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# APPENDIX A: ADDITIONAL ESKOM TARIFF STRUCTURES

Full Eskom tariff structures can be downloaded at:

[http://www.eskom.co.za/content/2012\\_13%20Draft%20Tariff%20Book%2011%20April%202012%20over%203~1.pdf](http://www.eskom.co.za/content/2012_13%20Draft%20Tariff%20Book%2011%20April%202012%20over%203~1.pdf)


Eskom Tariffs and Charges 2012/13

**NON-LOCAL AUTHORITY RATES – Megaflex**

Transmission zone	Voltage	Active energy charge [c/kWh]									Transmission network charges [R/kVA/m]				
		High demand season [Jun - Aug]			Low demand season [Sep - May]			Peak	Standard	Off Peak	Peak	Standard	Off Peak		
		Peak	Standard	Off Peak	Peak	Standard	Off Peak								
≤ 300km	< 500V	217.41	247.85	56.46	64.36	30.12	34.34	60.65	69.14	37.14	42.34	26.95	29.58	R 5.42	R 6.18
	≥ 500V & < 66kV	210.46	239.92	54.70	62.36	29.23	33.32	58.75	66.98	36.00	41.04	26.17	28.69	R 4.95	R 5.64
	≥ 66kV & ≤ 132kV	202.83	231.23	52.77	60.16	28.26	32.21	56.69	64.63	34.75	39.62	24.36	27.76	R 4.82	R 5.49
> 300km and ≤ 600km	< 500V	195.78	223.19	51.01	58.15	27.32	31.14	54.75	62.42	33.61	38.32	23.56	26.86	R 6.09	R 6.94
	≥ 500V & < 66kV	219.56	250.29	56.99	64.97	30.44	34.70	61.24	69.81	37.46	42.70	26.19	29.86	R 5.46	R 6.22
	≥ 66kV & ≤ 132kV	212.52	242.27	55.22	62.95	29.50	33.63	59.32	67.62	36.33	41.42	26.41	28.97	R 5.00	R 5.70
> 600km and ≤ 900km	< 500V	204.84	233.52	53.29	60.75	28.51	32.50	57.25	65.27	35.09	40.00	24.56	27.99	R 4.86	R 5.54
	≥ 500V & < 66kV	197.70	225.38	51.49	58.70	27.57	31.43	55.31	63.05	33.93	38.68	23.76	27.09	R 6.16	R 7.02
	≥ 66kV & ≤ 132kV	221.73	252.77	57.56	65.62	30.70	35.00	61.83	70.49	37.83	43.13	26.42	30.12	R 5.53	R 6.30
> 900km	< 500V	214.63	244.68	55.77	63.58	29.76	33.93	59.89	68.27	36.67	41.80	26.61	29.20	R 5.04	R 5.75
	≥ 500V & < 66kV	206.87	235.83	53.78	61.31	28.76	32.78	57.79	65.88	35.40	40.36	24.76	28.23	R 4.90	R 5.59
	≥ 66kV & ≤ 132kV	199.65	227.60	51.97	59.25	27.82	31.71	55.84	63.66	34.23	39.02	23.99	27.35	R 6.24	R 7.11
> 900km	< 500V	223.93	255.28	58.10	66.23	30.98	35.32	62.39	71.12	38.17	43.51	26.67	30.40	R 5.55	R 6.33
	≥ 500V & < 66kV	216.76	247.11	56.30	64.18	30.03	34.23	60.46	68.92	36.99	42.17	26.87	29.49	R 5.10	R 5.81
	≥ 66kV & ≤ 132kV	208.94	238.19	54.29	61.89	29.03	33.09	58.33	66.50	35.74	40.74	24.99	28.49	R 4.93	R 5.62
> 900km	> 132kV	201.65	229.88	52.44	59.78	28.08	32.01	56.34	64.23	34.66	39.40	24.18	27.57	R 6.29	R 7.17

Electrification and rural subsidy [c/kWh]		Reactive energy charge [c/kvarh]				Distribution network charges				
All seasons		High season		Low season		Network access charge [R/kVA/m]		Network demand charge [R/kVA/m]		
VAT incl	VAT excl	VAT incl	VAT excl	VAT incl	VAT excl	Voltage	VAT incl	VAT incl	VAT excl	
4.57	5.21	8.70	9.92	0.00	0.00	< 500V	R 10.82	R 12.33	R 20.51	R 23.38
						≥ 500V & < 66kV	R 9.53	R 11.32	R 18.82	R 21.45
						≥ 66kV & ≤ 132kV	R 9.61	R 10.96	R 18.25	R 20.81
						> 132kV	R 0.00	R 0.00	R 16.44	R 18.74

Monthly utilised capacity		Service charge [R/Account/day]		Administration charge [R/POD/day]	
VAT incl	VAT excl	VAT incl	VAT excl	VAT incl	VAT excl
> 1 MVA	R 123.61	R 140.92	R 65.71	R 63.51	
Key customers	R 2,422.28	R 2,761.40	R 77.36	R 88.19	

Environmental levy charge [c/kWh]			
Apr to Jun		Jul to Mar	
VAT incl	VAT excl	VAT incl	VAT excl
2.00	2.28	3.50	3.99

**LOCAL AUTHORITY RATES – Megaflex**

Transmission zone	Voltage	Active energy charge [c/kWh]									Transmission network charges [R/kVA/m]				
		High demand season [Jun - Aug]			Low demand season [Sep - May]			Peak	Standard	Off Peak	Peak	Standard	Off Peak		
		Peak	Standard	Off Peak	Peak	Standard	Off Peak								
≤ 300km	< 500V	216.99	247.37	56.37	64.26	30.10	34.31	60.54	69.02	37.06	42.25	25.89	29.51	R 5.40	R 6.16
	≥ 500V & < 66kV	210.06	239.47	54.61	62.26	29.16	33.24	58.65	66.86	35.95	40.98	25.13	28.65	R 4.94	R 5.63
	≥ 66kV & ≤ 132kV	202.47	230.82	52.68	60.06	28.18	32.13	56.58	64.50	34.70	39.56	24.28	27.68	R 4.81	R 5.48
> 300km and ≤ 600km	< 500V	195.39	222.74	50.91	58.04	27.28	31.10	54.65	62.30	33.55	38.25	23.53	26.82	R 6.09	R 6.94
	≥ 500V & < 66kV	219.14	249.82	56.90	64.87	30.37	34.62	61.13	69.69	37.39	42.62	26.15	29.81	R 5.46	R 6.22
	≥ 66kV & ≤ 132kV	212.11	241.81	55.12	62.84	29.43	33.55	59.22	67.51	36.26	41.34	26.36	28.91	R 4.98	R 5.68
> 600km and ≤ 900km	< 500V	204.44	233.06	53.18	60.63	28.47	32.46	57.13	65.13	36.01	39.91	24.51	27.94	R 4.84	R 5.52
	≥ 500V & < 66kV	197.32	224.94	51.42	58.62	27.52	31.37	55.19	62.92	33.86	38.60	23.69	27.01	R 6.16	R 7.01
	≥ 66kV & ≤ 132kV	221.28	252.26	57.44	65.48	30.61	34.90	61.70	70.34	37.75	43.04	26.37	30.06	R 5.52	R 6.29
> 900km	< 500V	214.23	244.22	55.64	63.43	29.71	33.87	59.77	68.14	36.59	41.71	26.58	29.16	R 5.04	R 5.75
	≥ 500V & < 66kV	206.47	235.38	53.69	61.21	28.71	32.73	57.65	65.72	36.32	40.26	24.73	28.19	R 4.89	R 5.57
	≥ 66kV & ≤ 132kV	199.30	227.20	51.86	59.12	27.79	31.68	55.74	63.54	34.17	38.95	23.92	27.27	R 6.23	R 7.10
> 900km	< 500V	223.48	254.77	58.00	66.12	30.92	35.25	62.29	71.01	38.08	43.41	26.63	30.36	R 5.54	R 6.32
	≥ 500V & < 66kV	216.33	246.62	56.18	64.05	29.98	34.18	60.35	68.80	36.92	42.09	26.84	29.46	R 5.09	R 5.80
	≥ 66kV & ≤ 132kV	208.63	237.72	54.19	61.78	28.97	33.03	58.21	66.36	35.68	40.68	24.95	28.44	R 4.91	R 5.60
> 900km	> 132kV	201.26	229.44	52.37	59.70	28.01	31.93	56.22	64.09	34.49	39.32	24.15	27.53	R 6.27	R 7.15


Electrification and rural subsidy [c/kWh]		Reactive energy charge [c/kvarh]				Distribution network charges				
All seasons		High season		Low season		Network access charge [R/kVA/m]		Network demand charge [R/kVA/m]		
VAT incl	VAT excl	VAT incl	VAT excl	VAT incl	VAT excl	Voltage	VAT incl	VAT incl	VAT excl	
4.56	5.20	8.72	9.94	0.00	0.00	< 500V	R 10.89	R 12.31	R 20.49	R 23.36
						≥ 500V & < 66kV	R 9.90	R 11.29	R 18.78	R 21.41
						≥ 66kV & ≤ 132kV	R 9.59	R 10.93	R 18.20	R 20.75
						> 132kV	R 0.00	R 0.00	R 16.41	R 18.71

Monthly utilised capacity		Service charge [R/Account/day]		Administration charge [R/POD/day]	
VAT incl	VAT excl	VAT incl	VAT excl	VAT incl	VAT excl
> 1 MVA	R 123.36	R 140.83	R 65.59	R 63.37	
Key customers	R 2,417.62	R 2,756.09	R 77.20	R 88.01	

Environmental levy charge [c/kWh]			
Apr to Jun		Jul to Mar	
VAT incl	VAT excl	VAT incl	VAT excl
2.00	2.28	3.50	3.99



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### NON-LOCAL AUTHORITY RATES – Nightsave Rural

Transmission zone	Voltage	Active energy charge [c/kWh]				Energy demand charges [R/kVA/m]				Network access charges [R/kVA/m]	
		High demand season [Jun - Aug]		Low demand season [Sep - May]		High demand season [Jun - Aug]		Low demand season [Sep - May]		VAT incl	
		VAT incl		VAT incl		VAT incl		VAT incl			
≤ 300km	< 500V	<b>48.98</b>	55.84	<b>32.09</b>	36.58	<b>191.67</b>	218.50	<b>116.22</b>	132.49	<b>R 8.22</b>	R 9.37
	≥ 500V & ≤ 22kV	<b>47.44</b>	54.08	<b>31.11</b>	35.47	<b>186.70</b>	212.84	<b>113.21</b>	129.06	<b>R 7.55</b>	R 8.61
> 300km and ≤ 600km	< 500V	<b>49.42</b>	56.34	<b>32.37</b>	36.90	<b>193.60</b>	220.70	<b>117.40</b>	133.84	<b>R 8.24</b>	R 9.39
	≥ 500V & ≤ 22kV	<b>47.91</b>	54.62	<b>31.38</b>	35.77	<b>188.60</b>	215.00	<b>114.34</b>	130.35	<b>R 7.58</b>	R 8.64
> 600km and ≤ 800km	< 500V	<b>49.91</b>	56.90	<b>32.68</b>	37.26	<b>195.55</b>	222.93	<b>118.56</b>	135.16	<b>R 8.32</b>	R 9.48
	≥ 500V & ≤ 22kV	<b>48.36</b>	55.13	<b>31.69</b>	36.13	<b>190.48</b>	217.15	<b>115.49</b>	131.66	<b>R 7.63</b>	R 8.70
> 800km	< 500V	<b>50.40</b>	57.46	<b>32.97</b>	37.59	<b>197.54</b>	225.20	<b>119.76</b>	136.53	<b>R 8.33</b>	R 9.50
	≥ 500V & ≤ 22kV	<b>48.82</b>	55.65	<b>31.97</b>	36.45	<b>192.43</b>	219.37	<b>116.67</b>	133.00	<b>R 7.64</b>	R 8.71

Environmental levy charge [c/kWh]			
Apr to Jun		Jul to Mar	
VAT incl		VAT incl	
<b>2.00</b>	2.28	<b>3.50</b>	3.99

Monthly utilised capacity	Service charge [R/Account/day]		Administration charge [R/POD/day]	
	VAT incl		VAT incl	
≤ 100 kVA	<b>R 11.14</b>	R 12.70	<b>R 3.17</b>	R 3.61
> 100 kVA & ≤ 600 kVA	<b>R 38.00</b>	R 43.32	<b>R 17.61</b>	R 20.08
> 500 kVA & ≤ 1 MVA	<b>R 116.88</b>	R 133.24	<b>R 27.03</b>	R 30.81
> 1 MVA	<b>R 116.88</b>	R 133.24	<b>R 60.17</b>	R 57.19
Key customers	<b>R 2,290.72</b>	R 2,611.42	<b>R 60.17</b>	R 57.19

### LOCAL AUTHORITY RATES – Nightsave Rural

Transmission zone	Voltage	Active energy charge [c/kWh]				Energy demand charges [R/kVA/m]				Network access charges [R/kVA/m]	
		High demand season [Jun - Aug]		Low demand season [Sep - May]		High demand season [Jun - Aug]		Low demand season [Sep - May]		VAT incl	
		VAT incl		VAT incl		VAT incl		VAT incl			
≤ 300km	< 500V	<b>51.66</b>	58.89	<b>33.86</b>	38.60	<b>202.28</b>	230.60	<b>122.66</b>	139.83	<b>R 8.67</b>	R 9.88
	≥ 500V & ≤ 22kV	<b>50.08</b>	57.09	<b>32.82</b>	37.41	<b>197.06</b>	224.64	<b>119.49</b>	136.22	<b>R 7.96</b>	R 9.07
> 300km and ≤ 600km	< 500V	<b>52.14</b>	59.44	<b>34.17</b>	38.95	<b>204.33</b>	232.94	<b>123.87</b>	141.21	<b>R 8.72</b>	R 9.94
	≥ 500V & ≤ 22kV	<b>50.55</b>	57.63	<b>33.16</b>	37.80	<b>199.05</b>	226.92	<b>120.68</b>	137.58	<b>R 7.99</b>	R 9.11
> 600km and ≤ 800km	< 500V	<b>52.68</b>	60.06	<b>34.49</b>	39.32	<b>206.39</b>	235.28	<b>126.13</b>	142.65	<b>R 8.80</b>	R 10.03
	≥ 500V & ≤ 22kV	<b>51.05</b>	58.20	<b>33.44</b>	38.12	<b>201.06</b>	229.21	<b>121.90</b>	138.97	<b>R 8.05</b>	R 9.18
> 800km	< 500V	<b>53.17</b>	60.61	<b>34.80</b>	39.67	<b>208.47</b>	237.66	<b>126.40</b>	144.10	<b>R 8.83</b>	R 10.07
	≥ 500V & ≤ 22kV	<b>51.54</b>	58.76	<b>33.75</b>	38.48	<b>203.08</b>	231.51	<b>123.14</b>	140.38	<b>R 8.07</b>	R 9.20

Environmental levy charge [c/kWh]			
Apr to Jun		Jul to Mar	
VAT incl		VAT incl	
<b>2.00</b>	2.28	<b>3.50</b>	3.99

Monthly utilised capacity	Service charge [R/Account/day]		Administration charge [R/POD/day]	
	VAT incl		VAT incl	
≤ 100 kVA	<b>R 11.74</b>	R 13.38	<b>R 3.37</b>	R 3.84
> 100 kVA & ≤ 600 kVA	<b>R 40.10</b>	R 45.71	<b>R 18.58</b>	R 21.18
> 500 kVA & ≤ 1 MVA	<b>R 123.36</b>	R 140.63	<b>R 28.49</b>	R 32.48
> 1 MVA	<b>R 123.36</b>	R 140.63	<b>R 62.95</b>	R 60.36
Key customers	<b>R 2,417.62</b>	R 2,756.09	<b>R 62.95</b>	R 60.36



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**NON-LOCAL AUTHORITY RATES – Ruraflex**

Transmission zone	Voltage	Active energy charge [c/kWh]									Network access charges [R/kVA/m]				
		High demand season (Jun - Aug)			Off Peak			Low demand season (Sep - May)							
		Peak	Standard	Off Peak	Peak	Standard	Off Peak								
		VAT incl	VAT incl	VAT incl	VAT incl	VAT incl	VAT incl	VAT incl	VAT incl	VAT incl	VAT incl	VAT incl			
≤ 300km	≤ 500V	327.44	373.28	83.89	95.63	44.11	50.29	90.12	102.74	54.58	62.22	37.68	42.96	R 11.47	R 13.08
	≥ 500V & ≤ 22kV	312.30	356.02	80.11	91.33	42.16	48.06	86.05	98.10	52.15	59.45	36.04	41.09	R 10.52	R 11.99
> 300km and ≤ 600km	≤ 500V	329.55	375.69	84.40	96.22	44.37	50.58	90.72	103.42	54.91	62.60	37.93	43.24	R 11.52	R 13.13
	≥ 500V & ≤ 22kV	314.35	358.36	80.61	91.90	42.41	48.35	86.61	98.74	52.48	59.83	36.27	41.35	R 10.59	R 12.07
> 600km and ≤ 900km	≤ 500V	331.64	378.07	84.95	96.84	44.65	50.91	91.27	104.05	55.23	62.96	38.16	43.50	R 11.58	R 13.20
	≥ 500V & ≤ 22kV	316.40	360.70	81.11	92.47	42.68	48.66	87.15	99.35	52.81	60.20	36.52	41.63	R 10.63	R 12.12
> 900km	≤ 500V	333.75	380.48	85.48	97.45	44.92	51.21	91.85	104.71	55.59	63.37	38.38	43.75	R 11.62	R 13.25
	≥ 500V & ≤ 22kV	318.44	363.02	81.64	93.07	42.93	48.94	87.70	99.98	53.15	60.59	36.70	41.84	R 10.64	R 12.13

Reactive energy charge [c/kvarh]			
High season		Low season	
VAT incl	VAT excl	VAT incl	VAT excl
5.44	6.20	0.00	0.00

Environmental levy charge [c/kWh]			
Apr to Jun		Jul to Mar	
VAT incl	VAT excl	VAT incl	VAT excl
2.00	2.28	3.50	3.99

Monthly utilised capacity	Service charge [R/Account/day]		Administration charge [R/POD/day]	
	VAT incl	VAT excl	VAT incl	VAT excl
≤ 100 kVA	R 11.14	R 12.70	R 3.17	R 3.61
> 100 kVA & ≤ 500 kVA	R 38.00	R 43.32	R 17.61	R 20.08
> 500 kVA & ≤ 1 MVA	R 116.88	R 133.24	R 27.03	R 30.81
> 1 MVA	R 116.88	R 133.24	R 60.17	R 57.19
Key customers	R 2,290.72	R 2,611.42	R 60.17	R 57.19

**LOCAL AUTHORITY RATES – Ruraflex**

Transmission zone	Voltage	Active energy charge [c/kWh]									Network access charges [R/kVA/m]				
		High demand season (Jun - Aug)			Off Peak			Low demand season (Sep - May)							
		Peak	Standard	Off Peak	Peak	Standard	Off Peak								
		VAT incl	VAT incl	VAT incl	VAT incl	VAT incl	VAT incl	VAT incl	VAT incl	VAT incl	VAT incl	VAT incl			
≤ 300km	≤ 500V	345.58	393.98	88.55	100.95	46.56	53.08	95.13	108.45	67.80	65.66	39.79	45.38	R 12.11	R 13.81
	≥ 500V & ≤ 22kV	329.60	375.74	84.54	96.38	44.49	50.72	90.82	103.53	55.02	62.72	38.05	43.38	R 11.12	R 12.68
> 300km and ≤ 600km	≤ 500V	347.79	396.48	89.12	101.60	46.84	53.40	96.76	109.17	67.95	66.06	40.02	45.62	R 12.15	R 13.85
	≥ 500V & ≤ 22kV	331.77	378.22	85.06	96.97	44.77	51.04	91.40	104.20	55.39	63.14	38.28	43.64	R 11.16	R 12.72
> 600km and ≤ 900km	≤ 500V	350.01	399.01	89.65	102.20	47.12	53.72	96.34	109.83	68.33	66.50	40.27	45.91	R 12.23	R 13.94
	≥ 500V & ≤ 22kV	333.92	380.67	85.60	97.58	45.06	51.37	91.99	104.87	55.74	63.54	38.53	43.92	R 11.22	R 12.79
> 900km	≤ 500V	352.24	401.55	90.20	102.83	47.42	54.06	96.94	110.51	68.66	66.87	40.52	46.19	R 12.27	R 13.99
	≥ 500V & ≤ 22kV	338.10	383.15	88.16	98.22	45.32	51.66	92.57	105.53	56.08	63.93	38.75	44.18	R 11.23	R 12.80

Reactive energy charge [c/kvarh]			
High season		Low season	
VAT incl	VAT excl	VAT incl	VAT excl
5.75	6.56	0.00	0.00

Environmental levy charge [c/kWh]			
Apr to Jun		Jul to Mar	
VAT incl	VAT excl	VAT incl	VAT excl
2.00	2.28	3.50	3.99

Monthly utilised capacity	Service charge [R/Account/day]		Administration charge [R/POD/day]	
	VAT incl	VAT excl	VAT incl	VAT excl
≤ 100 kVA	R 11.74	R 13.38	R 3.37	R 3.84
> 100 kVA & ≤ 500 kVA	R 40.10	R 45.71	R 18.58	R 21.18
> 500 kVA & ≤ 1 MVA	R 123.36	R 140.63	R 28.49	R 32.48
> 1 MVA	R 123.36	R 140.63	R 52.95	R 60.36
Key customers	R 2,417.62	R 2,756.09	R 52.95	R 60.36



# APPENDIX B: USUTU-VAAL PROPOSED

## BASELINE DATA

**Appendix table 1:** Grootdraai & Tutuka power consumption baseline

Grootdraai & Tutuka Baseline		
June 2011 - August 2011		
Hour	Weekday avg kW	Weekend avg kW
0	5 129	5 579
1	5 129	5 579
2	5 156	5 579
3	5 209	5 579
4	5 209	5 579
5	5 209	5 579
6	5 183	5 579
7	5 183	5 579
8	5 210	5 579
9	5 184	5 579
10	5 264	5 452
11	5 316	5 452
12	5 316	5 579
13	5 341	5 446
14	5 264	5 446
15	5 290	5 446
16	5 290	5 446
17	5 264	5 446
18	5 290	5 446
19	5 289	5 446
20	5 262	5 446
21	5 262	5 446
22	5 262	5 446
23	5 273	5 446
<b>Total:</b>	<b>125 784</b>	<b>132 179</b>

**Appendix table 2:** Grootdraai & Tutuka proposed usage data

Grootdraai & Tutuka Proposed Baseline		
Hour	Proposed weekday kW	Proposed weekend kW
0	4 885	6 124.00
1	4 849	6 077.00
2	4 876	6 103.00
3	4 867	6 082.00
4	4 876	5 965.00
5	4 877	6 003.00
6	4 918	6 049.00
7	4 966	6 119.00
8	4 986	6 082.00
9	4 928	6 080.00
10	4 976	6 133.00
11	5 003	6 082.00
12	5 077	6 117.00
13	5 079	6 013.00
14	5 152	6 084.00
15	5 126	6 108.00
16	5 173	6 107.00
17	5 107	6 112.00
18	260	6 064.00
19	221	6 084.00
20	5 029	6 001.00
21	5 104	6 091.00
22	5 114	6 196.00
23	5 097	6 192.00
<b>Total:</b>	<b>110 546</b>	<b>146 068.00</b>

**Appendix table 3:** Grootfontein power consumption baseline

Grootfontein Baseline June 2011 - August 2011		
Hour	Weekday avg kW	Weekend avg kW
0	3 559	3 673
1	3 491	3 673
2	3 525	3 673
3	3 508	3 508
4	3 543	3 550
5	3 530	3 512
6	3 525	3 512
7	3 617	3 512
8	3 718	3 677
9	3 743	3 508
10	3 768	3 590
11	3 735	3 673
12	3 662	3 673
13	3 644	3 673
14	3 745	3 673
15	3 795	3 673
16	3 762	3 673
17	3 763	3 673
18	3 729	3 673
19	3 730	3 673
20	3 679	3 673
21	3 661	3 673
22	3 661	3 673
23	3 650	3 673
<b>Total:</b>	<b>87 743</b>	<b>87 137</b>

**Appendix table 4:** Grootfontein proposed Usage

Grootfontein Proposed Baseline		
Hour	Proposed weekday kW	Proposed weekend kW
0	3 701	4 721.00
1	3 751	4 822.00
2	3 775	4 849.00
3	3 775	4 822.00
4	3 788	4 822.00
5	3 788	4 761.00
6	3 825	4 761.00
7	3 825	4 688.00
8	3 888	4 849.00
9	3 900	4 849.00
10	3 948	4 782.00
11	3 936	4 782.00
12	3 913	4 721.00
13	3 949	4 721.00
14	3 975	4 842.00
15	3 952	4 775.00
16	3 963	4 775.00
17	3 938	4 829.00
18	752	4 869.00
19	715	4 869.00
20	3 901	4 842.00
21	3 853	4 842.00
22	3 791	4 842.00
23	3 765	4 869.00
<b>Total:</b>	<b>86 367</b>	<b>115 304.00</b>

**Appendix table 5:** Rietfontein power consumption profile

Rietfontein Baseline June 2011 - August 2011		
Hour	Weekday avg kW	Weekend avg kW
0	1 299	3 519
1	1 334	3 519
2	1 408	3 519
3	1 477	3 519
4	1 561	3 519
5	1 515	3 519
6	1 430	3 578
7	1 618	5 443
8	3 111	7 449
9	3 717	7 989
10	3 817	8 446
11	4 303	7 918
12	4 423	7 038
13	4 456	7 038
14	4 749	6 628
15	5 297	5 865
16	5 881	5 079
17	5 268	2 393
18	5 323	1 408
19	5 028	1 408
20	4 747	1 408
21	2 559	411
22	2 023	0
23	1 954	0
<b>Total:</b>	<b>78 298</b>	<b>100615</b>

**Appendix table 6:** Rietfontein proposed Usage

Rietfontein Proposed Baseline		
Hour	Proposed weekday kW	Proposed weekend kW
0	1 299	4 282
1	1 334	3 892
2	1 408	3 892
3	1 477	3 892
4	1 561	3 892
5	1 515	3 892
6	1 430	3 951
7	1 618	5 816
8	3 111	7 822
9	3 717	8 362
10	3 817	8 819
11	4 303	8 291
12	4 423	7 412
13	4 456	7 412
14	4 749	7 001
15	5 297	6 239
16	5 881	5 453
17	5 268	2 766
18	485	1 781
19	520	1 781
20	4 747	1 781
21	2 559	784
22	2 023	373
23	1 954	373
<b>Total:</b>	<b>68 952</b>	<b>109 961</b>

**Appendix table 7:** Naauwpoort power consumption profile

Naauwpoort Baseline June 2011 - August 2011	
Hour	Weekday kW avg
0	0.00
1	0.00
2	0.00
3	0.00
4	0.00
5	307.10
6	2 149.68
7	2 303.23
8	2 303.23
9	2 303.23
10	2 303.23
11	2 303.23
12	2 303.23
13	2 303.23
14	2 149.68
15	1 919.35
16	1 842.58
17	1 765.81
18	1 535.48
19	1 074.84
20	460.65
21	153.55
22	153.55
23	0.00
<b>Total:</b>	<b>29634.84</b>

**Appendix table 8:** Usutu-Vaal power consumption profile

Usutu-Vaal Baseline		
June 2011 - August 2011		
Hour	Weekday avg kW	Weekend avg kW
0	9 987	12 771
1	9 955	12 771
2	10 089	12 771
3	10 195	12 606
4	10 312	12 648
5	10 254	12 610
6	10 138	12 668
7	10 419	14 533
8	12 039	16 705
9	12 645	17 075
10	12 849	17 488
11	13 354	17 043
12	13 400	16 290
13	13 441	16 158
14	13 758	15 747
15	14 382	14 985
16	14 932	14 199
17	14 295	11 512
18	14 342	10 527
19	14 046	10 527
20	13 688	10 527
21	11 482	95 30
22	10 946	91 19
23	10 877	91 19
<b>Total:</b>	<b>291 825</b>	<b>319 930</b>

# APPENDIX C: REMS SIMULATION RESULTS

## Usutu-Vaal 7 days REMS simulation raw data: Dam level percentages

Weekday	Hour	Grootdraai dam level%	Tutuka Reservoir level %	Grootfontein Canal level%	Knoppiesfontein level %	Bossiespruit level %	Trichardsfontein level %	Rietfontein level %	Matla reservoirs level %
Monday	0	75.00	75.00	75.00	75.00	75.00	75.00	75.00	75.00
Monday	1	75.00	74.89	74.09	74.23	74.87	75.00	75.08	74.44
Monday	2	75.00	74.77	73.18	73.46	74.74	75.00	75.15	73.87
Monday	3	75.00	74.66	72.27	72.69	74.61	75.00	75.23	73.31
Monday	4	75.00	74.54	71.36	71.92	74.48	75.00	75.30	72.74
Monday	5	75.01	74.43	70.45	71.15	74.34	75.00	75.38	72.18
Monday	6	75.01	74.32	69.54	70.38	74.21	75.00	75.45	71.61
Monday	7	75.01	74.20	68.64	69.62	74.08	75.00	75.53	71.05
Monday	8	75.01	74.09	67.73	68.85	73.95	75.00	75.60	70.48
Monday	9	75.01	73.98	66.82	68.08	73.82	75.00	75.68	69.92
Monday	10	75.01	73.86	65.91	67.31	73.69	75.00	75.75	69.35
Monday	11	75.01	73.75	65.00	66.54	73.56	75.00	75.83	68.79
Monday	12	75.01	73.63	64.09	65.77	73.43	75.00	75.90	68.22
Monday	13	75.01	73.52	63.18	65.00	73.30	75.00	75.98	67.66
Monday	14	75.02	73.41	62.27	64.23	73.17	75.00	76.05	67.09
Monday	15	75.02	73.29	61.36	63.46	73.03	75.00	75.91	67.99
Monday	16	75.02	73.18	60.45	62.69	72.90	75.00	75.77	68.89
Monday	17	75.02	73.07	59.54	61.92	72.77	75.00	75.63	69.79
Monday	18	75.02	72.95	58.63	61.15	72.64	75.00	75.49	70.69
Monday	19	75.02	72.87	59.42	60.38	72.51	75.00	75.56	70.12
Monday	20	75.03	71.80	60.21	59.62	72.38	75.00	75.64	69.56
Monday	21	75.03	71.68	60.39	58.85	72.25	75.00	75.71	68.99
Monday	22	75.03	71.57	60.56	58.08	72.12	75.00	75.79	68.43
Monday	23	75.03	71.46	60.73	58.62	71.99	75.00	75.86	67.86
Tuesday	0	75.03	71.34	60.90	59.15	71.85	75.00	75.94	67.30
Tuesday	1	75.03	71.73	61.00	59.69	71.72	75.00	76.01	66.73
Tuesday	2	75.03	72.12	61.10	60.23	71.59	75.00	76.09	66.17
Tuesday	3	75.03	72.51	61.19	60.77	71.46	75.00	76.16	65.60
Tuesday	4	75.03	72.90	61.29	61.31	71.33	75.00	76.24	65.04
Tuesday	5	75.02	73.29	61.39	61.85	71.59	75.00	76.31	64.47
Tuesday	6	75.02	73.68	61.49	62.38	71.66	75.00	76.39	63.91
Tuesday	7	75.02	73.57	61.59	62.92	71.72	75.00	76.46	63.34
Tuesday	8	75.02	73.46	61.69	63.46	71.79	75.00	76.54	62.78
Tuesday	9	75.02	73.34	61.79	64.00	71.85	75.00	76.61	62.21
Tuesday	10	75.02	73.23	61.89	64.54	71.92	75.00	76.69	61.65
Tuesday	11	75.02	73.11	61.98	65.08	71.99	75.00	76.76	61.08
Tuesday	12	75.02	73.00	62.08	65.85	72.05	75.00	76.84	60.52
Tuesday	13	75.02	72.89	62.18	66.62	72.12	75.00	76.91	59.95
Tuesday	14	75.02	72.77	62.28	67.38	72.18	75.00	76.99	59.39
Tuesday	15	75.02	73.16	62.38	68.15	72.25	75.00	77.06	58.82
Tuesday	16	75.02	73.55	62.48	68.92	72.31	75.00	77.14	58.26
Tuesday	17	75.02	73.94	62.58	69.69	72.38	75.00	77.21	57.69
Tuesday	18	75.01	74.33	62.68	70.46	72.44	75.00	77.29	57.13
Tuesday	19	75.02	73.76	63.47	71.23	72.51	75.00	77.36	56.56
Tuesday	20	75.02	73.18	64.26	72.00	72.58	75.00	77.44	56.00
Tuesday	21	75.02	73.06	64.35	72.77	72.64	75.00	77.30	56.90
Tuesday	22	75.02	72.95	64.45	73.54	72.71	75.00	77.37	56.33
Tuesday	23	75.02	72.84	64.55	74.31	72.77	75.00	77.45	55.77
Wednesday	0	75.02	72.72	64.65	75.08	72.84	75.00	77.52	55.20
Wednesday	1	75.02	72.61	65.83	75.85	72.90	75.00	77.38	56.10
Wednesday	2	75.02	72.50	67.01	75.46	72.97	75.00	77.24	57.00
Wednesday	3	75.02	72.38	68.19	75.08	73.03	75.00	77.10	57.90
Wednesday	4	75.02	72.27	69.37	74.69	73.10	75.00	76.96	58.80
Wednesday	5	75.02	72.15	70.55	74.31	73.17	75.00	76.82	59.70
Wednesday	6	75.02	72.04	71.72	73.92	73.23	75.00	76.68	60.60
Wednesday	7	75.02	72.43	72.90	73.54	73.30	75.00	76.54	61.50
Wednesday	8	75.02	72.82	74.08	73.15	73.36	75.00	76.39	62.40
Wednesday	9	75.01	73.21	75.26	72.77	73.43	75.00	76.25	63.30
Wednesday	10	75.01	73.60	76.44	72.38	73.49	75.00	76.11	64.20
Wednesday	11	75.01	73.99	77.62	72.00	73.56	75.00	75.97	65.10
Wednesday	12	75.01	73.88	78.80	71.62	73.62	75.00	75.83	66.00
Wednesday	13	75.01	73.76	79.98	71.46	73.69	75.00	75.69	66.90
Wednesday	14	75.01	73.65	81.15	71.31	73.75	75.00	75.55	67.80
Wednesday	15	75.01	73.54	82.33	71.15	73.82	75.00	75.41	68.69
Wednesday	16	75.01	73.42	83.51	71.00	73.89	75.00	75.26	69.59
Wednesday	17	75.01	73.31	84.69	70.85	73.95	75.00	75.12	70.49
Wednesday	18	75.01	73.19	85.87	70.69	74.02	75.00	74.98	71.39
Wednesday	19	75.01	72.62	85.00	70.54	74.08	75.00	75.06	70.83
Wednesday	20	75.02	72.04	84.14	70.38	74.15	75.00	75.13	70.26
Wednesday	21	75.02	72.43	84.24	70.23	74.21	75.00	74.99	71.16
Wednesday	22	75.01	72.82	84.34	70.08	74.28	75.00	75.07	70.60
Wednesday	23	75.01	73.21	84.43	69.92	74.34	75.00	75.14	70.03

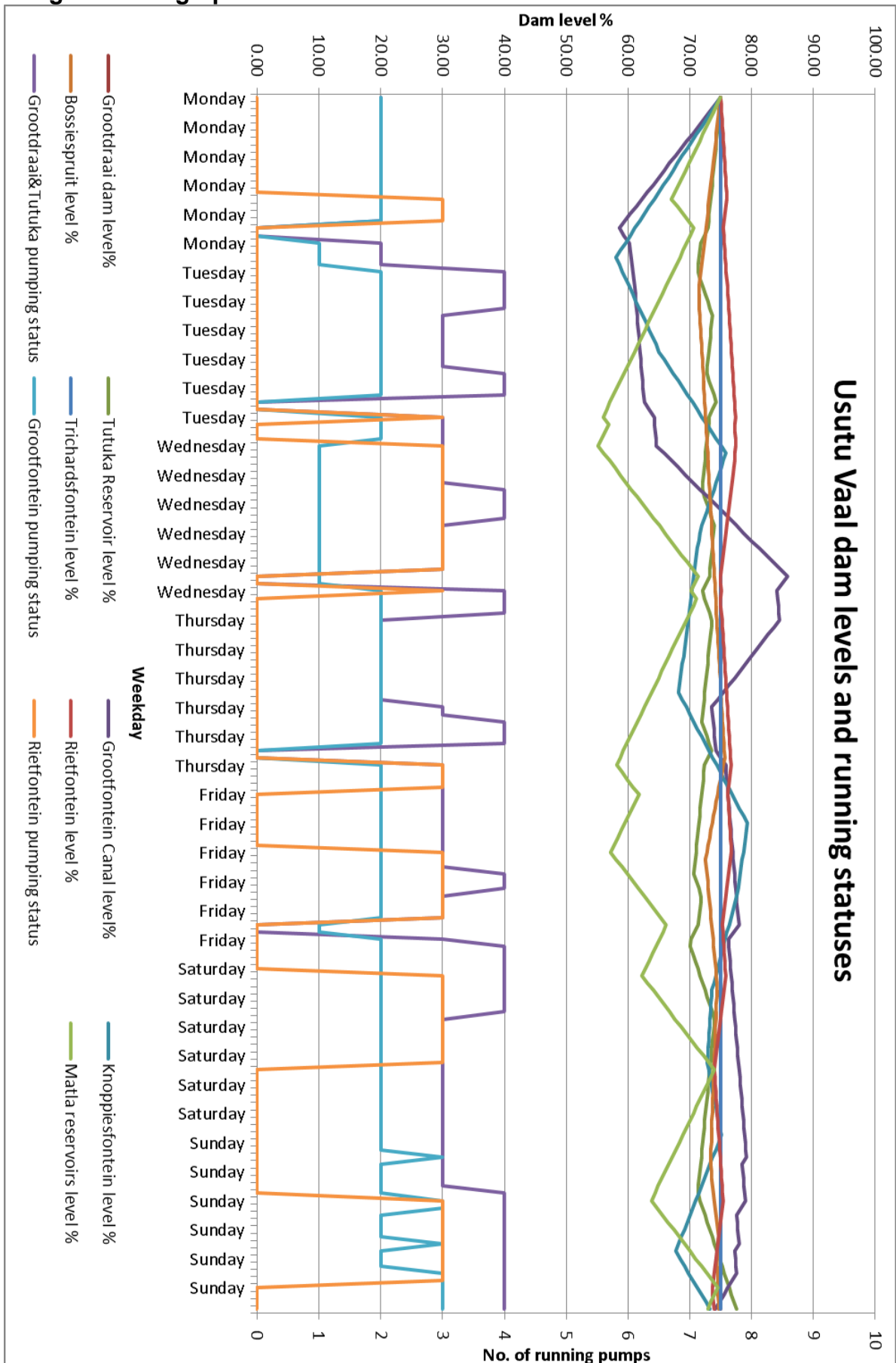
Thursday	0	75.01	73.60	84.53	69.77	74.41	75.00	75.22	69.47
Thursday	1	75.01	73.49	83.62	69.62	74.48	75.00	75.29	68.90
Thursday	2	75.01	73.37	82.71	69.46	74.54	75.00	75.37	68.34
Thursday	3	75.01	73.26	81.81	69.31	74.61	75.00	75.44	67.77
Thursday	4	75.02	73.14	80.90	69.15	74.67	75.00	75.52	67.21
Thursday	5	75.02	73.03	79.99	69.00	74.74	75.00	75.59	66.64
Thursday	6	75.02	72.92	79.08	68.85	74.80	75.00	75.67	66.08
Thursday	7	75.02	72.80	78.17	68.69	74.87	75.00	75.74	65.51
Thursday	8	75.02	72.69	77.26	68.54	74.93	75.00	75.82	64.95
Thursday	9	75.02	72.58	76.35	68.38	75.00	75.00	75.89	64.38
Thursday	10	75.02	72.46	75.44	68.23	75.07	75.00	75.97	63.82
Thursday	11	75.02	72.35	74.53	68.08	75.13	75.00	76.04	63.25
Thursday	12	75.02	72.23	73.62	67.94	75.20	75.00	76.12	62.69
Thursday	13	75.02	72.12	72.72	70.08	75.26	75.00	76.19	62.12
Thursday	14	75.02	72.01	71.82	70.69	75.33	75.00	76.27	61.56
Thursday	15	75.02	72.00	71.31	71.31	75.39	75.00	76.34	60.99
Thursday	16	75.02	72.79	74.02	71.92	75.46	75.00	76.42	60.43
Thursday	17	75.02	73.18	74.12	72.54	75.52	75.00	76.49	59.86
Thursday	18	75.02	73.57	74.22	73.15	75.59	75.00	76.57	59.30
Thursday	19	75.02	72.99	75.01	73.77	75.66	75.00	76.64	58.73
Thursday	20	75.03	72.41	75.80	74.38	75.44	75.00	76.72	58.17
Thursday	21	75.03	72.30	75.89	75.00	75.22	75.00	76.58	59.07
Thursday	22	75.02	72.18	75.99	75.62	75.00	75.00	76.44	59.97
Thursday	23	75.02	72.07	76.09	76.23	74.78	75.00	76.30	60.87
Friday	0	75.02	71.96	76.19	76.85	74.56	75.00	76.15	61.77
Friday	1	75.02	71.84	76.29	77.46	74.34	75.00	76.23	61.20
Friday	2	75.02	71.73	76.39	78.08	74.13	75.00	76.30	60.64
Friday	3	75.02	71.62	76.49	78.69	73.91	75.00	76.38	60.07
Friday	4	75.02	71.50	76.59	79.31	73.69	75.00	76.45	59.51
Friday	5	75.02	71.39	76.68	79.15	73.47	75.00	76.53	58.94
Friday	6	75.02	71.27	76.78	79.00	73.25	75.00	76.60	58.38
Friday	7	75.02	71.16	76.88	78.85	73.03	75.00	76.68	57.81
Friday	8	75.02	71.05	76.98	78.69	72.82	75.00	76.75	57.25
Friday	9	75.02	70.93	77.08	78.54	72.60	75.00	76.61	58.15
Friday	10	75.02	70.82	77.18	78.38	72.71	75.00	76.47	59.05
Friday	11	75.02	70.71	77.28	78.23	72.82	75.00	76.33	59.94
Friday	12	75.02	71.10	77.38	78.08	72.92	75.00	76.19	60.84
Friday	13	75.02	71.49	77.47	77.92	73.03	75.00	76.05	61.74
Friday	14	75.02	71.88	77.57	77.62	73.14	75.00	75.91	62.64
Friday	15	75.02	71.76	77.67	77.31	73.25	75.00	75.77	63.54
Friday	16	75.02	71.65	77.77	77.00	73.36	75.00	75.63	64.44
Friday	17	75.02	71.54	77.87	76.69	73.47	75.00	75.48	65.34
Friday	18	75.02	71.42	77.97	76.38	73.58	75.00	75.34	66.24
Friday	19	75.02	70.84	77.10	76.08	73.69	75.00	75.42	65.68
Friday	20	75.02	70.27	76.24	75.77	73.80	75.00	75.49	65.11
Friday	21	75.02	70.15	76.34	75.46	73.91	75.00	75.57	64.55
Friday	22	75.02	70.54	76.43	75.15	74.02	75.00	75.64	63.98
Friday	23	75.02	70.93	76.53	74.85	74.13	75.00	75.72	63.42
Saturday	0	75.02	71.32	76.63	74.54	74.24	75.00	75.79	62.85
Saturday	1	75.02	71.71	76.73	74.23	74.34	75.00	75.87	62.29
Saturday	2	75.01	72.10	76.83	73.92	74.45	75.00	75.73	63.19
Saturday	3	75.01	72.49	76.93	73.62	74.41	75.00	75.59	64.08
Saturday	4	75.01	72.88	77.03	73.54	74.37	75.00	75.44	64.98
Saturday	5	75.01	73.27	77.13	73.46	74.32	75.00	75.30	65.88
Saturday	6	75.01	73.66	77.22	73.38	74.28	75.00	75.16	66.78
Saturday	7	75.01	74.05	77.32	73.31	74.24	75.00	75.02	67.68
Saturday	8	75.01	73.94	77.42	73.23	74.19	75.00	74.88	68.58
Saturday	9	75.01	73.83	77.52	73.15	74.15	75.00	74.74	69.48
Saturday	10	75.01	73.71	77.62	73.08	74.10	75.00	74.60	70.38
Saturday	11	75.01	73.60	77.72	73.00	74.06	75.00	74.46	71.28
Saturday	12	75.01	73.49	77.82	72.92	74.02	75.00	74.31	72.18
Saturday	13	75.01	73.37	77.92	72.85	73.97	75.00	74.17	73.08
Saturday	14	75.01	73.26	78.02	73.08	73.93	75.00	74.03	73.98
Saturday	15	75.00	73.14	78.11	73.31	73.89	75.00	74.11	73.41
Saturday	16	75.00	73.03	78.21	73.54	73.84	75.00	74.18	72.85
Saturday	17	75.00	72.92	78.31	73.77	73.80	75.00	74.26	72.28
Saturday	18	75.00	72.80	78.41	74.00	73.75	75.00	74.33	71.72
Saturday	19	75.00	72.69	78.51	74.23	73.71	75.00	74.41	71.15
Saturday	20	75.00	72.58	78.61	74.46	73.67	75.00	74.48	70.59
Saturday	21	75.00	72.46	78.71	74.69	73.62	75.00	74.56	70.02
Saturday	22	75.00	72.35	78.81	74.92	73.58	75.00	74.63	69.46
Saturday	23	75.00	72.23	78.90	75.15	73.54	75.00	74.71	68.89
Sunday	0	75.00	72.12	79.00	74.69	73.49	75.00	74.78	68.33
Sunday	1	75.00	72.01	79.10	74.23	73.45	75.00	74.86	67.76
Sunday	2	75.00	71.89	79.20	73.77	73.41	75.00	74.93	67.20
Sunday	3	75.00	71.78	78.51	73.31	73.36	75.00	75.01	66.63
Sunday	4	75.00	71.66	78.61	72.85	73.49	75.00	75.08	66.07
Sunday	5	75.00	71.55	78.71	72.38	73.62	75.00	75.16	65.50
Sunday	6	75.00	71.44	78.80	71.92	73.75	75.00	75.23	64.94
Sunday	7	75.00	71.32	78.90	71.46	73.89	75.00	75.31	64.37
Sunday	8	75.00	71.21	79.00	71.00	74.02	75.00	75.38	63.81
Sunday	9	75.00	72.10	78.31	70.54	74.15	75.00	75.24	64.71
Sunday	10	75.00	72.49	77.62	70.08	74.28	75.00	75.10	65.61
Sunday	11	74.99	72.88	77.71	69.62	74.41	75.00	74.96	66.51
Sunday	12	74.99	73.27	77.81	69.15	74.54	75.00	74.82	67.41
Sunday	13	74.99	73.66	77.91	68.69	74.67	75.00	74.68	68.31
Sunday	14	74.99	74.06	78.01	68.23	74.58	75.00	74.54	69.21
Sunday	15	74.99	74.45	77.32	67.77	74.50	75.00	74.40	70.11
Sunday	16	74.99	74.84	77.42	68.46	74.41	75.00	74.25	71.00
Sunday	17	74.98	75.23	77.51	69.15	74.45	75.00	74.11	71.90
Sunday	18	74.98	75.62	77.61	69.85	74.50	75.00	73.97	72.80
Sunday	19	74.98	76.01	76.92	70.54	74.54	75.00	73.83	73.70
Sunday	20	74.98	76.40	76.23	71.23	74.58	75.00	73.69	74.60
Sunday	21	74.98	76.79	75.53	71.92	74.63	75.00	73.76	74.04
Sunday	22	74.98	77.18	74.84	72.62	74.67	75.00	73.84	73.47
Sunday	23	74.98	77.57	74.15	73.31	74.72	75.00	73.92	72.91

## Usutu-Vaal 7 days REMS simulation raw data: Status of pumps

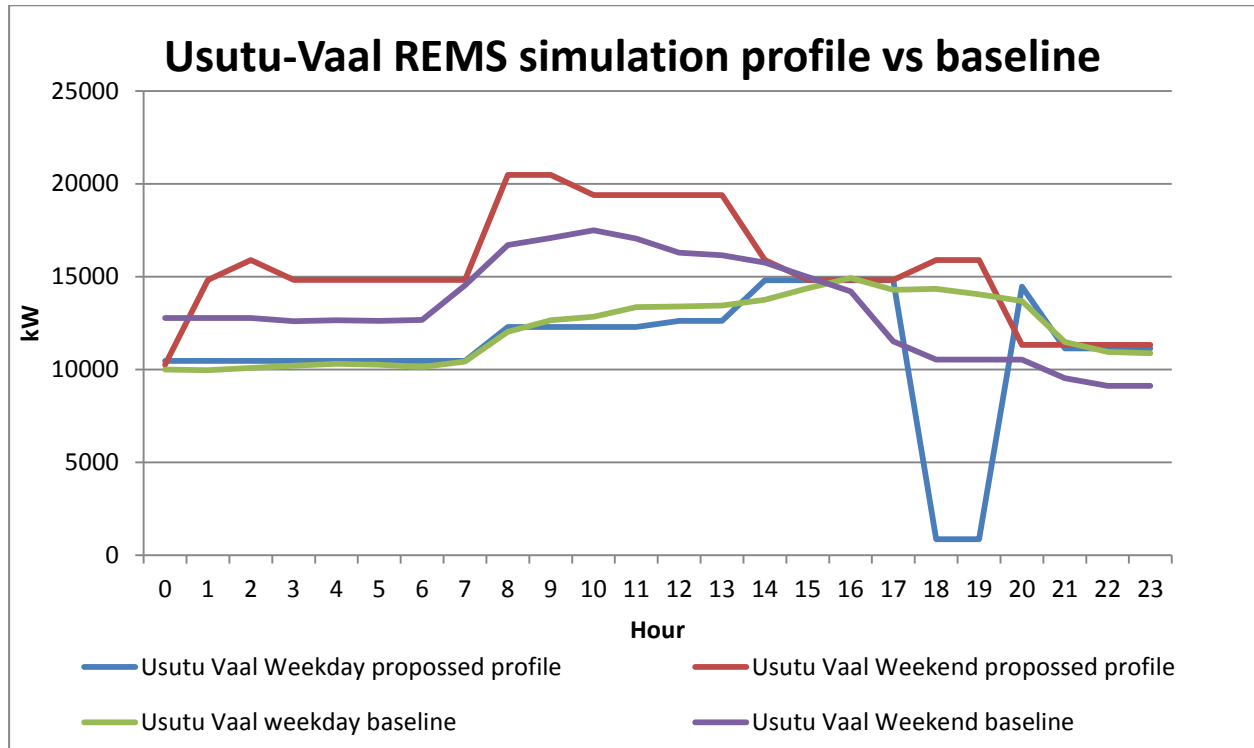
Weekday	Hour	Grootdraai&Tutuka pumps running status	Grootfontein pumps running status	Rietfontein pumps running status
Monday	0	2	2	0
Monday	1	2	2	0
Monday	2	2	2	0
Monday	3	2	2	0
Monday	4	2	2	0
Monday	5	2	2	0
Monday	6	2	2	0
Monday	7	2	2	0
Monday	8	2	2	0
Monday	9	2	2	0
Monday	10	2	2	0
Monday	11	2	2	0
Monday	12	2	2	0
Monday	13	2	2	0
Monday	14	2	2	3
Monday	15	2	2	3
Monday	16	2	2	3
Monday	17	2	2	3
Monday	18	0	0	0
Monday	19	0	0	0
Monday	20	2	1	0
Monday	21	2	1	0
Monday	22	2	1	0
Monday	23	2	1	0
Tuesday	0	4	2	0
Tuesday	1	4	2	0
Tuesday	2	4	2	0
Tuesday	3	4	2	0
Tuesday	4	4	2	0
Tuesday	5	4	2	0
Tuesday	6	3	2	0
Tuesday	7	3	2	0
Tuesday	8	3	2	0
Tuesday	9	3	2	0
Tuesday	10	3	2	0
Tuesday	11	3	2	0
Tuesday	12	3	2	0
Tuesday	13	3	2	0
Tuesday	14	4	2	0
Tuesday	15	4	2	0
Tuesday	16	4	2	0
Tuesday	17	4	2	0
Tuesday	18	0	0	0
Tuesday	19	0	0	0
Tuesday	20	3	2	3
Tuesday	21	3	2	0
Tuesday	22	3	2	0
Tuesday	23	3	2	0
Wednesday	0	3	1	3
Wednesday	1	3	1	3
Wednesday	2	3	1	3
Wednesday	3	3	1	3
Wednesday	4	3	1	3
Wednesday	5	3	1	3
Wednesday	6	4	1	3
Wednesday	7	4	1	3
Wednesday	8	4	1	3
Wednesday	9	4	1	3
Wednesday	10	4	1	3
Wednesday	11	3	1	3
Wednesday	12	3	1	3
Wednesday	13	3	1	3
Wednesday	14	3	1	3
Wednesday	15	3	1	3
Wednesday	16	3	1	3
Wednesday	17	3	1	3
Wednesday	18	0	1	0
Wednesday	19	0	1	0
Wednesday	20	4	2	3
Wednesday	21	4	2	0
Wednesday	22	4	2	0
Wednesday	23	4	2	0

Thursday	0	2	2	0
Thursday	1	2	2	0
Thursday	2	2	2	0
Thursday	3	2	2	0
Thursday	4	2	2	0
Thursday	5	2	2	0
Thursday	6	2	2	0
Thursday	7	2	2	0
Thursday	8	2	2	0
Thursday	9	2	2	0
Thursday	10	2	2	0
Thursday	11	2	2	0
Thursday	12	3	2	0
Thursday	13	3	2	0
Thursday	14	4	2	0
Thursday	15	4	2	0
Thursday	16	4	2	0
Thursday	17	4	2	0
Thursday	18	0	0	0
Thursday	19	0	0	0
Thursday	20	3	2	3
Thursday	21	3	2	3
Thursday	22	3	2	3
Thursday	23	3	2	3
Friday	0	3	2	0
Friday	1	3	2	0
Friday	2	3	2	0
Friday	3	3	2	0
Friday	4	3	2	0
Friday	5	3	2	0
Friday	6	3	2	0
Friday	7	3	2	0
Friday	8	3	2	3
Friday	9	3	2	3
Friday	10	3	2	3
Friday	11	4	2	3
Friday	12	4	2	3
Friday	13	4	2	3
Friday	14	3	2	3
Friday	15	3	2	3
Friday	16	3	2	3
Friday	17	3	2	3
Friday	18	0	1	0
Friday	19	0	1	0
Friday	20	3	2	0
Friday	21	4	2	0
Friday	22	4	2	0
Friday	23	4	2	0
Saturday	0	4	2	0
Saturday	1	4	2	3
Saturday	2	4	2	3
Saturday	3	4	2	3
Saturday	4	4	2	3
Saturday	5	4	2	3
Saturday	6	4	2	3
Saturday	7	3	2	3
Saturday	8	3	2	3
Saturday	9	3	2	3
Saturday	10	3	2	3
Saturday	11	3	2	3
Saturday	12	3	2	3
Saturday	13	3	2	3
Saturday	14	3	2	0
Saturday	15	3	2	0
Saturday	16	3	2	0
Saturday	17	3	2	0
Saturday	18	3	2	0
Saturday	19	3	2	0
Saturday	20	3	2	0
Saturday	21	3	2	0
Saturday	22	3	2	0
Saturday	23	3	2	0
Sunday	0	3	2	0
Sunday	1	3	2	0
Sunday	2	3	3	0
Sunday	3	3	2	0
Sunday	4	3	2	0
Sunday	5	3	2	0
Sunday	6	3	2	0
Sunday	7	4	2	0
Sunday	8	4	3	3
Sunday	9	4	3	3
Sunday	10	4	2	3
Sunday	11	4	2	3
Sunday	12	4	2	3
Sunday	13	4	2	3
Sunday	14	4	3	3
Sunday	15	4	2	3
Sunday	16	4	2	3
Sunday	17	4	2	3
Sunday	18	4	3	3
Sunday	19	4	3	3
Sunday	20	4	3	0
Sunday	21	4	3	0
Sunday	22	4	3	0
Sunday	23	4	3	0

**Usutu-Vaal 7 days REMS simulation: Dam level percentages and pumping running statuses graph**



Usutu-Vaal 7 days REMS simulation power profile vs. actual baseline profile



REMS Simulation data								
Grootdraai Proposed		Grootfontein Proposed		Rietfontein Proposed		Combined Usutu Vaal proposed profile		
Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend	
0	4758	5947.5	3870	4300	1830	0	10458	10247.5
1	4758	5947.5	3870	4300	1830	4575	10458	14822.5
2	4758	5947.5	3870	5375	1830	4575	10458	15897.5
3	4758	5947.5	3870	4300	1830	4575	10458	14822.5
4	4758	5947.5	3870	4300	1830	4575	10458	14822.5
5	4758	5947.5	3870	4300	1830	4575	10458	14822.5
6	4758	5947.5	3870	4300	1830	4575	10458	14822.5
7	4758	5947.5	3870	4300	1830	4575	10458	14822.5
8	4758	5947.5	3870	5375	3660	9150	12288	20472.5
9	4758	5947.5	3870	5375	3660	9150	12288	20472.5
10	4758	5947.5	3870	4300	3660	9150	12288	19397.5
11	4758	5947.5	3870	4300	3660	9150	12288	19397.5
12	5094	5947.5	3870	4300	3660	9150	12624	19397.5
13	5094	5947.5	3870	4300	3660	9150	12624	19397.5
14	5439	5947.5	3870	5375	5490	4575	14799	15897.5
15	5439	5947.5	3870	4300	5490	4575	14799	14822.5
16	5439	5947.5	3870	4300	5490	4575	14799	14822.5
17	5439	5947.5	3870	4300	5490	4575	14799	14822.5
18	0	5947.5	860	5375	0	4575	860	15897.5
19	0	5947.5	860	5375	0	4575	860	15897.5
20	5094	5947.5	3870	5375	5490	0	14454	11322.5
21	5439	5947.5	3870	5375	1830	0	11139	11322.5
22	5439	5947.5	3870	5375	1830	0	11139	11322.5
23	5439	5947.5	3870	5375	1830	0	11139	11322.5
	110451	142740	86860	113950	69540	114375	266851	371065

Baseline data		
June 2011 - August 2011		
Hour	Weekday avg kW	Weekend avg kW
0	9987	12771
1	9955	12771
2	10089	12771
3	10195	12606
4	10312	12648
5	10254	12610
6	10138	12668
7	10419	14533
8	12039	16705
9	12645	17075
10	12849	17488
11	13354	17043
12	13400	16290
13	13441	16158
14	13758	15747
15	14382	14985
16	14932	14199
17	14295	11512
18	14342	10527
19	14046	10527
20	13688	10527
21	11482	9530
22	10946	9119
23	10877	9119
Total:	291825	319930

MW Shifted: 13.3

# APPENDIX D: ACTUAL M&V PUMP STATION KW DATA

## Grootdraai & Tutuka results

Time	Average March 2012 to May 2012 [kW]			Scaled kW Baseline			PA Saving [kW]		
	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
0:00	4,271	4,932	4,203	3,536	3,846	3,755	-782	-980	-345
1:00	4,257	4,961	4,089	3,536	3,846	3,663	-767	-1,009	-325
2:00	4,277	4,961	4,080	3,555	3,846	3,576	-772	-1,009	-406
3:00	4,267	4,946	4,076	3,591	3,846	3,572	-720	-994	-406
4:00	4,261	5,040	4,003	3,591	3,846	3,572	-715	-1,087	-332
5:00	4,251	5,088	4,143	3,591	3,846	3,572	-705	-1,135	-473
6:00	4,313	5,164	4,188	3,573	3,846	3,480	-784	-1,212	-612
7:00	2,327	4,978	3,852	3,573	3,846	3,393	1,302	-1,026	-365
8:00	2,093	5,090	3,787	3,592	3,846	3,484	1,565	-1,138	-207
9:00	3,850	4,840	4,062	3,574	3,846	3,484	-276	-888	-482
10:00	3,974	4,953	4,254	3,629	3,759	3,484	-355	-1,090	-674
11:00	4,000	5,042	4,195	3,665	3,759	3,480	-342	-1,179	-619
12:00	4,116	5,056	4,295	3,665	3,846	3,480	-445	-1,104	-719
13:00	4,099	5,159	3,818	3,682	3,755	3,480	-412	-1,301	-242
14:00	3,785	5,152	3,775	3,629	3,755	3,572	-156	-1,294	-105
15:00	3,910	5,143	3,707	3,647	3,755	3,572	-264	-1,285	-37
16:00	3,880	5,135	3,763	3,647	3,755	3,572	-237	-1,276	-92
17:00	3,479	5,161	4,319	3,629	3,755	3,572	173	-1,302	-649
18:00	120	4,879	3,378	3,647	3,755	3,572	3,625	-1,021	292
19:00	75	4,452	3,309	3,646	3,755	3,572	3,672	-593	362
20:00	3,802	4,693	4,135	3,627	3,755	3,572	-162	-834	-465
21:00	4,447	4,693	4,265	3,627	3,755	3,572	-828	-834	-594
22:00	4,437	4,568	4,263	3,627	3,755	3,572	-816	-710	-593
23:00	4,427	4,559	4,159	3,635	3,755	3,572	-800	-700	-488
Total	86,716	118,645	96,120	86,716	91,125	85,191			
					Scaling factor	0.71			
					MW shifted	3.65			



## **Office of the Chief Executive**

Contracted the University of Johannesburg to execute this Report

## **Measurement and Verification**

**Project Name:** DWA Grootdraai & Tutuka PumpingProject

**Project Number:** 2010181

**Report Type:** Performance Certificate

**Reporting Period:** June 2012

Report Issue Date: 23-JUN-12 Report Number: PM/M&V/UJ-18/06/02  
Revision Number: UJ PC Report\_-\_2010181\_DWA Grootdraai & Tutuka Pump\_v0r0.docx

## DWA GROOTDRAAI &amp; TUTUKA PUMPING PROJECT-PA CERTIFICATE

## M&amp;V PERFORMANCE ASSESSMENT CERTIFICATE

<b>IDM PROJECT TITLE</b>	DWA Grootdraai & Tutuka Pumping project
<b>IDM PROJECT NUMBER</b>	2010181
<b>M&amp;VTEAM:</b>	University of Johannesburg
<b>DATE OF M&amp;V COMPLETION</b>	18 June 2012
<b>SHORT DESCRIPTION OF PROJECT</b>	Load Shifting out of evening peak
<b>P.A. PERIOD:</b>	March 2012-May 2012
<b>REPRESENTATIVE PERFORMANCE OF PROJECT</b>	3.65 MW shifted from evening peak.

It is hereby certified that the M&V Performance Assessment for the IDM project mentioned above has been completed and that its official performance for the mentioned period is as given in this certificate. The issuance of this certificate declares that all related Performance Assessment results have been issued to and reviewed by the relevant stakeholders.

Compiled by:

Date:

23-Jun-12



Pierre van Rhyn M&V Team  
members University of  
Johannesburg

Authorised by:

Date:

23-Jun-12



JHC Pretorius Team Leader  
University of Johannesburg

Submitted to:

The Chief Executive Officer Eskom



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UNIVERSITY  
JOHANNESBURG

DWA GROOTDRAAI &amp; TUTUKA PUMPING PROJECT-PA CERTIFICATE

## Performance of IDM project

<b>IDM PROJECT TITLE</b>	DWA Grootdraai & Tutuka Pumping Project
<b>IDM PROJECT NUMBER</b>	2010181
<b>ESCO OF IDM PROJECT</b>	HVAC International (Pty)Ltd
<b>M&amp;V TEAM</b>	University of Johannesburg
<b>PERFORMANCE ASSESSMENT PERIOD</b>	March 2012 - May 2012

### 1 MONTHLY ACTUAL VS CONTRACTED DEMAND SHIFT

#### 1.1 MONTH 1: MARCH 2012

Performance assessment reference: UJ M&amp;V PA1 - 2010181 -v0r0

**Table 1:** Actual weekday impact: 24 March 2012 - 31 March 2012

Weekday (MW)								
	Morning peak	Off-Standard	Morning Standard	Morning Peak	Midday Standard	Evening Peak	Evening Standard	Evening Off-peak
Baseline	4.620		4.630	4.640	4.730	4.720	4.700	4.620
Actual	5.060		5.070	4.070	5.040	0.180	5.110	5.060
Impact	-0.440		-0.440	0.570	-0.310	4.540	-0.410	-0.440
Intended Impact						3.800		
Over / Underperformance						0.740		

#### 1.2 MONTH 2: APRIL 2012

Performance assessment reference: UJ M&amp;V PA2 - 2010181 - v0r0

**Table 2:** Actual weekday impact: 1 April 2012 - 30 April 2012

Weekday (MW)								
	Morning peak	Off-Standard	Morning Standard	Morning Peak	Midday Standard	Evening Peak	Evening Standard	Evening Off-peak
Baseline	3.200		3.200	3.210	3.270	3.270	3.250	4.620
Actual	4.070		4.220	2.310	3.120	0.090	3.670	5.060
Impact	-0.870		-1.020	0.900	0.150	3.180	-0.420	-0.440
Intended Impact						3.800		
Over / Underperformance						-0.620		



## DWA GROOTDRAAI &amp; TUTUKA PUMPING PROJECT-PA CERTIFICATE

**1.3 MONTH 3: MAY 2012**

Performance assessment reference: UJ M&amp;V PA3 - 2010181 - v0r0

**Table 3:** Actual weekday impact: 1 May 2012 - 31 May 2012

Weekday (MW)								
	Morning peak	Off-Standard	Morning Standard	Morning Peak	Midday Standard	Evening Peak	Evening Standard	Evening Off-peak
Baseline	3.690		3.700	3.700	3.770	3.770	3.750	4.620
Actual	3.660		3.650	1.890	3.560	0.000	3.590	5.060
Impact	0.030		0.050	1.810	0.210	3.230	0.160	-0.440
Intended Impact						3.800		
Over / Underperformance						-0.570		

**2 OBSERVATIONS**

It is clear that the load shift intervention is operational during the week and that the control system manages to shift the load to the weekends for normalisation of buffers.

**Grootfontein results**

Time	Average March 2012 to May 2012 [kW]			Scaled kW Baseline			PA Saving [kW]		
	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
0:00	3,634	3,269	3,877	3,052	3,150	3,009	-582	-118	-868
1:00	3,601	3,282	3,875	2,994	3,150	3,150	-607	-132	-725
2:00	3,567	3,281	3,767	3,023	3,150	3,150	-544	-130	-617
3:00	3,493	3,141	3,731	3,009	3,009	3,150	-485	-132	-581
4:00	3,417	2,844	2,755	3,039	3,045	3,150	-379	201	395
5:00	3,197	2,932	3,796	3,028	3,012	3,150	-170	80	-646
6:00	2,900	2,819	3,807	3,023	3,012	3,150	124	193	-657
7:00	2,849	1,993	3,730	3,102	3,012	3,150	253	1,019	-580
8:00	2,891	1,746	3,542	3,189	3,154	3,150	298	1,408	-392
9:00	3,019	2,061	3,097	3,210	3,009	3,150	192	948	53
10:00	3,231	2,949	3,131	3,232	3,079	3,150	0	130	19
11:00	3,319	3,115	3,560	3,203	3,150	3,150	-115	35	-410
12:00	3,429	3,210	3,718	3,141	3,150	3,150	-288	-60	-568
13:00	3,720	3,350	3,816	3,125	3,150	3,150	-594	-200	-666
14:00	3,797	3,364	3,801	3,212	3,150	3,150	-585	-214	-651
15:00	3,723	3,620	3,736	3,255	3,150	3,150	-469	-470	-586
16:00	3,672	3,632	3,861	3,227	3,150	3,150	-445	-481	-711
17:00	3,318	3,624	3,688	3,227	3,150	3,150	-91	-474	-538
18:00	202	3,633	3,302	3,198	3,150	3,150	2,996	-483	-152
19:00	25	3,572	3,283	3,199	3,150	3,292	3,174	-422	9
20:00	3,314	3,642	3,618	3,155	3,150	3,292	-159	-492	-327
21:00	3,720	3,796	3,225	3,140	3,150	3,292	-580	-645	66
22:00	3,600	3,137	3,148	3,140	3,150	3,292	-460	13	143
23:00	3,615	3,587	3,642	3,130	3,150	3,220	-484	-437	-422
Total	89,113	118,645	96,120	89,113	93,644	87,545			
					Scaling factor	0.77			
					MW shifted	3.09			



**Office of the Chief Executive**  
Contracted the University of Johannesburg to execute this Report

## **Measurement and Verification**

**Project Name:** DWA Grootfontein Pumping Project

**Project Number:** 2010182

**Report Type:** Performance Certificate

**Reporting Period:** June 2012

Report Issue Date: 23-JUN-12 Report Number: PM/M&V/UJ-18/06/03  
Revision Number: UJ PC Report\_-\_2010182\_DWA Grootfontein Pump\_v0r0.docx

DWA GROOTFONTEIN PUMPING PROJECT-PA CERTIFICATE

**M&V PERFORMANCE ASSESSMENT CERTIFICATE**

<b>IDM PROJECT TITLE</b>	DWA Grootfontein Pumping project
<b>IDM PROJECT NUMBER</b>	2010182
<b>M&amp;VTEAM:</b>	University of Johannesburg
<b>DATE OF M&amp;V COMPLETION</b>	18 June 2012
<b>SHORT DESCRIPTION OF PROJECT</b>	Load Shifting out of evening peak
<b>P.A. PERIOD:</b>	March 2012-May 2012
<b>REPRESENTATIVE PERFORMANCE OF PROJECT</b>	3.09 MW shifted out of weekdays evening peak.

It is hereby certified that the M&V Performance Assessment for the IDM project mentioned above has been completed and that its official performance for the mentioned period is as given in this certificate. The issuance of this certificate declares that all related Performance Assessment results have been issued to and reviewed by the relevant stakeholders.

Compiled by:

Date: 23-Jun-12



Pierre van Rhyn M&V Team  
members University of  
Johannesburg

Authorised by:

Date: 23-Jun-12



JHC Pretorius Team Leader University of Johannesburg

Submitted to:

The Chief Executive Officer  
Eskom



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DWA GROOTFONTEIN PUMPING PROJECT-PA CERTIFICATE

## Performance of IDM project

<b>IDM PROJECT TITLE</b>	DWA Grootfontein Pumping Project
<b>IDM PROJECT NUMBER</b>	2010182
<b>ESCO OF IDM PROJECT</b>	HVAC International (Pty)Ltd
<b>M&amp;V TEAM</b>	University of Johannesburg
<b>PERFORMANCE ASSESSMENT PERIOD</b>	March 2012 - May 2012

### 1 MONTHLY ACTUAL VS CONTRACTED DEMAND SHIFT

#### 1.1 MONTH 1: MARCH 2012

Performance assessment reference: UJ M&V PA1 - 2010182 -v0r0

**Table 1:** Actual weekday impact: 24 March 2012 - 31 March 2012

Weekday (MW)								
	Morning peak	Off	Morning Standard	Morning Peak	Midday Standard	Evening Peak	Evening Standard	Evening Off-peak
Baseline	3.420		3.420	3.580	3.620	3.610	3.560	3.420
Actual	4.050		2.870	3.030	3.770	0.250	3.880	4.050
Impact	-0.630		0.550	0.550	-0.150	3.360	-0.320	-0.630
Intended Impact						3.150		
Over / Underperformance						0.210		

#### 1.2 MONTH 2: APRIL 2012

Performance assessment reference: UJ M&V PA2 - 2010182 - v0r0

**Table 2:** Actual weekday impact: 1 April 2012 - 30 April 2012

Weekday (MW)								
	Morning peak	Off	Morning Standard	Morning Peak	Midday Standard	Evening Peak	Evening Standard	Evening Off-peak
Baseline	2.930		2.930	3.070	3.100	3.100	3.050	3.420
Actual	2.990		2.750	2.870	3.400	0.070	3.230	4.050
Impact	-0.060		0.180	0.200	-0.300	3.030	-0.180	-0.630
Intended Impact						3.150		
Over / Underperformance						-0.120		



## DWA GROOTFONTEIN PUMPING PROJECT-PA CERTIFICATE

**1.3 MONTH 3: MA Y 2012**

Performance assessment reference: UJ M&amp;V PA3 –2010182 –v0r0

**Table 3:** Actual weekday impact: 1 May 2012 –31 May 2012

	Weekday (MW)							
	Morning peak	Off-Standard	Morning Peak	Midday Standard	Evening Peak	Evening Standard	Evening Off-peak	
Baseline	3.130	3.130	3.280	3.320	3.310	3.260	3.420	
Actual	3.420	3.080	2.850	3.410	0.000	3.450	4.050	
Impact	+0.290	0.050	0.430	-0.090	2.880	-0.190	-0.630	
Intended Impact					3.150			
Over / Underperformance					-0.270			

**2 OBSERVATIONS**

It is clear that the load shift intervention is operational during the week and that the control system manages to shift the load to the weekends for normalisation of buffers.

**Rietfontein results**

Time	Average March 2012 to May [kW] 2012			Scaled kW Baseline			PA Saving [kW]		
	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
0:00	3,739	2,862	3,805	1,476	3,997	0	-2,263	1,135	-3,805
1:00	3,600	3,706	3,807	1,515	3,997	0	-2,085	291	-3,807
2:00	3,693	4,391	3,806	1,599	3,997	0	-2,093	-394	-3,806
3:00	3,717	4,389	3,807	1,678	3,997	0	-2,040	-392	-3,807
4:00	3,879	4,384	3,797	1,773	3,997	0	-2,106	-387	-3,797
5:00	3,843	5,079	3,919	1,721	3,997	0	-2,122	-1,082	-3,919
6:00	3,757	5,712	4,340	1,624	4,064	267	-2,132	-1,648	-4,073
7:00	3,465	5,741	4,357	1,838	6,183	972	-1,627	441	-3,385
8:00	3,484	5,816	5,663	3,534	8,461	5,557	49	2,645	-106
9:00	4,181	6,340	7,008	4,222	9,075	6,743	41	2,734	-265
10:00	4,448	7,575	6,251	4,336	9,594	6,396	-113	2,019	146
11:00	5,039	5,846	6,031	4,888	8,994	6,396	-152	3,148	365
12:00	5,026	5,153	5,506	5,024	7,995	7,129	-2	2,842	1,623
13:00	4,890	5,258	5,035	5,062	7,995	7,196	171	2,737	2,161
14:00	4,939	5,476	5,103	5,394	7,529	7,196	455	2,052	2,093
15:00	5,104	6,222	4,717	6,017	6,662	7,196	913	440	2,479
16:00	5,427	6,379	4,827	6,680	5,769	6,529	1,253	-610	1,702
17:00	4,222	5,719	2,714	5,984	2,718	3,731	1,762	-3,000	1,018
18:00	14	5,674	1,916	6,046	1,599	3,198	6,032	-4,075	1,282
19:00	14	5,861	2,370	5,711	1,599	3,198	5,697	-4,262	828
20:00	2,098	6,395	2,660	5,392	1,599	3,132	3,294	-4,796	472
21:00	3,325	6,399	2,435	2,907	467	1,546	-419	-5,932	-889
22:00	3,423	5,986	2,216	2,298	0	933	-1,125	-5,986	-1,283
23:00	3,610	6,209	1,867	2,220	0	800	-1,391	-6,209	-1,067
Total	89,113	118,645	96,120	89,113	93,644	87,545			
					Scaling factor	1.14			
					MW shifted	5.86			



**Office of the Chief Executive**  
Contracted the University of Johannesburg to execute this Report

## **Measurement and Verification**

**Project Name:** DWA Rietfontein Pumping Project

**Project Number:** 2010183

**Report Type:** Performance Certificate

**Reporting Period:** June 2012

Report Issue Date: 23-JUN-12 Report Number: PM/M&V/UJ-18/06/01  
Revision Number: UJ PC Report\_-\_2010183\_DWA Rietfontein Pump\_v0r0.docx

## DWA RIETFontein PUMPING PROJECT-PA CERTIFICATE

## M&amp;V PERFORMANCE ASSESSMENT CERTIFICATE

<b>IDM PROJECT TITLE</b>	DWA Rietfontein Pumping project
<b>IDM PROJECT NUMBER</b>	2010183
<b>M&amp;VTEAM:</b>	University of Johannesburg
<b>DATE OF M&amp;V COMPLETION</b>	18 June 2012
<b>SHORT DESCRIPTION OF PROJECT</b>	Load Shifting out of evening peak
<b>P.A. PERIOD:</b>	March 2012-May 2012
<b>REPRESENTATIVE PERFORMANCE OF PROJECT</b>	5.86 MW shifted from evening peak

It is hereby certified that the M&V Performance Assessment for the IDM project mentioned above has been completed and that its official performance for the mentioned period is as given in this certificate. The issuance of this certificate declares that all related Performance Assessment results have been issued to and reviewed by the relevant stakeholders.

Compiled by:

Date: 23-Jun-12



Pierre van Rhyn M&V Team  
members University of  
Johannesburg

Authorised by:

Date: 23-Jun-12



JHC Pretorius Team Leader  
University of Johannesburg

Submitted to:

The Chief Executive Officer Eskom



DWA RIETFontein PUMPING PROJECT-PA CERTIFICATE

## Performance of IDM project

<b>IDM PROJECT TITLE</b>	DWA Rietfontein Pumping Project
<b>IDM PROJECT NUMBER</b>	2010183
<b>ESCO OF IDM PROJECT</b>	HVAC International (Pty)Ltd
<b>M&amp;V TEAM</b>	University of Johannesburg
<b>PERFORMANCE ASSESSMENT PERIOD</b>	March 2012 - May 2012

### 1 MONTHLY ACTUAL VS CONTRACTED DEMAND SHIFT

#### 1.1 MONTH 1: MARCH 2012

Performance assessment reference: UJ M&V PA1 - 2010183 -v0r0

**Table 1:** Actual weekday impact: 24 March 2012 - 31 March 2012

Weekday (MW)								
	Morning peak	Off Standard	Morning Standard	Morning Peak	Midday Standard	Evening Peak	Evening Standard	Evening Off-peak
Baseline	1.560		1.560	3.070	5.210	5.650	3.990	1.560
Actual	1.490		1.440	2.800	6.790	0.020	1.230	1.490
Impact	0.070		0.120	0.270	-1.580	5.630	2.760	0.070
Intended Impact						3.200		
Over / Underperformance						2.430		

#### 1.2 MONTH 2: APRIL 2012

Performance assessment reference: UJ M&V PA2 - 2010183 - v0r0

**Table 2:** Actual weekday impact: 1 April 2012 - 30 April 2012

Weekday (MW)								
	Morning peak	Off Standard	Morning Standard	Morning Peak	Midday Standard	Evening Peak	Evening Standard	Evening Off-peak
Baseline	1.620		1.620	3.180	5.390	5.850	4.130	1.560
Actual	4.880		4.880	3.500	2.530	0.020	2.960	1.490
Impact	-3.260		-3.260	-0.320	2.860	5.830	1.170	0.070
Intended Impact						3.200		
Over / Underperformance						2.630		



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## DWA RIETFontein PUMPING PROJECT-PA CERTIFICATE

**1.3 MONTH 3: MA Y 2012**

Performance assessment reference: UJ M&amp;V PA3 - 2010183 - v0r0

**Table 3:** Actual weekday impact: 1 May 2012 - 31 May 2012

Weekday (MW)								
	Morning peak	Off-Standard	Morning Standard	Morning Peak	Midday Standard	Evening Peak	Evening Standard	Evening Off-peak
Baseline	2.090		2.090	4.110	6.980	7.560	5.340	1.560
Actual	4.860		4.950	4.830	5.340	0.000	3.950	1.490
Impact	-2.770		-2.860	-0.720	1.640	6.120	1.390	0.070
Intended Impact						3.200		
Over / Underperformance						2.920		

**2 OBSERVATIONS**

It is clear that the load shift intervention is operational during the week and that the control system manages to shift the load to the weekends for normalisation of buffers.

The huge over performance for this project can be ascribed to the increased load during the evaluation period which were all shifted out of the evening peak.

# APPENDIX E: USUTU-VAAL FINANCIAL RESULTS

Excel calculation 1: Formulas

A1	B	C	D	E	F	G	H	I	J	K	L	M	N
2		d	Opti			Summer Tariff	Summer Tariff	Summer Tariff			Winter Tariff	Winter Tariff	Winter Tariff
3	of	Base li	mise d			Weekday	Saturday	Sunday			Weekday	Saturday	Sunday
4	0	3536	4271		0	24.35	24.35	24.35		0	28.25	28.25	28.25
5	1	3536	4256		1	24.35	24.35	24.35		1	28.25	28.25	28.25
6	2	3555	4277		2	24.35	24.35	24.35		2	28.25	28.25	28.25
7	3	3591	4267		3	24.35	24.35	24.35		3	28.25	28.25	28.25
8	4	3591	4261		4	24.35	24.35	24.35		4	28.25	28.25	28.25
9	5	3591	4251		5	24.35	24.35	24.35		5	28.25	28.25	28.25
10	6	3573	4313		6	34.75	24.35	24.35		6	52.77	28.25	28.25
11	7	3573	2327		7	56.69	34.75	24.35		7	202.83	52.77	28.25
12	8	3591	2936		8	56.69	34.75	24.35		8	202.83	52.77	28.25
13	9	3574	3850		9	56.69	34.75	24.35		9	202.83	52.77	28.25
14	10	3629	3974		10	34.75	34.75	24.35		10	52.77	52.77	28.25
15	11	3664	4000		11	34.75	34.75	24.35		11	52.77	52.77	28.25
16	12	3664	4116		12	34.75	24.35	24.35		12	52.77	28.25	28.25
17	13	3682	4099		13	34.75	24.35	24.35		13	52.77	28.25	28.25
18	14	3629	3785		14	34.75	24.35	24.35		14	52.77	28.25	28.25
19	15	3647	3910		15	34.75	24.35	24.35		15	52.77	28.25	28.25
20	16	3647	3880		16	34.75	24.35	24.35		16	52.77	28.25	28.25
21	17	3629	3479		17	34.75	24.35	24.35		17	52.77	28.25	28.25
22	18	3647	120		18	56.69	34.75	24.35		18	202.83	52.77	28.25
23	19	3646	75		19	56.69	34.75	24.35		19	202.83	52.77	28.25
24	20	3627	3802		20	34.75	24.35	24.35		20	52.77	28.25	28.25
25	21	3627	4447		21	34.75	24.35	24.35		21	52.77	28.25	28.25
26	22	3627	4437		22	24.35	24.35	24.35		22	28.25	28.25	28.25
27	23	3635	4427		23	24.35	24.35	24.35		23	28.25	28.25	28.25
28			452										
29	Total	=SUM	=SUM										
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Summer Tariff			Winter Tariff				
Summer Tariff	Summer Tariff	Summer Tariff	Winter Tariff	Winter Tariff	Winter Tariff		
Weekday	Saturday	Sunday	Weekday	Saturday	Sunday		
0	=((\$C4-\$D4)*G4)/100	=((\$C4-\$D4)*H4)/100	=((\$C4-\$D4)*I4)/100	=((\$C4-\$D4)*L4)/100	=((\$C4-\$D4)*M4)/100		
1	=((\$C5-\$D5)*G5)/100	=((\$C5-\$D5)*H5)/100	=((\$C5-\$D5)*I5)/100	=((\$C5-\$D5)*L5)/100	=((\$C5-\$D5)*M5)/100		
2	=((\$C6-\$D6)*G6)/100	=((\$C6-\$D6)*H6)/100	=((\$C6-\$D6)*I6)/100	=((\$C6-\$D6)*L6)/100	=((\$C6-\$D6)*M6)/100		
3	=((\$C7-\$D7)*G7)/100	=((\$C7-\$D7)*H7)/100	=((\$C7-\$D7)*I7)/100	=((\$C7-\$D7)*L7)/100	=((\$C7-\$D7)*M7)/100		
4	=((\$C8-\$D8)*G8)/100	=((\$C8-\$D8)*H8)/100	=((\$C8-\$D8)*I8)/100	=((\$C8-\$D8)*L8)/100	=((\$C8-\$D8)*M8)/100		
5	=((\$C9-\$D9)*G9)/100	=((\$C9-\$D9)*H9)/100	=((\$C9-\$D9)*I9)/100	=((\$C9-\$D9)*L9)/100	=((\$C9-\$D9)*M9)/100		
6	=((\$C10-\$D10)*G10)/100	=((\$C10-\$D10)*H10)/100	=((\$C10-\$D10)*I10)/100	=((\$C10-\$D10)*L10)/100	=((\$C10-\$D10)*M10)/100		
7	=((\$C11-\$D11)*G11)/100	=((\$C11-\$D11)*H11)/100	=((\$C11-\$D11)*I11)/100	=((\$C11-\$D11)*L11)/100	=((\$C11-\$D11)*M11)/100		
8	=((\$C12-\$D12)*G12)/100	=((\$C12-\$D12)*H12)/100	=((\$C12-\$D12)*I12)/100	=((\$C12-\$D12)*L12)/100	=((\$C12-\$D12)*M12)/100		
9	=((\$C13-\$D13)*G13)/100	=((\$C13-\$D13)*H13)/100	=((\$C13-\$D13)*I13)/100	=((\$C13-\$D13)*L13)/100	=((\$C13-\$D13)*M13)/100		
10	=((\$C14-\$D14)*G14)/100	=((\$C14-\$D14)*H14)/100	=((\$C14-\$D14)*I14)/100	=((\$C14-\$D14)*L14)/100	=((\$C14-\$D14)*M14)/100		
11	=((\$C15-\$D15)*G15)/100	=((\$C15-\$D15)*H15)/100	=((\$C15-\$D15)*I15)/100	=((\$C15-\$D15)*L15)/100	=((\$C15-\$D15)*M15)/100		
12	=((\$C16-\$D16)*G16)/100	=((\$C16-\$D16)*H16)/100	=((\$C16-\$D16)*I16)/100	=((\$C16-\$D16)*L16)/100	=((\$C16-\$D16)*M16)/100		
13	=((\$C17-\$D17)*G17)/100	=((\$C17-\$D17)*H17)/100	=((\$C17-\$D17)*I17)/100	=((\$C17-\$D17)*L17)/100	=((\$C17-\$D17)*M17)/100		
14	=((\$C18-\$D18)*G18)/100	=((\$C18-\$D18)*H18)/100	=((\$C18-\$D18)*I18)/100	=((\$C18-\$D18)*L18)/100	=((\$C18-\$D18)*M18)/100		
15	=((\$C19-\$D19)*G19)/100	=((\$C19-\$D19)*H19)/100	=((\$C19-\$D19)*I19)/100	=((\$C19-\$D19)*L19)/100	=((\$C19-\$D19)*M19)/100		
16	=((\$C20-\$D20)*G20)/100	=((\$C20-\$D20)*H20)/100	=((\$C20-\$D20)*I20)/100	=((\$C20-\$D20)*L20)/100	=((\$C20-\$D20)*M20)/100		
17	=((\$C21-\$D21)*G21)/100	=((\$C21-\$D21)*H21)/100	=((\$C21-\$D21)*I21)/100	=((\$C21-\$D21)*L21)/100	=((\$C21-\$D21)*M21)/100		
18	=((\$C22-\$D22)*G22)/100	=((\$C22-\$D22)*H22)/100	=((\$C22-\$D22)*I22)/100	=((\$C22-\$D22)*L22)/100	=((\$C22-\$D22)*M22)/100		
19	=((\$C23-\$D23)*G23)/100	=((\$C23-\$D23)*H23)/100	=((\$C23-\$D23)*I23)/100	=((\$C23-\$D23)*L23)/100	=((\$C23-\$D23)*M23)/100		
20	=((\$C24-\$D24)*G24)/100	=((\$C24-\$D24)*H24)/100	=((\$C24-\$D24)*I24)/100	=((\$C24-\$D24)*L24)/100	=((\$C24-\$D24)*M24)/100		
21	=((\$C25-\$D25)*G25)/100	=((\$C25-\$D25)*H25)/100	=((\$C25-\$D25)*I25)/100	=((\$C25-\$D25)*L25)/100	=((\$C25-\$D25)*M25)/100		
22	=((\$C26-\$D26)*G26)/100	=((\$C26-\$D26)*H26)/100	=((\$C26-\$D26)*I26)/100	=((\$C26-\$D26)*L26)/100	=((\$C26-\$D26)*M26)/100		
23	=((\$C27-\$D27)*G27)/100	=((\$C27-\$D27)*H27)/100	=((\$C27-\$D27)*I27)/100	=((\$C27-\$D27)*L27)/100	=((\$C27-\$D27)*M27)/100		
Total	=SUM(G34:G57)	=SUM(H34:H57)	=SUM(I34:I57)	Total	=SUM(L34:L57)	=SUM(M34:M57)	=SUM(N34:N57)

Monthly Savings		
summer	Jan	=22*G58+4*H58
summer	Feb	=20*G58+4*H58
summer	Mar	=22*G58+5*H58
summer	Apr	=18*G58+5*H58
summer	May	=22*G58+5*H58
winter	Jun	=21*L58+5*M58
winter	Jul	=22*L58+4*M58
winter	Aug	=22*L58+5*M58
summer	Sep	=19*G58+6*H58
summer	Oct	=23*G58+4*H58
summer	Nov	=22*G58+4*H58
summer	Dec	=18*G58+6*H58
Annual savings		=SUM(J64:J75)

Excel calculation 2: Grootdraai & Tutuka financial results

Hour of day	Scaled Baseline	Optimised	Summer Tariff			Winter Tariff		
			Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
0	3,536	4,271	24.35	24.35	24.35	28.25	28.25	28.25
1	3,536	4,257	24.35	24.35	24.35	28.25	28.25	28.25
2	3,555	4,277	24.35	24.35	24.35	28.25	28.25	28.25
3	3,591	4,267	24.35	24.35	24.35	28.25	28.25	28.25
4	3,591	4,261	24.35	24.35	24.35	28.25	28.25	28.25
5	3,591	4,251	24.35	24.35	24.35	28.25	28.25	28.25
6	3,573	4,313	34.75	24.35	24.35	52.77	28.25	28.25
7	3,573	2,327	56.69	34.75	24.35	202.83	52.77	28.25
8	3,592	2,093	56.69	34.75	24.35	202.83	52.77	28.25
9	3,574	3,850	56.69	34.75	24.35	202.83	52.77	28.25
10	3,629	3,974	34.75	34.75	24.35	52.77	52.77	28.25
11	3,665	4,000	34.75	34.75	24.35	52.77	52.77	28.25
12	3,665	4,116	34.75	24.35	24.35	52.77	28.25	28.25
13	3,682	4,099	34.75	24.35	24.35	52.77	28.25	28.25
14	3,629	3,785	34.75	24.35	24.35	52.77	28.25	28.25
15	3,647	3,910	34.75	24.35	24.35	52.77	28.25	28.25
16	3,647	3,880	34.75	24.35	24.35	52.77	28.25	28.25
17	3,629	3,479	34.75	24.35	24.35	52.77	28.25	28.25
18	3,647	120	56.69	34.75	24.35	202.83	52.77	28.25
19	3,646	75	56.69	34.75	24.35	202.83	52.77	28.25
20	3,627	3,802	34.75	24.35	24.35	52.77	28.25	28.25
21	3,627	4,447	34.75	24.35	24.35	52.77	28.25	28.25
22	3,627	4,437	24.35	24.35	24.35	28.25	28.25	28.25
23	3,635	4,427	24.35	24.35	24.35	28.25	28.25	28.25
		452						
<b>Total</b>	86,716	86,716						

Summer Tariff				Winter Tariff			
	Summer Tariff	Summer Tariff	Summer Tariff	Winter Tariff	Winter Tariff	Winter Tariff	
	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday	
0	-R 178.93	-R 178.93	-R 178.93	-207.59	-207.59	-207.59	
1	-R 175.44	-R 175.44	-R 175.44	-203.54	-203.54	-203.54	
2	-R 175.87	-R 175.87	-R 175.87	-204.03	-204.03	-204.03	
3	-R 164.58	-R 164.58	-R 164.58	-190.94	-190.94	-190.94	
4	-R 163.12	-R 163.12	-R 163.12	-189.24	-189.24	-189.24	
5	-R 160.68	-R 160.68	-R 160.68	-186.42	-186.42	-186.42	
6	-R 257.15	-R 180.19	-R 180.19	-390.49	-209.05	-209.05	
7	R 706.55	R 433.10	R 303.48	2,527.95	657.69	352.09	
8	R 849.93	R 520.99	R 365.07	3,040.94	791.16	423.54	
9	-R 156.38	-R 95.86	-R 67.17	-559.51	-145.57	-77.93	
10	-R 119.74	-R 119.74	-R 83.91	-181.84	-181.84	-97.34	
11	-R 116.54	-R 116.54	-R 81.66	-176.97	-176.97	-94.74	
12	-R 156.85	-R 109.91	-R 109.91	-238.19	-127.51	-127.51	
13	-R 144.88	-R 101.52	-R 101.52	-220.01	-117.78	-117.78	
14	-R 54.06	-R 37.88	-R 37.88	-82.10	-43.95	-43.95	
15	-R 91.44	-R 64.07	-R 64.07	-138.86	-74.34	-74.34	
16	-R 80.90	-R 56.69	-R 56.69	-122.85	-65.77	-65.77	
17	R 52.04	R 36.46	R 36.46	79.02	42.31	42.31	
18	R 1,999.57	R 1,225.70	R 858.87	7,154.21	1,861.30	996.43	
19	R 2,024.43	R 1,240.94	R 869.55	7,243.17	1,884.44	1,008.82	
20	-R 60.53	-R 42.42	-R 42.42	-91.92	-49.21	-49.21	
21	-R 284.90	-R 199.64	-R 199.64	-432.64	-231.61	-231.61	
22	-R 197.04	-R 197.04	-R 197.04	-228.60	-228.60	-228.60	
23	-R 192.74	-R 192.74	-R 192.74	-223.61	-223.61	-223.61	
<b>Total</b>	<b>R 2,700.75</b>	<b>R 924.36</b>	<b>R 0.00</b>	<b>15,775.95</b>	<b>2,179.35</b>	<b>0.00</b>	

Monthly Savings		
summer	Jan	R 63,113.84
summer	Feb	R 57,712.35
summer	Mar	R 64,038.20
summer	Apr	R 53,235.22
summer	May	R 64,038.20
winter	Jun	R 342,191.67
winter	Jul	R 355,788.27
winter	Aug	R 357,967.62
summer	Sep	R 56,860.32
summer	Oct	R 65,814.59
summer	Nov	R 63,113.84
summer	Dec	R 54,159.57
<b>Annual savings</b>		<b>1,598,033.72</b>

Excel calculation 3: Grootfontein financial results

Hour of day	Baseline	Optimised	Summer Tariff			Winter Tariff		
			Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
0	3,052	3,634	24.35	24.35	24.35	28.25	28.25	28.25
1	2,994	3,601	24.35	24.35	24.35	28.25	28.25	28.25
2	3,023	3,567	24.35	24.35	24.35	28.25	28.25	28.25
3	3,009	3,493	24.35	24.35	24.35	28.25	28.25	28.25
4	3,039	3,417	24.35	24.35	24.35	28.25	28.25	28.25
5	3,028	3,197	24.35	24.35	24.35	28.25	28.25	28.25
6	3,023	2,900	34.75	24.35	24.35	52.77	28.25	28.25
7	3,102	2,849	56.69	34.75	24.35	202.83	52.77	28.25
8	3,189	2,891	56.69	34.75	24.35	202.83	52.77	28.25
9	3,210	3,019	56.69	34.75	24.35	202.83	52.77	28.25
10	3,232	3,231	34.75	34.75	24.35	52.77	52.77	28.25
11	3,203	3,319	34.75	34.75	24.35	52.77	52.77	28.25
12	3,141	3,429	34.75	24.35	24.35	52.77	28.25	28.25
13	3,125	3,720	34.75	24.35	24.35	52.77	28.25	28.25
14	3,212	3,797	34.75	24.35	24.35	52.77	28.25	28.25
15	3,255	3,723	34.75	24.35	24.35	52.77	28.25	28.25
16	3,227	3,672	34.75	24.35	24.35	52.77	28.25	28.25
17	3,227	3,318	34.75	24.35	24.35	52.77	28.25	28.25
18	3,198	202	56.69	34.75	24.35	202.83	52.77	28.25
19	3,199	25	56.69	34.75	24.35	202.83	52.77	28.25
20	3,155	3,314	34.75	24.35	24.35	52.77	28.25	28.25
21	3,140	3,720	34.75	24.35	24.35	52.77	28.25	28.25
22	3,140	3,600	24.35	24.35	24.35	28.25	28.25	28.25
23	3,130	3,615	24.35	24.35	24.35	28.25	28.25	28.25
<b>Total</b>		75,253	75,253					

MW shifted in Morning	248	Summer Tariff			Winter Tariff		
		Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
MW shifted in Evening	3,085						
0		-R 141.70	-R 141.70	-R 141.70	-164.40	-164.40	-164.40
1		-R 147.70	-R 147.70	-R 147.70	-171.36	-171.36	-171.36
2		-R 132.49	-R 132.49	-R 132.49	-153.71	-153.71	-153.71
3		-R 118.02	-R 118.02	-R 118.02	-136.92	-136.92	-136.92
4		-R 92.20	-R 92.20	-R 92.20	-106.97	-106.97	-106.97
5		-R 41.35	-R 41.35	-R 41.35	-47.97	-47.97	-47.97
6		R 42.94	R 30.09	R 30.09	65.21	34.91	34.91
7		R 143.70	R 88.08	R 61.72	514.13	133.76	71.61
8		R 168.99	R 103.59	R 72.59	604.63	157.31	84.21
9		R 108.58	R 66.56	R 46.64	388.50	101.08	54.11
10		R 0.11	R 0.11	R 0.08	0.17	0.17	0.09
11		-R 40.07	-R 40.07	-R 28.08	-60.85	-60.85	-32.58
12		-R 100.06	-R 70.11	-R 70.11	-151.94	-81.34	-81.34
13		-R 206.54	-R 144.73	-R 144.73	-313.65	-167.91	-167.91
14		-R 203.43	-R 142.55	-R 142.55	-308.92	-165.38	-165.38
15		-R 162.81	-R 114.09	-R 114.09	-247.24	-132.36	-132.36
16		-R 154.81	-R 108.48	-R 108.48	-235.09	-125.85	-125.85
17		-R 31.50	-R 22.07	-R 22.07	-47.83	-25.61	-25.61
18		R 1,698.55	R 1,041.18	R 729.57	6,077.19	1,581.09	846.43
19		R 1,799.37	R 1,102.99	R 772.88	6,437.94	1,674.95	896.67
20		-R 55.26	-R 38.72	-R 38.72	-83.91	-44.92	-44.92
21		-R 201.59	-R 141.26	-R 141.26	-306.13	-163.88	-163.88
22		-R 112.12	-R 112.12	-R 112.12	-130.08	-130.08	-130.08
23		-R 117.91	-R 117.91	-R 117.91	-136.79	-136.79	-136.79
<b>Total</b>		R 1,902.68	R 707.03	R 0.00	11,284.01	1,666.96	0.00

Monthly Savings		
summer	Jan	R 44,687.07
summer	Feb	R 40,881.71
summer	Mar	R 45,394.10
summer	Apr	R 37,783.38
summer	May	R 45,394.10
winter	Jun	R 245,298.95
winter	Jul	R 254,916.00
winter	Aug	R 256,582.96
summer	Sep	R 40,393.09
summer	Oct	R 46,589.74
summer	Nov	R 44,687.07
summer	Dec	R 38,490.41
<b>Annual savings</b>		<b>1,141,098.56</b>



### DSM strategy for national water pumping systems amendments:

- Page v: Changed “Energy Service company” to “Energy Service Company”
- Page 2: Changed “ Thomas Edison was the first person to discover electricity in the United States of America in the year 1882 [1].” to “Thomas Edison was the person to discover the electricity generating power distribution system in the United States of America in the year 1882 [1].”
- Page 3§1: Changed “According to the National Energy Regulator of South Africa (NERSA), this resulted in an annual economic loss of R 50bn [7].” To “According to the National Energy Regulator of South Africa (NERSA), this resulted in an annual economic loss of R 50bn as production in most companies was dragged to a halt [7].”
- Page 3§2: Added “Figure 3 indicates the electricity demand patterns for the year 2008 and has been included in this dissertation to illustrate the power consumption of consumers during a 24-hour period.”
- Page 4§2: Changed “With a maximum generation capacity of 41 194 MW, ...” to “With a maximum generation capacity of 41 194 MW in the year 2012, ...”
- Page 4§3: Changed “These new tariff structures act as incentive for companies to save energy during peak periods.” To “These tariff structures act as incentive for companies to save energy during peak periods.”
- Page 5§1: Changed “By example, applying the Mega flex ...” to “ For example, applying the Mega flex ...”
- Page 10§3 Changed “An energy service company (ESCO) is a profit-making business, ...” to “An ESCo is a profit-making business, ...”
- Page 10§4: “is” changed to “are”
- Page 19§3: Changed “... year[35].” to “... year [35].”
- Page 20§1: Changed “Figure 13 show that only a small percentage of the country receives an annual rainfall of more than 500mm.” to “Figure 13 indicates that a large part of the country receives less than 500mm of rain annually.”
- Page 26, Table 2: All decimal separators changed to “.”, and unit specified for wall height [m].
- All tables and units indicated by “( )” changed to “[ ]” for consistency.
- Page 28§2: Changed “... of 4 pumps each ...” to “... of four pumps each ...”
- Page 29, Table 6: “No” changed to “No.”
- All figures: Titles more descriptive, for example “Grootdraai & Tutuka baseline” changed to “Grootdraai & Tutuka power baseline”. Same for axis titles:
  - X-axis- changed from “Hour” to “Time of day [hour]”,
  - Y-axis- changed from “kW” to “Power [kW]”
- Page 30§3: added “The figure illustrates that the pumping station consumes just over 5 MW of power on average throughout a weekday. This calculates to three pumps running throughout the day. By starting an additional pump during the off-peak and standard time period of the day, the possibility of stopping all the pumps between 18H00 and 20H00 will exist on the pump station.”
- Page 31§4: added “As with the Grootdraai & Tutuka pump station, an additional pump could be started throughout the standard and off-peak periods. This will allow for the entire load to be shifted out of the evening peak time period.”
- Page 32§2: added “...by scheduling pumping outside of the Eskom evening peak period.”

- Page 34§2: changed “This will be explained later in this document.” to “This is explained in section 2.5.2 of this document.”
- Page 37: Figure 29 moved from page 38 to page 37
- Page 41§1: added space after full stop “ information [47].The ...” to “information [47]. The ...”
- Page 42§5: changed “drag-drop” to “drag and drop”
- Page 53§1: changed “... Chapter Two, ...” to “... Chapter 2, ...”
- Page 57§3: changed “...the amperage on the pump-motors will exceed their maximum allowable limit,...” to “...the power drawn by the pump-motors will exceed their maximum allowable limit,...”
- Page 65§1: changed “result or ... periods is the...” to “result to ... periods, is the ...”
- Page 65§3: added” during the 3 month performance assessment”
- Page 65§4: Changed “... the financial saving achieved during the performance assessment periods are...” to “... the financial saving achieved during the 3 month performance assessment periods are...”