBURY	94.23%	4.81%
OLYFBOOM	94.21%	4.83%
MANDELA_SQUARE_6A	94.18%	4.86%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 16 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY

Montagu 5 Year Feeder Loading

Feeder to	Feeder % Loading
N3	104.73%
BUS_0136	88.73%
N21	88.62%
N204	88.62%
N205	88.62%
N181	82.72%
MONIS_RMU	78.93%
SKERPIOEN_RMU	69.24%
N37	63.63%
N38	61.48%
N202	58.94%
N39	57.54%
N201	56.64%
BUSBAR_2	55.78%
N40	54.56%
BUSBAR_1	53.60%
N44	51.57%
N34	48.56%
N182	46.14%
N36	45.95%
GOLFBAAN_TRF	45.76%
N1	44.74%
BARRY_STRRMU	41.46%
NATUURTUIN	37.90%
VANRIEBEECK	32.55%
vRIEBEECKRMU	30.76%
N2	30.35%
CBR_RMU_	29.45%
N33	28.68%
LAPPIES_LAAGTE	28.13%
N11	28.04%
POSKNTR_RMU	27.78%
N189	27.71%
KOHLER_STR	26.85%
KOELKMRS	26.52%
N20	25.71%
N6	24.90%
N114	23.96%
N186	23.26%
KOHLER_RMU	23.06%
GOLF_COURSE	21.91%
MANDELA_SQUARE_6A	21.90%
N4	21.78%

BUS_0020	21.23%
BRINK_SS	21.07%
BADSHOOGTE	20.98%
LANG_STR_RMU	20.59%
N27	19.35%
N26	19.34%
N24	18.45%
BUS_0013	18.20%
N13	18.10%
LA_DOMAIN	17.22%
MONTAGU_SPRINGS_RMU	16.93%
ISMAIL_RMU	16.40%
INDUSTRIAL_2	16.40%
N29	15.86%
AVALON	15.19%
N42	15.01%
_7_ELEVEN_RMU	14.78%
N198	13.90%
N15	13.89%
N43	13.83%
AVALON_RMU	13.44%
HSPTL_RMU_1	12.88%
CBR_3	12.64%
UITVLUCHT	12.44%
POMPSTASIE_2	12.40%
N16	12.29%
GRAAF_TANNER	12.08%
BUS_0145	11.69%
N8	11.47%
N12	11.09%
ASHBURY	10.55%
AVALON_SPRINGS_RMU	10.49%
TRFR_A_TO_E	9.97%
MANDELA_SQ_TRA	9.80%
N196	9.74%
BERG_STR_RMU_2_	9.15%
N197	9.09%
MON_KELDER	8.82%
BUS_0130	8.80%
CBR_1	7.96%
SWANEPOEL_	7.88%
DE_WHITE	7.88%
DUTOIT_RMU	7.66%
DU_TOIT	7.66%
MONTAGU_FOODS	7.65%
LAERSKOOL_RMU	7.60%
LANDELIKE_PLASE	7.56%

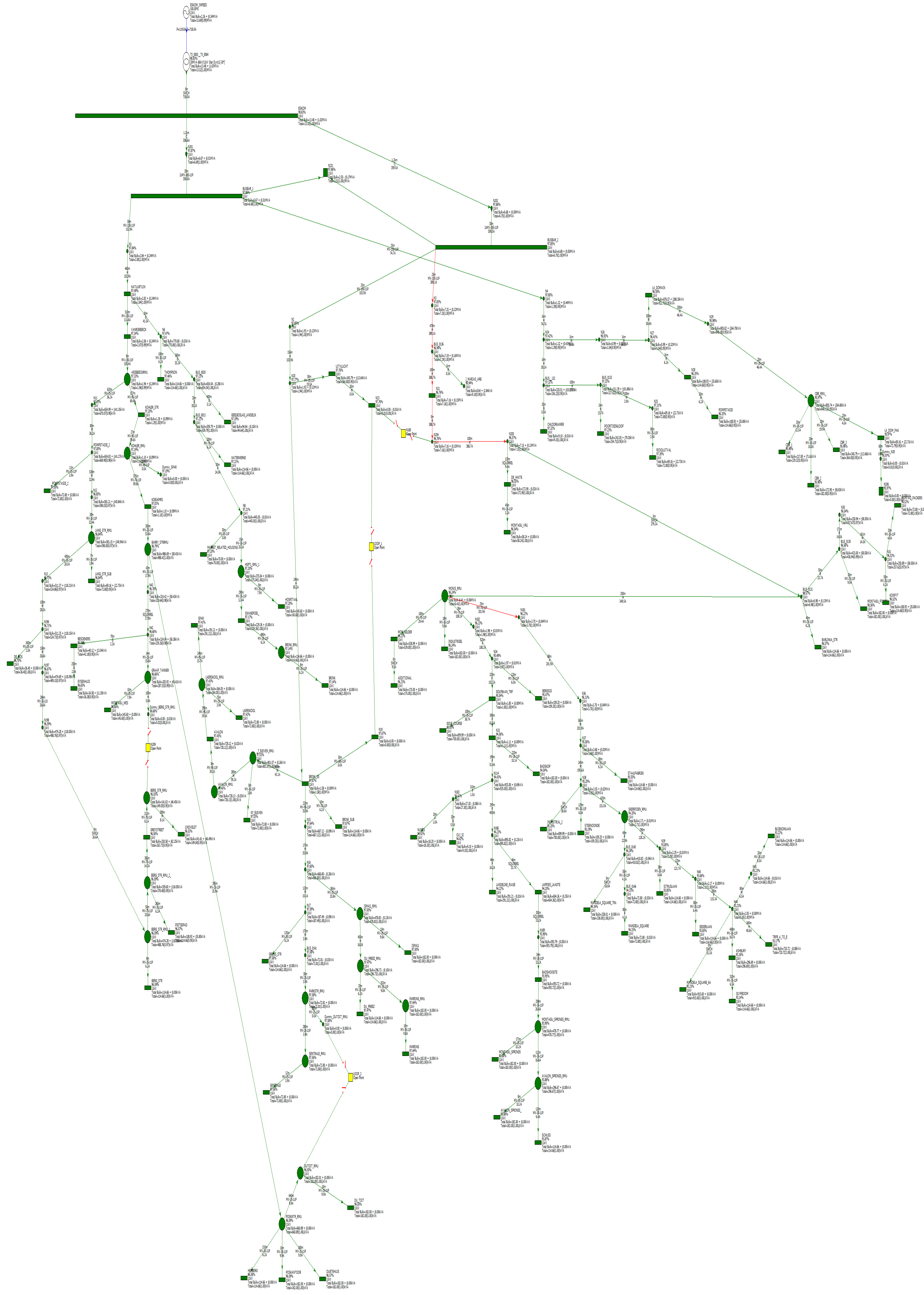
MONTAGU_SPRINGS	6.44%
AVALON_SPRINGS_	6.44%
BADSKOP	6.40%
GREYSTREET	6.38%
CBR_2	6.32%
INDUSTRIEEL	6.30%
OUETEHUIS	6.29%
POSKANTOOR	6.28%
PARRING_RMU	6.24%
PARRING	6.24%
ISMAIL	6.23%
BUS_0131	6.21%
MONTAGU_WES	6.12%
SPAR	6.08%
N30	5.19%
HOSPITAAL	5.00%
SITRUSLAAN	4.93%
BARLINKA_STR	4.82%
N31	4.79%
BUS__132	4.48%
BUS_0133	4.37%
BLOEKOMLAAN	4.08%
OLYFBOOM	4.08%
SEDERLAAN	4.06%
SCHUSS	4.05%
STAALFABRIEK	3.99%
PIETSEPAD	3.96%
HERBERG	3.96%
KONFYT	3.96%
BERG_STR	3.96%
DU_PREEZ_RMU	3.95%
BRINK_RMU	3.94%
BRINK	3.94%
THOMPSON	3.93%
DU_PREEZ	3.93%
GROSS_STR	3.92%
STEENOONDE	3.81%
BERGSIG	3.81%
BERG_STR_RMU	3.60%
N17	3.46%
POORTJIESKLOOF	3.40%
_POMPSTASIE_2	3.05%
LAERSKOOL	3.04%
PARKSTR_RMU	3.03%
SENTRALE_RMU	3.03%
GEELBOSLAG_LANDELIK	3.03%
SENTRALE	3.03%

LINDVELDT	2.77%
WATERWERKE	2.76%
BRINK_SUB	2.75%
MARKET_RELATED_HOUSING	2.69%
BUS_0146	2.56%
LA_DOM_PAK	2.53%
LANG_STR_SUB	2.51%
MONTAQ_PACKERS	2.51%
RIOOLUITVAL	2.50%
N7_ELEVEN	2.49%
N45	2.19%
N28	2.14%
POMPSTASIE	2.14%
MONTAGU_VRU	2.01%
MANDELA_SQUARE	1.89%
DE_BOS	1.53%
BESOEKERS	1.36%
BUS_0141	1.34%
N25	1.34%
EYSENHUIS	1.17%
N183	0.71%
NUNES	0.47%
BERG_STR_RMU_1	0.47%
OUI_SI	0.30%
CHLOORKAMER	0.29%
J_MARIAS_ARB	0.18%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 17 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS



LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 18 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY

Montagu 10 Year Voltage Level Study

Node Name	Min Voltage	Difference
ESKOM	98.83%	
N201	97.87%	0.96%
BUSBAR_1	97.86%	0.97%
N202	97.86%	0.97%
N231	97.86%	0.97%
BUSBAR_2	97.85%	0.98%
N2	97.85%	0.98%
N4	97.85%	0.98%
N1	97.84%	0.99%
N3	97.83%	1.00%
N20	97.77%	1.06%
UITVLUCHT	97.76%	1.07%
N23	97.76%	1.07%
BRINK_SS	97.67%	1.16%
BRINK_SUB	97.67%	1.16%
N19	97.67%	1.16%
N15	97.64%	1.19%
N16	97.60%	1.23%
N17	97.59%	1.24%
BUS_0141	97.58%	1.25%
PARKSTR_RMU	97.58%	1.25%
GROSS_STR	97.58%	1.25%
SENTRALE_RMU	97.56%	1.27%
SENTRALE	97.56%	1.27%
_7_ELEVEN_RMU	97.53%	1.30%
N7_ELEVEN	97.53%	1.30%
ISMAIL_RMU	97.50%	1.33%
ISMAIL	97.50%	1.33%
NATUURTUIN	97.49%	1.34%
N6	97.47%	1.36%
DU_PREEZ_RMU	97.47%	1.36%
DU_PREEZ	97.47%	1.36%
THOMPSON	97.46%	1.37%
AVALON_RMU	97.45%	1.38%
AVALON	97.45%	1.38%
PARRING_RMU	97.44%	1.39%
PARRING	97.44%	1.39%
LAERSKOOL_RMU	97.43%	1.40%
N24	97.42%	1.41%
LAERSKOOL	97.42%	1.41%
SPAR	97.41%	1.42%
VANRIEBEECK	97.34%	1.49%
vRIEBEECKRMU	97.33%	1.50%

BUS__132	97.32%	1.51%
CHLOORKAMER	97.32%	1.51%
BUS_0133	97.31%	1.52%
N25	97.31%	1.52%
RIOOLUITVAL	97.30%	1.53%
BUS_0020	97.23%	1.60%
POORTJIESKLOOF	97.23%	1.60%
BUS_0013	97.22%	1.61%
WATERWERKE	97.21%	1.62%
N8	97.21%	1.62%
HSPTL_RMU_1	97.20%	1.63%
KOHLER_STR	97.20%	1.63%
HOSPITAAL	97.20%	1.63%
MARKET_RELATED_HOUSING	97.20%	1.63%
KOHLER_RMU	97.19%	1.64%
GEELBOSLAG_LANDELIK	97.19%	1.64%
SWANEPOEL_	97.17%	1.66%
BRINK_RMU	97.14%	1.69%
BRINK	97.14%	1.69%
N11	97.03%	1.80%
KOELKMRS	97.01%	1.82%
POMPSTASIE_2	97.00%	1.83%
_POMPSTASIE_2	97.00%	1.83%
BUS_0136	96.94%	1.89%
J_MARIAS_ARB	96.94%	1.89%
N26	96.92%	1.91%
N12	96.85%	1.98%
LANG_STR_RMU	96.84%	1.99%
LANG_STR_SUB	96.84%	1.99%
BARRY_STRRMU	96.79%	2.04%
N43	96.78%	2.05%
N21	96.76%	2.07%
N204	96.76%	2.07%
N13	96.73%	2.10%
N196	96.71%	2.12%
DE_BOS	96.70%	2.13%
N197	96.67%	2.16%
N42	96.66%	2.17%
GRAAF_TANNER	96.66%	2.17%
BESOEKERS	96.66%	2.17%
MONTAGU_WES	96.66%	2.17%
EYSENHUIS	96.65%	2.18%
BERG_STR_RMU_2_	96.59%	2.24%
POSKNTR_RMU	96.59%	2.24%
POSKANTOOR	96.59%	2.24%
BERG_STR	96.59%	2.24%
N198	96.59%	2.24%

BERG_STR_RMU_1	96.59%	2.24%
HERBERG	96.58%	2.25%
PIETSEPAD	96.57%	2.26%
OUETEHUIS	96.57%	2.26%
BUS_0131	96.57%	2.26%
BARLINKA_STR	96.57%	2.26%
N205	96.57%	2.26%
GREYSTREET	96.56%	2.27%
BUS_0130	96.56%	2.27%
MONTAGU_FOODS	96.56%	2.27%
BERG_STR_RMU	96.55%	2.28%
DE_WHITE	96.55%	2.28%
MONTAGU_VRU	96.54%	2.29%
N30	96.54%	2.29%
LINDVELDT	96.53%	2.30%
N31	96.52%	2.31%
KONFYT	96.52%	2.31%
MONTAQ_PACKERS	96.52%	2.31%
DUTOIT_RMU	96.50%	2.33%
DU_TOIT	96.50%	2.33%
N27	96.41%	2.42%
N28	96.35%	2.48%
POMPSTASIE	96.35%	2.48%
MONIS_RMU	96.24%	2.59%
INDUSTRIEEL	96.24%	2.59%
MON_KELDER	96.23%	2.60%
N182	96.23%	2.60%
ADDITIONAL	96.23%	2.60%
N181	96.22%	2.61%
LA_DOMAIN	96.18%	2.65%
N36	96.13%	2.70%
N29	95.98%	2.85%
CBR_RMU_	95.97%	2.86%
LA_DOM_PAK	95.97%	2.86%
N206	95.97%	2.86%
CBR_1	95.96%	2.87%
CBR_2	95.96%	2.87%
CBR_3	95.96%	2.87%
N37	95.56%	3.27%
STAALFABRIEK	95.55%	3.28%
N34	95.48%	3.35%
BERGSIG	95.47%	3.36%
N38	95.20%	3.63%
INDUSTRIAL_2	95.20%	3.63%
STEENOONDE	95.19%	3.64%
GOLFBAAN_TRF	95.04%	3.79%
GOLF_COURSE	95.00%	3.83%

N33	94.56%	4.27%
BADSKOP	94.54%	4.29%
N114	94.43%	4.40%
N183	94.42%	4.41%
NUNES	94.42%	4.41%
OUI_SI	94.42%	4.41%
SKERPIOEN_RMU	94.35%	4.48%
BUS_0145	94.34%	4.49%
MANDELA_SQUARE_TRA	94.34%	4.49%
BUS_0146	94.33%	4.50%
MANDELA_SQUARE	94.33%	4.50%
N186	94.23%	4.60%
LANDELIKE_PLASE	94.22%	4.61%
LAPPIES_LAAGTE	94.20%	4.63%
N189	93.96%	4.87%
BADSHOOGTE	93.95%	4.88%
MONTAGU_SPRINGS_RMU	93.90%	4.93%
MONTAGU_SPRINGS	93.88%	4.95%
AVALON_SPRINGS_RMU	93.88%	4.95%
AVALON_SPRINGS_	93.88%	4.95%
SCHUSS	93.87%	4.96%
N39	93.85%	4.98%
SITRUSLAAN	93.85%	4.98%
N40	93.66%	5.17%
SEDERLAAN	93.65%	5.18%
N44	93.23%	5.60%
N45	93.23%	5.60%
MANDELA_SQUARE_6A	93.23%	5.60%
BLOEKOMLAAN	93.22%	5.61%
TRFR_A_TO_E	93.17%	5.66%
ASHBURY	93.16%	5.67%
OLYFBOOM	93.14%	5.69%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 19 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY

Montagu 10 Year Feeder Loading

Feeder to	Feeder % Loading
N3	127.59%
BUS_0136	108.09%
N21	107.96%
N204	107.96%
N205	107.96%
N181	100.96%
MONIS_RMU	97.07%
SKERPIOEN_RMU	79.48%
N37	77.66%
N38	75.24%
N202	67.82%
N201	67.65%
N39	67.45%
BUSBAR_2	64.19%
N40	64.08%
BUSBAR_1	64.03%
N44	60.69%
N34	56.95%
N36	56.09%
N182	54.10%
GOLFBAAN_TRF	53.79%
N1	50.13%
BARRY_STRRMU	46.61%
NATUURTUIN	42.47%
VANRIEBEECK	36.58%
vRIEBEECKRMU	34.57%
N2	34.07%
CBR_RMU_	33.13%
N33	32.38%
LAPPIES_LAAGTE	31.77%
N11	31.52%
N189	31.29%
POSKNTR_RMU	31.23%
KOHLER_STR	30.18%
KOELKMRS	29.81%
N20	28.86%
N6	27.67%
GOLF_COURSE	27.62%
N114	27.06%
N186	26.26%
KOHLER_RMU	25.92%
N4	24.49%
BADSHOOGTE	23.69%

BRINK_SS	23.65%
BUS_0020	23.55%
LANG_STR_RMU	23.15%
N26	21.76%
N27	21.76%
N24	20.75%
N13	20.34%
BUS_0013	20.15%
LA_DOMAIN	19.37%
MONTAGU_SPRINGS_RMU	19.12%
ISMAIL_RMU	18.41%
N29	17.84%
AVALON	17.05%
N42	16.87%
_7_ELEVEN_RMU	16.59%
N198	15.62%
N15	15.59%
N43	15.55%
AVALON_RMU	15.08%
MON_KELDER	14.70%
HSPTL_RMU_1	14.47%
CBR_3	14.22%
UITVLUCHT	13.96%
POMPSTASIE_2	13.94%
N16	13.79%
GRAAF_TANNER	13.58%
N8	12.65%
N12	12.46%
BUS_0145	12.03%
ASHBURY	11.94%
AVALON_SPRINGS_RMU	11.85%
TRFR_A_TO_E	11.28%
N196	10.95%
BERG_STR_RMU_2_	10.28%
N197	10.21%
BUS_0130	9.90%
CBR_1	8.96%
DE_WHITE	8.87%
SWANEPOEL_	8.85%
DUTOIT_RMU	8.61%
DU_TOIT	8.61%
MONTAGU_FOODS	8.60%
LANDELIKE_PLASE	8.54%
LAERSKOOL_RMU	8.53%
BUS_0131	7.59%
MONTAGU_SPRINGS	7.27%
AVALON_SPRINGS_	7.27%

BADSKOP	7.22%
GREYSTREET	7.17%
CBR_2	7.11%
INDUSTRIEEL	7.09%
OUETEHUIS	7.07%
POSKANTOOR	7.06%
ISMAIL	7.00%
PARRING_RMU	7.00%
PARRING	7.00%
MONTAGU_WES	6.87%
SPAR	6.82%
N30	5.84%
HOSPITAAL	5.62%
SITRUSLAAN	5.58%
BARLINKA_STR	5.42%
N31	5.39%
BUS_132	5.04%
BUS_0133	4.91%
OLYFBOOM	4.62%
BLOEKOMLAAN	4.61%
SEDERLAAN	4.59%
SCHUSS	4.58%
STAALFABRIEK	4.50%
PIETSEPAD	4.45%
HERBERG	4.45%
KONFYT	4.45%
BERG_STR	4.45%
DU_PREEZ_RMU	4.44%
BRINK_RMU	4.43%
BRINK	4.43%
THOMPSON	4.41%
DU_PREEZ	4.41%
GROSS_STR	4.41%
STEENOONDE	4.30%
BERGSIG	4.29%
BERG_STR_RMU	4.05%
N17	3.88%
POORTJIESKLOOF	3.82%
_POMPSTASIE_2	3.43%
PARKSTR_RMU	3.41%
SENTRALE_RMU	3.41%
GEELBOSLAG_LANDELIK	3.41%
SENTRALE	3.41%
LAERSKOOL	3.41%
LINDVELDT	3.12%
WATERWERKE	3.10%
BRINK_SUB	3.08%

BUS_0146	2.89%
LA_DOM_PAK	2.84%
MONTAQ_PACKERS	2.83%
LANG_STR_SUB	2.82%
RIOOLUITVAL	2.80%
N7_ELEVEN	2.80%
MARKET_RELATED_HOUSING	2.70%
N45	2.48%
N28	2.40%
POMPSTASIE	2.40%
MONTAGU_VRU	2.26%
MANDELA_SQUARE	2.13%
DE_BOS	1.72%
BESOEKERS	1.53%
BUS_0141	1.51%
N25	1.51%
EYSENHUIS	1.32%
MANDELA_SQUARE_6A	1.03%
N183	0.80%
INDUSTRIAL_2	0.77%
NUNES	0.53%
BERG_STR_RMU_1	0.53%
MANDELA_SQUARE_TRA	0.38%
OUI_SI	0.34%
CHLOORKAMER	0.33%
J_MARIAS_ARB	0.21%
ADDITIONAL	0.19%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MONTAGU AREA OF SUPPLY

APPENDIX 20 – RECOMMENDED CAPITAL UPGRADES

Langeberg Municipality Electrical Engineering Services Infrastructure: Capital Projects - Montagu													
Priority	Ward	Project Description As per masterplan	Budget 2022/23	Budget 2023/24	Budget 2024/25	Budget 2025/26	Budget 2026/27	Budget 2027/28	Budget 2028/29	Budget 2029/30	Budget 2030/31	Budget 2031/32	Project Total
1. CAPITAL PROJECTS													
1.1		Increase in NMD (from 9MVA to 10MVA)	R5,616,169.72										R5,616,169.72
1.2		Replacement of Prepaid Meters (PLC)											
1.3		Mark Str 11kV Cable Upgrading, Relocate RMU				R950,000.00							R950,000.00
1.4		Du Toit / Parring 11kV Ring (35mm² x 3C)		R750,000.00									R750,000.00
1.5		Replacement of 800kVA Ismail minisub		R700,000.00									R700,000.00
1.6		11kV Overhead Line to Poortjieskloof											R0.00
1.7		Replacement of Oil Ring Main Units		R550,000.00	R550,000.00	R550,000.00	R550,000.00	R550,000.00	R550,000.00	R550,000.00	R550,000.00	R550,000.00	R4,950,000.00
1.8		Brink / Van Riebeeck 11kV Ring					R1,500,000.00						R1,500,000.00
1.9		Replace existing street lights with LED street lights		R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R900,000.00
2. MASTERPLAN RECOMMENDATIONS													
2.1		Transformer replacements		R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00	R2,700,000.00
2.2		Upgrade of Mink / Fox conductor to Hare from Moni's RMU to Skerpioenkop RMU (1.06km)			R400,000.00								R400,000.00
2.3		Upgrade of Fox conductor to Hare from Moni's RMU to Golfbaan once Golfbaan development starts (800m)				R350,000.00							R350,000.00
2.4		Upgrade 150mm² x 3 U/G cable (MONIS feeder) to 240mm² x 3 U/G Cu cable					R100,000.00						R100,000.00
2.5		Upgrade Montagu main switching station to Monis RMU feeder to Wolf conductor (1,7km)										R950,000.00	R950,000.00
		Total	R5,616,169.72	R2,400,000.00	R1,350,000.00	R2,250,000.00	R2,550,000.00	R950,000.00	R950,000.00	R950,000.00	R950,000.00	R1,900,000.00	R19,866,169.72

Notes

All amounts excl VAT